DEVELOPING MOBILE LEARNING MANAGEMENT SYSTEM (MLMS) BASED ON ANDROID FOR CURRICULUM LITERACY

MENGEMBANGKAN *MOBILE LEARNING MANAGEMENT SYSTEM* (MLMS) BERBASIS ANDROID UNTUK LITERASI KURIKULUM

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Abstrak. Penelitian tentang inovasi pembelajaran ini bertujuan untuk mengembangkan aplikasi Sistem Manajemen Pembelajaran Seluler (mLMS) berbasis *Android Honeycomb* sebagai media bagi mahasiswa untuk meningkatkan penguasaan kompetensi dasar profesional, dengan akses yang lebih luas dan konten yang lebih kaya dikemas dalam multimedia. Subyek dalam penelitian ini adalah mahasiswa pada mata kuliah Kurikulum dan Pembelajaran di Departemen Pendidikan Akuntansi A dan Departemen Pendidikan Jerman B. Instrumen yang digunakan adalah kuesioner dan tes *online*. Temuan menunjukkan sebagai berikut: (1) Pengembangan mLMS berbasis *Android Honeycomb* dilakukan melalui tahapan analisis kebutuhan model, pengembangan kerangka kerja konseptual, dan pengembangan kebutuhan perangkat lunak; (2) Model mLMS berbasis *Android Honeycomb* terdiri dari tiga tahap, yaitu kegiatan pra-pembelajaran, pembelajaran, dan pasca belajar; (3) Penggunaan mLMS berbasis *Android Honeycomb* mampu meningkatkan hasil belajar mata kuliah Kurikulum dan Pembelajaran di UPI. Peningkatan ini dapat dilihat pada nilai *post-test* yang lebih besar dari nilai *pre-test*; (4) Tanggapan dan persepsi siswa terhadap penggunaan aplikasi berbasis *Android Honeycomb* dalam mata kuliah Kurikulum dan Pembelajaran pada umumnya baik dan positif.

Kata Kunci: Sistem Manajemen Pembelajaran Seluler, Literasi Kuriulum, Capaian Pembelajaran

Abstract. *This research on instructional innovation aims to develop an application of mobile Learning Management System (mLMS) based on Android Honeycomb as a medium for college students to increase their mastery of a basic professional course, with broader access and richer content packaged in multimedia. The subjects were students taking the professional basic course of Curriculum and Instruction at the Department of Accounting Education A and the Department of German Education B. The instruments used were online questionnaires and tests. The findings show the followings: (1) The development of mLMS based on Android Honeycomb was carried out through stages of needs analysis of the model, development of conceptual framework, and development of software requirement; (2) The model of mLMS based on Android Honeycomb consisted of three stages, namely pre-learning activities, learning, and post learning; (3) The use of mLMS based on Android Honeycomb was able to increase learning outcomes in Curriculum and Instruction course at UPI. The increase can be seen in the post-test scores that were greater than the pre-test scores; and (4)*

Students' responses and perceptions of the use of the application of based on Android Honeycomb in Curriculum and Instruction course in general were good and the mLMS being positive.

Keywords: Mobile Learning Management System, Curriculum Literacy, Learning Outcomes

INTRODUCTION

The rapid development of information and communication technology (ICT) and the spread of global information infrastructure development have changed the ways activities in the industries, trades, government, and politics are done. Economic development based on ICT and information society has created a new dominant paradigm, and the ability to be effectively involved in the information technology revolution will determine the future of the nation.

The National Educational Standards Board (BSNP, 2010) explained that the most prominent demand for the 21st century is the connectivity ability, thanks to the science technology that is increasingly narrowed and united and even has created hybrids. This has been pioneered by physicists who has begun to speculate and searching for general theories that can explain the relationships among four forces (gravity, electromagnet, strong, and weak) into the string theory or the Theory of Everything.

In this context, several technologies that are currently changing and will change the paradigms in the future are: (1) Nanoscience and *nano* technology. Simultaneously as the pioneering of DNA theory, physicist Feneman expressed an idea on the essence of the manipulation of atoms and molecules using the dependability of the substance itself. With the aid of technology appropriate to the size of the *nano*, it is expected that gravitation will not be a problem, while surface tension and pulling force will work even more significantly; (2) Cognitive neuroscience. This term comes from the words "cognition" which means knowing process, and "neuroscience," which is the science of nerve system. This science attempts to localize parts of the brains according to their functions in cognition. Hence, the focus is on the brain and the nerve system related to the brain functions. This science basically attempts to reveal the structure and functions of human brains; (3) Imaging technology. A study of optics brings research further into imaging. Among the imaging technologies contributing the most to the life in the 21st century are optic fibre, hologram, and virtual reality; (4) Hologram/Holography**.** Hologram is the product of holographic technology. Hologram is formed by a combination of two coherent lights and takes a microscopic form. Hologram acts as optical information warehouse. The optical information will then form a picture, landscape, or action; (5) Information technology. Life and education especially in the 21st century is characterized by the presence of information technology, whose impacts have changed the fundamental aspects of life. In relation to the academic world, science and technology has broadened the insight into the reality of nature, humans

(their abilities and limitations), and the meaning of their socio-cultural life, thereby breaking down the domination of reductionist philosophies at the levels of ontological, epistemological, or methodological. Information technology is one of the technologies most prominently developing in the 21st century that should contribute to the teaching and learning in the university.

In its realization, there are still some obstacles pertaining to the basic professional courses.The research of MKDP team (2008) shows that: (1) Students were still lacking in their abilities to apply the basic competencies of education accommodating the professional basic courses during their teaching practicum/internship. This lack of ability is assumed to be caused by the lack of such materials during the courses; (2) There was a lack of standardization on the materials to be delivered during lectures, probably caused by the lack of intensive communication among lecturers to unite their perceptions of the courses they teach, so that lecturers' authority became dominant and they did not base their teaching and learning on the guidelines, hence varieties in lectures; (3) There was a lack of media providing standard contents on generic materials of the courses that could be easily accessed by students and lecturers without time constraints. The books for each of the basic professional courses were thought to not optimally facilitate the needs for comprehensive contents accompanied by clear and interesting modelling, such as multimedia.

Departing from these problems, it is clear that there is a need for media able to accommodate students' learning needs concerning broader access in basic professional courses. With the development of information technology, this is highly possible to be done. One of the supports to realize this is the internet that enables interconnectivity of one device to another. In addition, information technology today has given birth to more affordable devices but with great benefits. Computational device such as personal computer (PC) has now entered a generation called Personal Computer Tablet(PC Tablet) and its development has been even more rapid with the support of various free softwares (*freewhere*/open sources) that can be used to create instructional programs. One of such software is Android Honeycomb. Currently, Android is one of the most rapidly developing tablet operating systems. This is inarguably because android that is supported by Google is free. Hence, many producers of PC tablets use android for the operating system. Consequently, the prices of mobile phones with Android operating system become cheaper. Today, Android has created the 3.0 version called Android Honeycomb.

Departing from these facts, the

researcher is interested in developing software and hardware in the form of mobile Learning Management System (*mLMS*) based on Android Honeycomb as a learning medium for students to help provide them with the materials of basic professional courses more openly, with broader access, and richer content with the multimedia.

The general problem of this research is "How to develop a model of mobile Learning Management System (*mLMS*) based on Android Honeycomb as a learning medium for students to increase the quality of the teaching and learning and accessibility of professional basic courses, especially the course of Curriculum and Instruction.

The research aims to: (1) Describe the needs for developing a model of *mLMS* based on Android in increasing the quality of the teaching and learning of the Curriculum and Instruction course; (2) Develop a model of *mLMS* based on Android to increase the quality of the teaching and learning in the course; (3) Test the effectiveness of the model of *mLMS* based on Android in increasing the quality of the teaching and learning in the said course; (5) Find students' responses on the use of the model of mobile Learning Management System (*mLMS*) based on Androidin the said course.

LITERATURE REVIEW

E-learning is frequently linked to learning with a high intensity of the use of ICT. A number of other terms are used to describe this ICT-based learning mode, such as online learning, virtual learning, delivery learning, network learning, and web-based learning. Basically, all of the terms refer to the teaching and learning process that uses ICT for both asynchronousand synchronous. However, the terms are not synonymous to the concept of e-learning, as it has its own characteristics.

The term e-learning has a broader meaning than the terms online learning, virtual learning, delivery learning, network, and web-based learning. This can be seen from the etymology of this term. The letter "e" in e-learning is a shortened form of "electronic". Weggen (2000) stated, "e-learning is delivery of content via all electronic media, including the internet, intranet, extranets, satellite broadcast, audio/video tape, interactive tv, and CD-ROM". The statement clearly describe that e-learning is the delivery of teaching and learning through various electronic devices. Hence, e-learning combines various educational activities carried out by an individual or a group online or offline and asynchronously through computer network or independently and using other electronic devices. This can be seen from the concept of e-learning modality (Romiszowski, 2004).

Mobile learning is defined Quinn

(2000:20) as: "The intersection of mobile computing and e-learning: accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment. E-learning is independent of location in time or space."Based on the definition, mobile learning is a learning model making use of the ICT. In this concept, mobile learning provides the benefits of accessibility to learning materials and interesting visualization. It is important to note that not every teaching material is suitable for mobile learning.

The research on mobile learning has been conducted, and it is a reference in this research. Some of them are, Ben Bachmair, Pachler Nobert, John Cook (2011). *Mobile Learning Towards Curricular Validity in the Maelstromofthe Mobile Complex.* The conclusion of this research is *Mobile learning can meaningfully serve as interfaces between traditional and newcontexts. And, second, specific designs formobile learning and teaching seem essential in order to achieve sustainable results.* Research conducted by Dwi Masfufah (2015) on Media Development Learning Mobile Learning (M-Learning) Android Based On Material For Class X SMA / MA, obtaining results that "m-learning instructional media developed Android-based models 4- D is declared fit for use by teaching biology class X SMA/MA. Research by Helen Crompton (2016). *MovingToward a Mobile Learning Landscape : Presenting a M – learning Integration Framework*. Empirical data shows that educators have not been able to integrate technology effectively into the curriculum, so that it is necessary for a framework coming to the integration of mobile devices in the learning process.

Framework for the integration of mobile learning (mMLearning) consists of four main parts: the confidence, resources, methods, and goals. The fourth asek into a component for integrating mobile into a learning system that takes into account the system and environment. Riset *Olivia Annisa Tifani (2016) :* Teachers' Readiness in Using Mobile Devicesfor Mathematics Teaching and Learning: A Case Study in Banten Province, Indonesia. The survey shows that the six indicators of the readiness (1) understanding ICT in education, (2) curriculum and assessment, (3) pedagogy, (4) ICT, (5) organization and administration, (6) teacher professional learning already achieved. They are ready for mobile learning implementation using mobile devices. This paper emphasize that mathematics teachers have to be empowered to use their own mobile devices for use in teaching and learning. Riset Kevin Burden (2016). A Snap shot of Teacher Educators' Mobile Learning Practices. *Mobile Learning, Emerging Learning Design & Learning 2.0, May 27-*

28, 2016, Bangkok, Kingdomof Thailand. Findings indicated high 'selfratings' of features of authenticity (setting, toolandtask) and healthy perceptions of generativity and sharing, often involving media production apps.

This research has fundamental differences with some of the research that has been done above, that is no focus on a study conducted in universities, in addition, students and faculty as research subjects and not the students and teachers at the school. This research also uses the latest technology with the Android Honeycomb software that has not done a lot of research beforehand.

The Advantages of Mobile-Learning

M-learning is a type of learning based on mobile technology, such as PDA, cell phone, laptop, which enables anyone to learn through the internet, anytime and anywhere with fun, ease, and affordability. The general characteristics of m-learning are:

1. **M-learning is very dynamic.** The learning materials can be enriched, updated, and accessed anytime. Today's news can be made the actual information right at the moment. Access to main sources or experts can be quick when needed. M-learning program can be presented in various interesting, attractive, and interactive formats. The format of presentation is supported by the rapidly developing multimedia technology. Animation technology enables the packaging of materials to be more easily understood, without the need for real objects. Real experiences can be replaced with peccarious experiences. If the teaching and learning is done in real mode, at least battery, cable, coil, and lamp are needed. Through learning animation media, learning outcomes will still be meaningful because students can interactively simulate, practice, and see visually the changes of the concepts. Certainly, the advantage of m-learning is that it is simpler, without the need for a lot of preparations.
2. **M-learning can be operated all the time** The tools used in m-learning are simple and practical. When there is a problem, the tools can be readily used. Wecangetthenecessaryinformationorlearningmaterialswhenweneed it. Whenweneed a calculator, for instance, wecanget it easily for mathemaical data calculation.
3. **M-learning requires cooperation.** Cooperation in learning is highly needed in order to form rich, varying, and in-depth knowledge. Support from others is needed for knowledge brainstorm. Weller (2003) argued that one of the theories and applications for m-learning is the “collaborative learning” model. This is so because one learns from the other. M-learning connects students to experts, colleagues, or peers, both those within and without the professional organizations.
4. **M-learning supports individual learning.** Each student can select a format or model that s/he desires and one that is more relevant to his/her background. M-learning provides choices for individual

learning. The learning outcomes will also be determined by individual mastery. Each student will experience the learning process differently according to his/her prior knowledge. In the classical learning situation, students can also use technological devices individually.

The term mobile learning (m-learning) refers to the use of IT mobile devices, such as PDA, cell phones, laptops, and PC tablets, in the teaching and learning. M-learning is a unique form of teaching and learning because the learners can access learning materials, instructions, and applications related to the course anytime and anywhere. This accessibility will increase their attention to learning materials, making learning more pervasive and encouraging them with the lifelong learning. Furthermore, compared to the conventional learning, enables more opportunities for ad hoc collaboration and informal interaction among learners. In e-learning, time and space independence becomes the most important factor. However, in traditional e-learning the need for the use of PC makes the learning not totally independent of time and space. M-learning promises the real independence of time and space.

Despite the advantages, m-learning will not totally replace the traditional e-learning. With limited computing resources, m-learning cannot provide access to learning resources similar to those provided in e-learning. M-learningwill most probably be used as a supplement for e-learningor the traditional learning in which computer-aidedlearning is not available. The most optimal system is one combining m-learningand e-learning, in which there is an alternative to the learning process done with computer or mobile devices combined with the traditional learning.

The Concept of Mobile Learning System (*mLMS*)

Learning management system based on computer has been available since the 1960s, but it developed very rapidly in the late 1900s and early 2000s. With the rapid changes in the world of education and training software, it is of no wonder that several learning management systems begin to look old and obsolete. At the same time, many companies of learning management system (LMS) admitted that they have reached the saturation point and were looking for new ways to sell their intellectual wealth. *Just-in-time*, a revolution in mobile learning came, presenting new opportunities for the LMS companies to market their products. The ways are highly varying.

Some of the open source learning management systems have been designed with mobile computing in mind. For example, Moodle interface consists of a three-column layout that is very mobile friendly. *Sakai*, another open-source

learning management system, has a group of developers that produce features that make their phone LMS-ready. However, this is not very different from LMS in their mobile and non-mobile versions.

Another approach is to design a "plug-in" or "extensions" to the existing learning management system (Level II). Moodle has several plug-ins designed for the inclusion of MLE-Moodle and MOMO (Mobile Moodle). Blackboard has an extension to their Learn 9.1 platform called Blackboard Mobile that allows users to receive notifications of updates to their Blackboard courses, including the new task, the content of course, updating the study group, public discussion, and the values of the assessment results.

Other contenders in this category are *Cellcast of OnPoint Digital*. Mobile learning program allows users to create, inform, deliver, and track learning audio and video content on a variety of smart phones, tablet, and netbook computers. It also allows for the delivery and tracking of mobile web content, web and PDF files, video, animation narrated slide presentation, and the spoken word and text-based assessment. *Cellcast* is fully integrated with a learning management system *OnPoint Digital*, but can operate independently without referring to the LMS.

RESEARCH METHODS

The research consisted of two stages. The first stage was the development of mobile learning management system (*mLMS*), and the second stage was the implementation of the model. The development of the learning device adapted the development model proposed by Thiaragajan, Semmel, &Semmel (1974), covering “define, design, dan develop,”

At the stage of define, an analysis to the curriculum, students, and learning problems was done. Then, the subject matter of the course Curriculum and Instruction (as a part of the basic professional courses, Indonesian, and henceforth MKDP) was identified. At the stage of design, a prototype of learning device to be developed was designed. The format and substance of the design refer to the standards of UPI's curriculum and the essential materials developed by the team of MKDP. At the stage of *develop*, a set of learning management system (*mLMS*) software was developed. An analysis of the device draft was also done, both internally by researchers and externally by experts, as well as the readability by students. The draft was then revised according to the input until the text was ready for a test. The limited test was done in the Department of Curriculum and Educational Technology, involving lecturers and students, by implementing the device in the teaching and learning. The teaching and learning activities were observed, with a focus on both lecturers

and students. Based on the observations, a reflection was done for the learning device and the teaching and learning. When weaknesses were found, improvement was subsequently made.

Context of the Study and Participants

The research was focused on in the implementation of teaching and learning in the basic professional courses (MKDP) at Universitas Pendidikan Indonesia. To limit the scope of this research, it was done in one othe courses, namely Curriculum and Instruction. The implementation of the research included the stage sof designing and testing in the Department of Curriculum and Educational Technology of the Faculty of Educational Sciences. The research subjects were students and lecturers involved in the lectures. For sampling, a class of 40 students was selected for observations on the use of *mLMS* based on Andriod on PC tablet in the course of Curriculum and Instruction. They're asked to provide written consent before being given the treatment to be used as research subjects.

In line with the needs of the research, the instruments used included: (1) At the analysis, to find the initial needs for the model in the Curriculum and Instruction course, a questionnaire was distributed; (2) Once the model was made, it was tested using the model checklist softwareto observe the variables used in the software, and guided interviews were done with experts to give assessment to the model; (3) At the stage of model effectiveness test, learning outcomes instrument was given to the students; and (4) To find the accessibility of the model in the teaching and learning, a questionnaire was distributed to students and lecturers.

DISCUSSION AND RESULT

This part describes the data collected on the needs and development of the ICT-based learning model through the use of mobile Learning Management System (*mLMS*).

Analysis of the Needs for mLMS Development

The model in this research was developed based on the analysis of students' needs for learning with *mLMS* based on Android. The research surveyed 79 students of UPI with 30 questions. As many as 50 respondents were female and 29 male. They are scattered among semesters 5 and 7.What follows are some important items that describe the needs for the system to be developed.

1. There were 48 students out of the total N=79 who stated the need for independent learning materials to support the course of Curriculum and Instruction in the form of enrichment. The respondents said that it was important (57%), and even 37% of them said it was very important.
2. The researchers explored the students' opinion on whether the internet contributed to course

enrichment. It was found that 52% of the students "Strongly agreed", 38% of them agreed, and only 4% did not really agree.

3. Students could operate Android software fairly well (35%).This is the important prerequisite for developing the learning model.
4. The features required in the mobile learning with Android were, among others, course materials (62%), learning the materials online (59%), learning games (46%). These features were considered in the development of the software.
5. The devices required in the Mobile Learning are: Application software, internet connection, mobile devices, lecturers' and students' preparation, and supporting curriculum system. In this context, the majority responded that what the ultimate need was the preparedness of lecturers and students (59%).
6. The features needed in the mLMS system, according to the results of the survey: (1) Login as users, (2) Download and Upload facilities, (3) Variative content (Multimedia), (4) Training facilities (problems or case studies), (5) Records of students' online activities, and (6) Manual book.

Mobile Learning Management System (*mLMS*) Model Development

a. Model's Conceptual Framework

As stated in the beginning, the main goal of this research is to develop a learning model that can increase accessibility in the course of Curriculum and Instruction and its teaching and learning through the implementation of a model of mobile Learning Management System (MLMS).The concept of this model referenced the idea of Joyce & Weil (1992)that learning model is a plan or pattern that can be use to shape curricula (long-term instructional planning), design learning materials, and guide classroom learning or any other learning. Learning model can be made a choice, meaning that teachers can choose which learning model is most appropriate and efficient to meet the education goals.

The construct of the model developed in general has the following characteristics:

1. Having scientificprocedure, namely the learning model should have a systematic procedure to change students' behaviours.
2. Having specification of learning outcomes, meaning that the learning model mentions learning outcomes in detail regarding student performance.
3. Mentioning specification of environment, namely the learning model mentions exactly the conditions in which students' responses are observed.
4. Having criteria of performance, meaning that the learning model shows the criteria of performance expected from students and plan the behaviours expected from students that can be demonstrated after certain learning steps.
5. Having specification of operations, namely the learning model mentions the mechanisms which show students' reactions to and interactions with the

environment.

6. Being based on educational theory and learning theory from certain experts. For example, a model of research group by Herbert Thelenand is based on John Dewey's theory. The model is designed to train democratic participation in a group.
7. Having certain educational missions or goals. For instance, inductive thinking model designed to develop inductive thinking process.
8. Being able to be made guidelines for improvement of classroom teaching and learning activities. For example, the synecticmodel designed to improve creativity in writing subject.
9. Having certain parts in its implementation, namely: (1) the order of learning steps (syntax), (2) reaction principles, (3) social system, and (4) support system. The four parts are practical guidelines for teachers to apply a learning model.
10. Having impacts as a result of the applied learning model. The impacts include: (1) learning impacts, namely measureable learning outcomes, and (2) accompanying impacts, namely long-term learning outcomes.
11. Making instructional design with the selected learning model.

Based in the needs of the model explored in the beginning of the research as well as the theoretical framework above, a conceptual model was produced. The model of mobile Learning Management System (MLMS) based on Android is implemented in three main stages, namely (1) pre-learning, (2) learning,and (3) post-learning. The three stages depart from the input, namely UPI's students who were enrolled in the Curriculum and Learning Course (MKDP) for three semesters. The activity was expected to result in output in the form of learning outcomes. In the pre-learning activity, several things are done: (1) Curriculum analysis, (2) course syllabus mapping, (3) course materials uploading through Android application, (4) task making (initiation), and (5) learning evaluation making (Online). In the learning stage, some main activities are mostly dominated by students in using the Android application, namely: (1) Accessing Android learning materials, (2) Doing the task (initiation), (3) Formative tests, (4) Reviewing students' activity by the lecturers, and (5) Group discussion. In the post-learning stage, the activities are dominated by the lecturers': (1) Task grading and formative evaluation; (2) Checking students' learning outcomes; (3) Final learning evaluation (exam) done face to face; and (4) Follow-up action (enrichment/remedial).

The research produced an innovation of ICT-based learning in the form of mobile Learning Management System (*mLMS*)based on Android Honeycombas students' learning medium to increase the quality of the teaching and learning and accessibility of MKDP courses, especially the Curriculum and Instruction course in Universitas Pendidikan Indonesia.

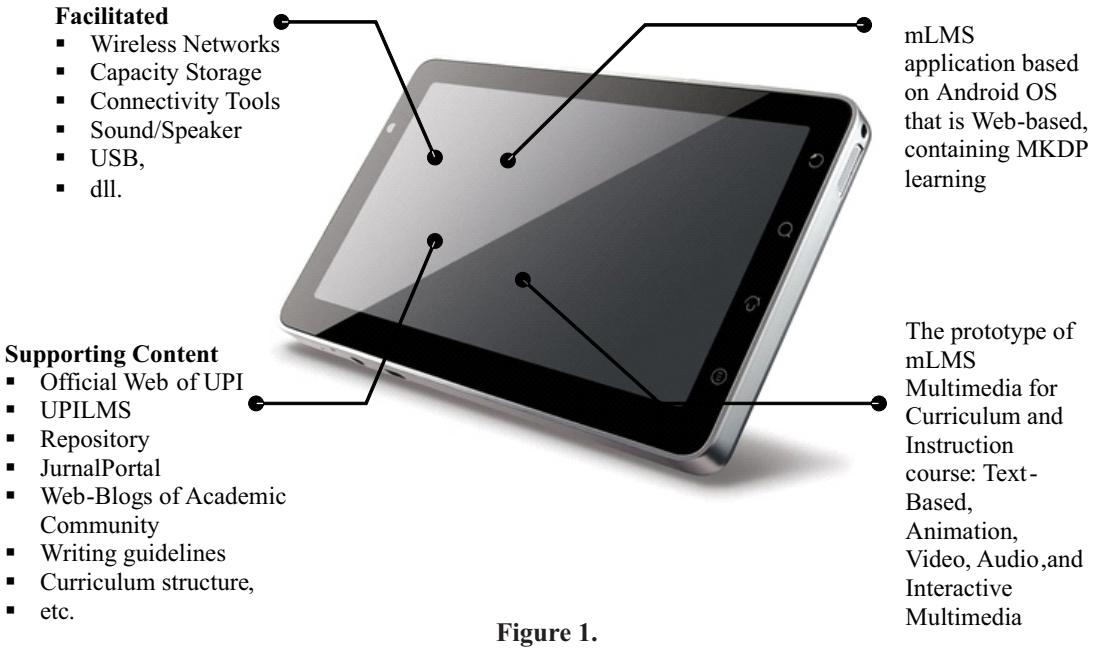

Figure 1.
Description of the m-LMS

Evaluation of Students' Activities and Learning Outcomes

To find students' learning outcomes and their increase, the research employed pre-tesand post-test design. Both were then compared to find the difference in the learning outcomes and their increase. The tests were given to the Department of Accounting Education and German Education.

Table 1.
Android Learning Outcomes of German Education Department

NUMBER OF STUDENTS	LEVEL	TOTAL PRE-TEST GRADE	TOTAL POST-TEST GRADE	GAIN
39	Bachelor's degree			
TOTAL		Σ1374	Σ 2190	Σ816
AVERAGE		**47.37**	**75.51**	**28.13**

The table indicates that the learning outcomes using Android increased for 28 points from the pre-test to the post-test, or as much as 137 point in total. Hence, it can be concluded that the use of Android can increase learning outcomes, especially in the subject of Curriculum and Instruction.

Table 2.
Android Learning Outcomes of Accounting Education Department

NUMBER OF STUDENTS	TOTAL PRE-TEST GRADE	TOTAL POST-TEST GRADE	GAIN
45		100	44
TOTAL	Σ 2280	Σ 3481	Σ 1201
AVERAGE	**54.285**	**82.880**	**28.595**

Table 2 shows the learning outcomes of Accounting Education Department students in their pre-test and post-test. An increase of 28.595 point was observed. The post-test score was greater than that of the pre-test. Thus, it can be concluded that the use of mobile Learning Management System (*mLMS*) based on Android can increase students' learning outcomes. What follow is the comparison of the learning outcomes of the two departments.

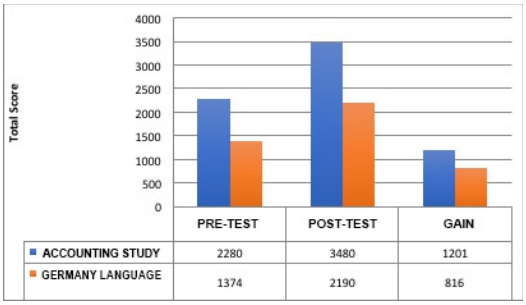

Figure 3
Comparison of Learning Outcomes between German Education Department and Accounting Education Department Students through mLMSLearning Based on Android

Based on the graph, it can be seen that both samples, the German Education Department and Accounting education Department experienced an increase in their post-test scores compared to their pre-test scores, both in terms of total points and average score. Based on the difference in gain, Accounting Education Department students had a higher gain.

Students' Responses to the Learning model of mLMS

The researchers explored students' responses to the use of mobile Learning Management System (*mLMS*). They are as follows:

Table 4
Students' Responses to the Learning model of mLMS

NO	ITEM	NOTES										
		SB	%	B	%	C	%	K	%	T	N	ɛ
1	The available features in the mLMSbased on Android HoneyComb	21	29.58	39	54.93	10	14.08	1	1.41	0	71	100
2	The ease of uploading and installing application from tablet or cell phone	55	77.46	13	18.31	3	4.23	0	0.00	0	71	100
3	The range and depth of the learning materials	59	83.10	11	15.49	1	1.41	0	0.00	0	71	100
4	Interactivity and ease of navigation	23	32.39	42	59.15	4	5.63	2	2.82	0	71	100
5	Program responses to the stimuli given by the user	15	21.13	17	23.94	37	52.11	2	2.82	0	71	100
6	Multimedia content, such as Animationand Video	18	25.35	20	28.17	30	42.25	2	2.82	1	71	100
7	The language used in each module unit	21	29.58	34	47.89	12	16.90	3	4.23	1	71	100
8	Material display systematics	21	29.58	12	16.90	34	47.89	2	2.82	2	71	100
9	Ergonomic display of the application	23	32.39	34	47.89	12	16.90	2	2.82	0	71	100
10	Application of interface design and ease in use	21	29.58	13	18.31	35	49.30	2	2.82	0	71	100
Total		277		235		178		16		4	710	

The data show that on average students' responses to the use of *mLMS* in the course of Curriculum and Instruction was good, namely 39.01%. hence, the use of *mLMS* was strengthened by students' responses which express the importance of this application in teaching and learning.

The model developed in this research was based on the results of needs assessment. Need Assessmentis an important stage in developing a model. In the encyclopaedia of evaluation, *Anderson* and Krathwohl (2001) explained that need assessment is defined as a process of determining needs as well as priorities. Need Assessmentis a method to find the difference between that should be and what is. The desired condition is the ideal condition, while the existing condition is usually called the real condition. Need assessment is a formal process to determine the gap between the output and the real impacts and the output and desired impacts, and then placing the gap in a priority scale to choose the most important to solve first.

Furthermore, Anderson (2001) explained that need assessment can be done in the following stages: (1) preparation, (2) data collection, (3) data analysis, (3) interpretation, (4) dissemination, and (5) report making. In the preparation, the necessary steps are: (a) Identifying and describing the audiences and target population, (b) Clarifying the goals of need assessment, namely the stated reasons of selecting individuals or groups to participate in the program, budget allocation, etc., and the unstated reasons; (c)Determining the scope and location of need assessment; (d) Determining the people involved in the need assessment and how to maintain communication with the group throughout the study; (e) Developing and considering the urgent political issues, namely involvement of key individuals and groups in the their environment, continuous communication, and identification and approach to the people in the bureaucratic environment;and (f) Identifying and explaining the information needed, including conditions, program, fund, conceptual framework, and philosophical bases as well as success indicators.

The research has successfully developed a learning model based on mobilecommunication technology. The concept of learningdeveloped in this research has gone through an in-depth analysis of the relevant literature and previous studies. M-Learning (mobile learning)is a learning approach involving mobile devices, such as cell phone, PDA, Laptop, and tablet PC Tablet, in which learners can access the materials, instructions, and applications related to the subject without time and space constraints. Clark in Yulianto (2012) explained that Mobile Learning is: “The intersection of mobile computing and e-

learning: accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment. E-learning is independent of location in time or space." Mobile learning is a learning model making use of ICT. Conceptually, mobile learning brings the benefits of the availability of learning materials that can be accessed anytime and interesting material visualization. Mobile learning refers to the use of mobile IT devices, such as PDA, cell phone, laptop, PC tablet in teaching and learning. M-learning is a part of electronic learning (e-learning),so in itself it is a part of distance learning.

The aspects that should be provided by m-learningdevices are the ability to get connected to other devices, especially computer; the ability to display learning information; and the ability to realize the bilateral communication between teachers and learners. M-learningis a unique learning because learners can access learning materials, instructions, and applications anytime and anywhere. This ease of access will increase attention to learning materials, make learning pervasive, and encourage learners towards lifelong learning. In addition, compared to the conventional learning, m-learning enables more opportunities to directly collaborate and interact informally with other learners.

CONCLUSIONS

This research has developed a model of mobile Learning Management System (mLMS) based on Android Honeycombas a learning medium for students through the stages of need assessment for the model, conceptual framework development, and development of software requirements. The model was then implemented and analysed for its impacts on students' learning outcomes.

Need assessment of the model was conducted through a survey to students of Accounting Education and German Education Departments as the research sample. The important aspects required for the model development are: (1) Usability of the features of the application; (2) Ease of autorun installation; (3) Appropriate content and conformity to independent learning needs and learning mastery; (4) High interactivity; (5) Multi-platform; (6) Enabling students' independent learning and self-evaluation.

The model of mobile Learning Management System (mLMS) based on Android Honeycomb consists of three main stages: (1) pre-learning, (2) learning and (3) post-learning. The three stages depart from the input obtained from the third semester students who were enrolled in the Curriculum and Instruction Course. The activity is expected to result in learning outcomes as the output. The pre-learning stage comprises: (1) Curriculum

analysis, (2) Syllabus mapping, (3) Uploading of course materials through Android application, (4) initiation (task making), and (5) Evaluation making (Online).In the learning stage, the activities are: (1) Students' accessing Android learning materials, (2) Doing the task (initiation), (3) Formative tests, (4) Reviewing students' activity by the lecturers, and (5) Group discussion. In the post learning stage, the activities which are dominated by lecturers include: (1) Task grading and formative evaluation, (2) Checking students' learning outcomes, (3) Final learning evaluation (exam) done face to face, and (4) Follow-up action (enrichment/remedial).

The use of mobile Learning Management System (*mLMS*) based on Android Honeycomb could increase the learning outcomes in and the quality of the teaching and learning of the course of Curriculum and Instruction in dapat meningkatkan hasil belajar. This can be seen in the post-test scores that were greater than the pre-test scores.

Students' responses to the use of the model of mobile Learning Management System (mLMS) based on Android Honeycombin the course of Curriculum and Instruction in UPI in general were categorized as good and they had positive perceptions of the use of the application in the teaching and learning of the Curriculum and Instruction course, included under the group of basic professional courses.

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