THE DEVELOPMENT OF MULTIMEDIA-BASED LEARNING MATERIAL FOR DIGITAL ELECTRONICS SUBJECT TO IMPROVE STUDENTS' COMPETENCE IN THE DEPARTMENT OF ELECTRONICS ENGINEERING, MAKASSAR STATE UNIVERSITY

Mahmud Mustafa
Universitas Negeri Makassar
mahmudmustafa.pta@gmail.com

ABSTRACT

This research and development study aimed at developing multimedia-based learning model and finding any forms of learning process for digital electronics subject conducted at the first semester of Electronics Engineering at Engineering Faculty, Makassar State University in academic year 2015-2016. The data was gathered through theoretical review and field observation, interview, recording, and note taking. The development process was done by expert validation and trial-error of individual, small group, and field group for validity, practically, interest, as well as the effectiveness of multimedia-based for digital electronics subject.

Keywords: development, model, learning Material, multimedia-based, and electronics

INTRODUCTION

The role of education is very important in determining the nation's competitiveness; therefore, it is necessary to improve its quality. One of them is the use of information technology which is growing rapidly in this era of globalization in the world of education through change and innovation.

Stine (2002) states that learning, which is applied since childhood, is the old-fashioned and unproductive way of learning since it emphasized to memorizing without thinking. It is time for teachers and lecturers to leave the conventional learning method or teacher-centered where learning only use lecturing and memorizing methods to student-centered using information and communication technology (ICT)

Some researches indicate that the effectiveness of using ICT in learning is better than traditional or conventional learning. Rusman (2006) in his dissertation research shows the results of learning by using computer-based learning model of tutorial and drill and practice is better than conventional one. Therefore, every university needs to create a fun learning environment. This is in accordance with the opinion of Chickering (1987) in the seven principles for good practice in undergraduate education in which the Institutions or Universities and colleges in the learning process should take into account the seven principles namely; (1) encouraging contact between students and lecturers (outside the classroom), (2) encouraging cooperation among students, (3) encouraging active learning, (4) providing feedback as soon as possible, (5) emphasizing time and tasks, (6) communicating high expectations, and (7) respecting different talents.

Meanwhile, Brodjonegoro (2002) pointed out that it is also required a change in the orientation of higher education. The changes are aimed at: (1) teaching to learning, (2) passive students to active learners, (3) ability-centered to learner-centered, (4) solitary learning to interactive

learning, and cooperative; (5) learning in the classroom to learning society.

One application of ICT is the use of multimedia in learning. Bates (1995) emphasized that among other media, interactive multimedia or other computer-based media is the most obvious (overt). Real interactivity here is interactivity that involves physical and mental of users when trying to program multimedia. As a comparison, a book or television media actually provide interactivity, however, this interactivity is vague (covert) because it only involves mental of user.

Along with Bates's opinion, Ariesmunandar (2003) states that Multimedia-based learning is seen as a developed strategy to enhance the quality of learning. In this case, there are several advantages of learning with multimedia-based, namely: (1) new way of working with multimedia will raise the motivation of learners in learning, (2) colors, music, graphics, and animations can add a sense of realism and demanding exercise, (3) laboratory activities, simulations, etc., (4) personal quick response in learning activities will generate high strengthening, (5) memory capability allows learners' past performance and uses in planning the next steps, (6) patience, personal habits that can be programmed to complete more positive attitude atmosphere, especially it is useful for slow learners, (7) the ability to memorize allows individual learning, the commands given individual can be prepared for all learners, especially to devoted learners and their learning progress can be monitored continuously. Teacher could monitor their students and could help them directly, as well.

In addition to aspects of technological progress, one of the other components that are considered as a contributing factor of education quality in universities according to Howell in Fauziah (2012) is the ability of lecturers to facilitate the learning process. It is strongly associated with two teaching competencies that lectures should have, they are personal and operational competencies. Personal competence is knowledge of something, whereas operational competence is the ability to demonstrate something. Lecturers' competence include: (1) competence in teaching materials, (2) didactic competence, (3) pedagogy methods, (4) skills in presenting materials, (5) skills in giving instruction, (6) the ability to design curriculum and learning materials, (7) organizational competence, (8) competence in science.

Referring to the current situation, teacher needs to undertake development activities. Development according to Richey (1994) is one of the domains of educational technology which is the process of translating the design specifications into physical form. Furthermore, Reigeluth (1983) also explains that Instructional theory is defined as identifying methods that will be best provide the conditions under which learning goals will most likely be attained. In this definition, there are three components need to be considered, namely the methods, conditions, and learning objectives. This may imply that when learning theory used, it is necessary to identify the appropriate method to create a pleasant learning conditions in order to achieve the learning objectives.

Chalil (2008) states that learning is an interaction process of learners' interaction with educators and learning resources in one environmental study. The context of interaction in learning process is social interaction, the relationship between individual and the group, in this case teacher as individual interact with a group of learners.

In conducting learning and teaching process, lecturers of Digital Electronic subject in the Department of Electronics Engineering, has been using modules as learning resources. The method used is still conventional namely lecturing or practicing. Therefore, there are some difficulties found in the learning process such as limited learning recourses, and mostly lecturers have lack of experience in the field of practicing. Learning resources in this case could be learning media as a means to support learning process. One of them is multimedia CD (compact disc).

Multimedia CD is a series of moving images that combine the two elements of the audio and visual. The existence of the audio element allows the student to be able to receive messages of learning through auditory, visual elements while enabling the creation of the message to learn through visualization. Multimedia CD learning in this case is used as a medium of learning. Thus, the selection of multimedia as a learning resource in the form of instructional media for the Digital Electronics subject is relevant and effective since learning the subject needs direct examples which is sometimes it is difficult to be practiced by educators.

The purpose of this development is to develop a multimedia learning course on Digital Electronics, to produce a variety of learning resources and media that can be used based on the needs of learning to support the learning process. The product form of this research is in the form of systematic models in developing multimedia-based learning course on Digital Electronics, in the Department of Electronics Engineering Education . The development model produces some multiple outputs, namely : (1) syllabus, (2) lesson plans , (3) flow chart (4) storyboard , and (5) instruction guidance.

Material Teaches

Material teaches to have terminology that variably been given by pro. There are many terminology is utilized deep study instructional designs is instructional materials (learning material) one that ranges all learning forms as road map for instructor, participant module is taught o*verhead transparent (OHP), videotapes* , multimedia's format computer-based) and pages web to distance learning (Dick and Carey, 2005:7)

In its relationship by use of technology into learning, material teaches also be called materials that ordinary differentiated with tools (equipment), and devices (peripheral, tool). Equipment is hardware dn software that is utilized with as to establish video training who is kept or is exported material thru. Material is web stream (digital), casette's video (analogue), and player's DVD (digital) and computer is Rom's DVD (digital) one that is utilized to access material. (Antony Karl Betrus in Janusweski Molenda, 2008:225). Tool third, material and aforesaid equipment at assesses through a Belaar's source study that will at assesses through a source study that as domain what do be even greater deep instructional design. Beside it, material teaches also learning materials (material teaches) one that range visual's assistive tool as handout, comprise of slides / overheads text, diagram, image and photograph, other media plus as audio, video and animations (Davies and Hinghton, 2006: 130).

Medias Base Concept Learning

Media in learning define as: (1) form or physical realization of education technology that for example as word or

sentence, film, tape, *recorder* , *slide* , and a variety combine; (2) various mass communication channels comprise newspapers, radio, and TV.

Gerlach and Ely (1979:241) define, in common media can be understood as all something, object, or even school environment that enable student to get science, attitude, and skill. In this case, teacher, book, and school environment can be understood as media. On a more media savvy special in processes define tend teaching and learning as tool of graphics, photographic, or electronic devices to catch, process, reorganizing visual's information or verbal.

Gerlach more and Ely (1979:242) dividing media as two a part essentials *significant* (object) and *equipment* (equipment). *Significant* in learning media can be model as image that implemented in transparent film or one on *overhead projector* or glued image on blackboard. *Equipment* (equipment) are *overhead projector*, or winding peripheral and image recorder in film, or blackboard that is utilized to feature that image.

Meanwhile Gagne and Briggs in Azhar (2002) giving limitation about media cover tools that physically been utilized to pass on teaching material content that consisting of: book, *recorder's tape* , cassette, camera video, *recorder's video* , film, *slide* (image edges), photograph, image, graph, television, and computer.

Learning media consisting of two components: (1) *Hardware* (hardware) which is media physical component learning, phenomenal object something, heard, or touch with the five senses; (2) *Software* (software), which is order content that exists in hardware that constitutes to fill that will be passed on to student.

In learning media design gets multimedia's technology basis walks in a few phase, which is: (1) analyze phases, on exhaustive morphological phase analyze teaching component, and succeeding bears a scenario teaching (didactical scenario) one that involves and figure student activity (College student) and also instructor (teacher); (2) phase design that result path diagram to figure hierarchy activity, activity structure, each role unit, and another activities; (3) developmental phases, constituting physical developmental phase learning media. On this phase results a learning media program get multimedia's basis in medium CD-ROM; (4) phase evaluate which is evaluation base to usufruct base startup specification already be determined

Multimedia's Purpose study in Education

The use of multimedia in teaching is very good since it can improve better learning achievement. It is as Zachmann (1999) points out that there are several reasons of using multimedia in learning; namely: (1) it can increase students' motivation and attitude to gain knowledge; (2) it facilitates students to have learning experience by understanding real products; (3) it provides an opportunity for students to explore through the use of actual technology, 4) it encourages active participation and strengthen students' interaction.

Most researchers agree that the use of multimedia in teaching is intended to improve learning and it could be reusable in different learning contexts. Multimedia is an interactive tool that is able to describe one or more interrelated concepts. Although small in size, multimedia, however, contains suitable context for better and useful pedagogical process. According to Wiley

(2002: 1), multimedia can be the object of study that can be reused many times to support learning. Although it is designed and made in small pieces but it is able to maximize in reaching learning objectives and a number of situations by using existing resources. It is in line with Roy's opinion (2004: 82) who states that the use of well-managed multimedia could become an important point to increase the learning process. Furthermore, he points out that the use of multimedia gives an opportunity for students to learn various resources which are well and effectively managed.

In designing and making instructional media, generally, it is always found confusion on how to meet the learning context with its usability and how to facilitate students to construct their knowledge through the media. Therefore, the aspect of interactivity of the learning media is very important. Good learning media are designed to perform and to simulate professional quality of audio equipment design. Moreover, good media also should have menu or facility for user feedback and formative assessment. Multimedia software should provide a lot of tools that can be used to develop the learning process and provides some choices for students not only to meet the learning objectives but also to be commercialized (Heins and Himes, 2002).

Metros and Bennett (2002: 8-9) also declares that when it is designed, multimedia should be clear its pedagogical framework. Multimedia designer should be able to provide an interesting learning objects and provide interactive learning experience for students, as well.

Abdul-Hadi Abulrub G. et al, (2011) states that with the increasing demand for innovative media of higher learning, and also with the advance in 3D visualization technology and computer hardware are constantly evolving, which enable Multimedia CD used in virtual reality environments. Virtual reality can be used as a training tool with several advantages such as a safe, cost effective and fully controlled. In addition, virtual reality environments enhance the students to have learning experience significantly because the media provides an opportunity for students to learn in a real and interactive situation. Furthermore, multimedia can also be combined with Blended Learning Model as proposed by Koohang (2009) who points out that "Blended learning is defined as a mix of traditional face-to-face instruction and e-learning". This concept of learning is done by combining face-to-face with virtual methods.

According to Weber-Shirk and Lion (1996) things that must be considered when designing multimedia is maintaining the relationship between teachers and students, especially when using simulation multimedia. It is possible happens in the learning process since students will pay more attention to the simulation media not to their teacher. Based on his research, Leutner and Mayer (2013) offer a critical reflection on the virtues of multimedia in the process of developing the theory of cognitive and affective learning.

CONCLUSION

The use of multimedia in teaching is very good since it can improve better learning achievement. There are several reasons of using multimedia in learning; namely: (1) it can increase students' motivation and attitude to gain knowledge; (2) it facilitates students to have learning experience by understanding real products; (3) it provides an opportunity for students to explore through the use of actual technology, 4) it encourages active

participation and strengthen students' interaction.

that the use of multimedia in teaching is intended to improve learning and it could be reusable in different learning contexts. Multimedia is an interactive tool that is able to describe one or more interrelated concepts. multimedia can be the object of study that can be reused many times to support learning. Although it is designed and made in small pieces but it is able to maximize in reaching learning objectives and a number of situations by using existing resources.

BIBLIOGRAPHY

A. G. De Sa and G. Zachmann, Virtual reality as a tool for verification of asembly and maintenance processes, Computer Graphics 1999, Volume 23, Number 3, pp. 389-403.

Abdul-Hadi G. Abulrub, Alex N. Attridge and Mark A.Williams (2011) Virtual Reaity in Engineering :The Future of Creative Learning IEEE Global Engineering Education Conference (EDUCON) – "Learning Environments and Ecosystems in Engineering Education" April 4 - 6, 2010, Amman, Jordan.

Ariesmunandar. *Pengembangan Model Pelatihan Berbantuan Komputer Untuk Pelatihan Guru.* Disertasi Universitas Negeri Malang .2003

Bates, A.W.(1995).*Technology, Open Learning And Distance Education*. London: Routledge.

Bennett, K., & Metros, S. (2001). Learning object/module checklist. Educause 2001: The Promise and Pitfalls of Learning Objects: Current Status of Digital Repositories 10/21/01.http://itc.utk.edu/educause2001/checklist.html> Retrieved 23.02.2003.

Borg dan Gall, *Educational Research, An Introduction*. New York and London: Logman. Inc,1983.

Brodjonegoro, S.S.. *Perguruan Tinggi Sebagai Kekuatan Moral. Disampaikan dalam Rapat Kerja Nasional Pimpinan Perguruan Tinggi Negeri Seluruh Indonesia*, Yogyakarta.2002

Chalil, Achjar (2008) *Pembelajaran Berbasis Fitrah*. Cetakan I Jakarta : Balai Pustaka

Chickering Arthur W. and Zelda F. Gamson. Seven *Principles For Good Practice in ndergraduate Education* Washington Center News.1987

Data *ETSBED Program studi TIK Jurusan Teknik Elektronika* FT UNM 2010-2012.

Dick Walter .R. Burke Johnson *Evaluation in Instructional Design ; A Comparison of Evaluation Models.Book :* Robert A. Reiser. John V. Dempsey. *Trens and Issue Instructional Design and Technology. (*Boston: Pearson,2012) h.97

Fauziah, Ami. *Dosen sebagai Fasilitator proses Pembelajaran: Kompetensi Dosen dan Harapan Mahasiswa-Kumpulan karya dalam Pembelajaran Teknologi dan Informasi di Perguruan*

Tinggi (Yogyakarta : Graha Ilmu, 2012.

Gagne, Robert M., et.al. *Principle of Instruction Design (New York: Thomson Learning*. Inc.,Publisher, 2005.

Hannafin Michael J., Kyle L. Peck. *The Desain, Development, and Evaluation of Instructional Software* (New York : Macmillan Publishing Company, 1988)

Heins, T., & Himes, F. (2002). Creating learning objects with macromedia flash mx, April. <http://download.macromedia.com/pub/solutions/downloads/elearning/flash_mxlo.pdf> Retrieved 1.02.2003.

Koohang, A. (2009). A learner-centered model for blended learning design. International Journal of Innovation and Learning, 6(1), 76-91.

M. L.Weber-Shirk and L.W. Lion, Virtual instruments in anundergraduate en-vironmental Engineering laboratory,ASEE (1996).

Miarso, Yusufhadi. *Menyemai Benih Teknologi Pendidikan*. Jakarta : Prenada Media, 2004

Regeluth Charles M. *Instructional Design Theories and Model, a New paradigm of instructional Theory.* Lawrence Erbaum Associates. inc,1983.

Richey,Rita C. B.Seel, Barbara dan.Desain *Development and Reseach (Methods, Strategies and Issue).* L.wrence Erlbaum Associates, Inc.,Publisher, 1994

Roy, M. (2004). Learning objects. EdUCAUSE Review, 39(6), 80–84.

Suparman, Atwi. *Model Pengembangan Instruksional.* Jakarta: Universitas Terbuka,2004.

Stine (2002)Organizational Behavior, Section 4 Harvard UniversityFall

Wiley, D. (2002). Learning objects – a definition. In A. Kovalchick & K. Dawson (Eds.), Educational technology:An encyclopedia. Santa Barbara: ABC-CLIO.