Survey on LMS Moodle for Adaptive Online Learning Design

Linawati, NMAE Dewi Wirastuti, G. Sukadarmika

Department of Electrical and Computer Engineering
Udayana University
Bali – Indonesia

Abstract - The paper proposed usage of LMS Moodle for adaptive learning implementation because of its simplicity and its capabilities. LMS Moodle has wide range of features to satisfy many learning styles. Adaptive learning design in this paper recommended blended learning method which involves face-to-face activity and LMS Moodle utilization. In this initial design stage, only five LMS Moodle activities were chosen. The selected activities have met all learning styles requirements.

***Index Terms* - adaptive learning system, LMS, Moodle**

I. INTRODUCTION

Since e-learning, mobile learning, technology based learning, web based learning, etc. have increased their popularity, more issues have to be addressed by education institutions, such as the uniqueness of learner's style [Ahmed Abou Elfetouh S, 2013]. Traditional e-learning provides same learning process for all learners. It is namely one-size-fit-all learning style. Therefore recently many researches have proposed adaptive online learning to bring effective solutions for any types of learners style [Ahmed Abou Elfetouh S. 2013], [Despotović-Zrakić, M., 2012], [Nenad Stefanovic, 2013], [Andharini Dwi C., 2015], [Herman Dwi Surjono, 2011], [Bower, M., Craft, B., 2011], [Miroslav Minovic, 2010], [F. Kareal, 2006], [M. Prabhani Pitigala Liyanage, 2014].

Similar with other higher education of institutions, obviously Udayana University has developed and implemented e-learning since year 2008. The University utilizes LMS Moodle as its e-learning platform. Certainly its implementation without considering the uniqueness of a person as a learner. In addition e-learning implementation is applied only for local students. There is no e-learning for overseas students. In fact students who study in Udayana University come from Indonesia and overseas. Therefore adaptive e-learning will be designed for both all students in Udayana University. Then LMS Moodle will be selected as adaptive online learning platform. Thus this paper will discuss all features of LMS Moodle which fit to be implemented for adaptive online learning application.

II. RELATED WORKS

Each person has different learning style which depends on individual strengths, motivation, and preferences when receiving and processing information [Ahmed Abou Elfetouh S., 2013]. Then Table 1 shows briefly group of learning style according to Felder and Silverman's model. However Table 1 doesn't conclude that a person strictly differentiated to be one of six learner's styles. On the other hand, the six styles present which is dominant that their counterparts in one person. The style may appear powerfully, reasonably, or dimly.

TABLE 1
TYPES OF LEARNING STYLES MODIFIED OF FELDER-SILVERMAN MODEL [AHMED ABOU ELFETOUH S., 2013]

Type of Individual Learning Style	**Style**	**Explanation**
Processing	Active	Learning by doing
	Reflective	Learning by thinking
Perception	Sensitive	Learners prefer deal with details.
	Intuitive	Learners are keen to deal with principles and theories
Entry Channel	Visual	Learners prefer to see images, diagrams, graphs, etc.
	Verbal	Learners easily to remember what they've heard, read or said.
Understanding	Sequential	Learners easily to understand by subsequent a linear reasoning process when solving problems
	Global	Learners easily to understand by having big intuitive leaps with the information
Realistic	Traditional	Learners can easily understand with simple concept or theory
	Advanced	Learners can easily get bored with just explanation of concept or theory
Behaviour	Work in group	Learners prefer to work together in peers or group
	Stand-alone	Learners prefer to work alone

Learner's style then is set to be three clusters [Despotović-Zrakić, 2012]. The cluster describes the relationship between learning style and its characteristics as seen in Table 2. Classifying into cluster is to design course activity easily. They found that students who attended adapted online courses achieved better results than students who attended non-adapted online course. These related to students satisfaction analysis to the adapted online course.

TABLE 2
LEARNING STYLES CLUSTERS [DESPOTOVIĆ ZRAKIĆ, 2012]

Cluster	**Characteristics**	**Learning Style**
1	Multimedia materials Going through obligations sequentially Team work	Visual Sequential Active
2	Practical work No strict deadline Student choose topics	Intuitive Active Global
3	Written materials Going through obligations sequentially Team work	Verbal Sequential Active

Learning style models can be categorized as VAK (visual, auditory, kinesthetic) and Felder styles (global and sequential) [Herman Dwi Surjono, 2011]. When the learners prefer to follow logical stage by stage then they are categorized as sequential learners. Otherwise they are global learners who prefer to acquire in big leap. Visual, auditory, and kinesthetic learners concern to how human absorbs information using the channels of vision, hearing, and feeling. Auditory Learners use their listening channels to absorb information. Therefore they prefer to learn from listening to lectures, to involve actively in discussions. On the other hand Visual Learners use their visual channels to absorb information. They prefer to see information in pictures, tables, charts, maps or diagrams. Then Kinesthetic Learners use their feeling channels to absorb information. These learners prefer learning by doing and feeling. Activities in laboratory or excursion is best activity for kinesthetic learners.

Adaptive e-learning can be best implemented using LMS Moodle [F. Kareal, 2006]. The LMS Moodle appears to overcome basic e-learning barriers. The basic barriers are personal barriers (attitude towards e-learning, learning style or preferences), organizational barriers (lack of time for study, interpersonal barriers, registration system problems), technological barriers (Course Management Systems quality, Limitations of technical support,

Loss of data and inability to save or transfer data), content-suitability barriers (Content not audience-specific, Poor content duality and limited rigor, Poorly constructed assessments), and instructional barriers (Lack of progress reports and feedback, Limited learner engagement, Poor instructional design, Limited reference materials, Access and navigation problems, Limited use of multimedia, Unclear or inconsistent instructions, Inability to save work, Information overload, Lack of instructor presence/interaction).

A framework for adaptive LMS Moodle is proposed in [M. Prabhani Pitigala Liyanage, 2014]. A questionnaire and a rule-based methods have been utilized to predict the learner's style. There are four dimension of learners style, i.e. active or reflective, sensory or intuitive, visual or verbal, and sequentially or globally. Then they analysed learners' behaviour using LMS Moodle into learner styles, such as content visit, content stay, forum visit, forum stay, and forum posts. When they mapped the behaviour to the style, they indicate the behaviour to be irrelevant behaviour, relevant positive behaviour, and relevant negative behaviour.

In addition, LMS Moodle could facilitate adaptive online learning [Despotović-Zrakić, 2012], [Nenad Stefanovic, 2013], and [Bower, M., Craft, 2011]. Table 3 and Table 4 presents Moodle suitability for adaptive online learning. According to [Despotović-Zrakić, 2012], the benefit of using LMS Moodle for adaptive online learning is no requirement for programming new software and without any programming knowledge. Thus the teachers can easily adjusting the contents, the activities, and the evaluation in LMS Moodle. However LMS Moodle has not yet provided real time adaptation features.

TABLE 3. LMS MOODLE FOR ADAPTIVE ONLINE LEARNING [DESPOTOVIĆ-ZRAKIĆ, 2012] [NENAD STEFANOVIC, 2013]

	Moodle Activities							**Collaborative Methods**
	Forum	**Chat**	**Glossary**	**Workshop**	**Survey**	**Choice**	**Lesson**	
Active	Concrete Problems	Yes	Many terms	Experiment	No	Yes	Problems example	Face-to-Face
Reflexive	Topics for thinking	No	Concepts	Unexplored or new topics	Yes	Yes	Provided topics	Email
Visual	No	No	No	Yes	Yes	Yes	Illustration	Combined
Verbal	Yes	Yes	Yes	Yes	Yes	Yes	Written, multimedia	Combined
Sequential	Yes	Frequent	Yes	Yes	No	Yes	Yes	Combined
Global	Global topics	No	No	Yes	Yes	Rarely	Rarely	Combined
Sensitive	Facts, examples	Yes	Yes	Practical examples	Yes	Yes	Facts, algorithm	Combined
Intuitive	Abstract topics	No	No	Unexplored topics or new topics	Yes	No	Rarely	Combined

TABLE 4. MAPPING OF LEARNING DESIGNER TLAS TO LMS MOODLE TOOLS [BOWER, M., CRAFT, 2011]

Learning Designers TLA	**Moodle Tools**
Tutor – supported class = Classes	
Online presentation by tutor (synchronous)	Web-conferencing, Virtual World
Online presentation by student(s) (synchronous)	Web-conferencing, Virtual World
Online tutor – guided class guided class discussion (synchronous)	Chat
Online presentation by tutor (asynchronous)	Page, Lesson, File, Label, URL
Online tutor-guided class discussion (asynchronous)	Forum
TEL formative activity	Choice, Survey
Tutor – supported group = Tutor group	
Online tutor – guided group discussion (synchronous)	Chat
Online tutor – guided group discussion (asynchronous)	Forum
Tutor – supported individual work = Tuition	
Online individual tuition	Web-conferencing, Virtual World, Skype
Independent group work = Student group activity	
TEL peer – assessed formative assignment	Wiki, Folder, Forum
TEL resource – based group activity	Wiki, Folder, Database, Glossary
Online student – only group discussion (synchronous)	Chat
Online student – only group discussion (asynchronous)	Forum
Online student group production (asynchronous)	Wiki, Folder. Glossary
Adaptive TEL group activity	IMS content package, SCROM Package
Independent individual work = Self-directed study	
TEL resource – based individual activity	File, Advanced Uploading of Files
Adaptive TEL individual activity	IMS Content Package, SCORM Package
TEL – based formative assignment	Advanced Uploading of Files, Quiz
Summative Assessment	
Essay	Upload a Single File, Online Text
Exam	Quiz, Upload a Single File, Online Text
Project Report	Upload a Single File, Online Text
Performance / Design	Upload a Single File, Offline Text
Dissertation	Upload a Single File, Online Text
TEL based summative assessment	Quiz, Upload a Single File, Online Text

III. RESULTS AND DISCUSSIONS

LMS Moodle has been implemented in Udayana University as e-learning platform. It can be accessed on http://elearning.unud.ac.id. The university has strongly supported its operation. However recently, the Moodle has been applied without concern on dissimilarity of personal learning style. Most lecturers just applied all the features of LMS Moodle in the form of blended learning. They put all subject contents with their references in the system. The contents and references can be content slides, web resources link, and lecturer notes. Then discussion has been done using 'activity forum' of the Moodle. In order to satisfy the uniqueness of learning styles in the University, learning process using Moodle will be designed to be adaptive online learning. From Table 3 and Table 4, the selection of the features of Moodle based on their simplicity and functionality to be applied in a classroom. There are six Moodle activities that will be combined with face – to – face in the class which is called a blended learning method.

TABLE 5. PROPOSED MOODLE ACTIVITIES

Learning Style	Moodle Activities					
	Forum	**Survey**	**Lesson / Resources**	**Assignment**	**Quiz**	**Collaborative Methods**
Active **Reflexive** **Visual** **Verbal** **Sequential** **Global** **Sensitive** **Intuitive**	1. Concrete Problems, Topics for thinking, Global topics, Facts, Examples, Abstract topics, online tutor. 2. Online tutor guided class 3. Class or group discussion 4. Assessed formative assignment	1. Online formative activity	1. Problems example, provided topics, Illustration, written, multimedia 2. Online Presentation (Page, Lesson, File, Label, URL)	1. Upload a single file / multiple files 2. Summative assessment 3. Exam 4. Project Report	1. Formative assignment 2. Summative Assessment	1. Face-to-Face in Class Room, Email, Combined 2. Blended Learning

Definitely the proposed system will involve an administrator, teachers or lecturers, technical person, and students. An administrator has the highest access to the system which can modify the LMS Moodle. However the administrator has no capabilities to create course contents and manage the class. The teachers can set up and modify the contents, courses, assignment, discussion topics, and ability to explore all LMS Moodle features. On the other hand, the students have limited access to the system in comparison to administrator and teachers admission.

Mostly the course contents will be in multimedia form which include text, image, and illustrations. 'Forum' feature will be utilized by discussing at least two topics, for example in Industrial Technology course, i.e. (i) How green is industry in Indonesia?, and (ii) What kind of innovated technology would you offer to industry in Indonesia to make them smarter and greener?. Then guideline for discussion below will be explained in Figure 1.

- Students' comments or arguments must be relevant to the topic.
- Each topic will be open for two weeks.
- Teachers or Tutors will give response twice a week.
- Teachers and Students can read all comments.

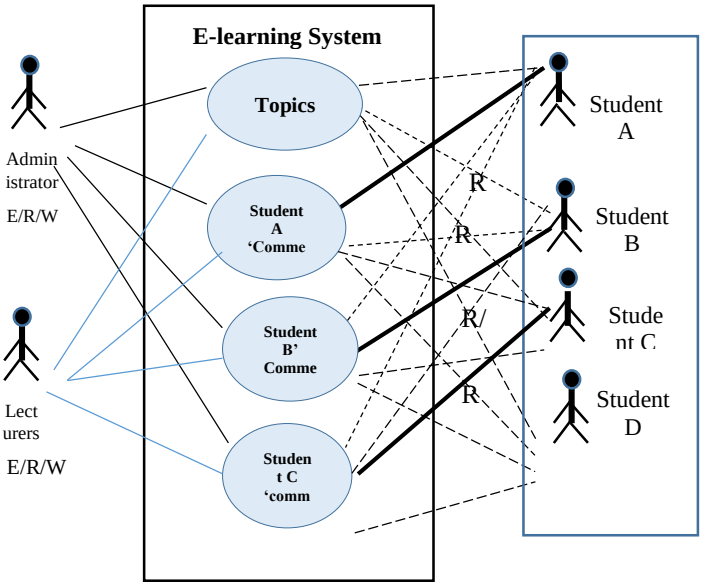

Figure 1. Use Case Diagram for Discussion using 'Forum' Feature

Then learning process will be completed with formative and summative evaluations. 'Forum', 'Survey', and 'Quiz' features will be applied for formative assessments. Then 'Assignment' and 'Quiz' features will be used for summative assessments.

IV. CONCLUSIONS

Survey on LMS Moodle features for adaptive online learning design has been done extensively. The LMS Moodle has broad range of activities which can be selected. In this paper, a blended learning method that is a combination between face-to-face in the classroom and LMS Moodle usage was selected for adaptive learning process. The proposed design selected only five Moodle activities, i.e. 'Forum', 'Survey', 'Lesson or Resources', 'Assignment', and 'Quiz'. All selected activities be able to satisfy all learning styles.

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