

Effectiveness and efficiency of e-learning in Instructional Design

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ABSTRACT: The focus of this study was to develop a model of e-learning using the program Edmodo for course teaching. Compared to traditional learning, it has been found that many benefits can be obtained by giving students freedom of learning anytime and anywhere. Students have access to on-line lecture material that does not depend on time or place. The results of this study indicate that student learning has improved. To measure efficiency, a questionnaire was given to 42 students. Research results are as follows. First, the e-learning model assisted by Edmodo is very successful. Second, the Edmodo display model is effective in promoting class participation by students. Third, the content of display material by Edmodo provides an effective learning environment for students, and for learning to become more active among students. In conclusion, this study found that e-learning content displayed on Edmodo holds promise for future students. Most importantly, the effectiveness of Edmodo reflects the principles applied in the developed e-learning model.

INTRODUCTION

The world of education, which is complex, has two options: namely, either to equip individuals with new knowledge, skills or attitudes through learning, or to change the organisational environment where individuals learn. At present, learning is carried out both face-to-face and through e-learning. It was found that e-learning is the more desirable approach for students and lecturers, because e-learning can be done anywhere and anytime [1].

In line with the development of e-learning, which is progressing rapidly, learning is defined as a constructive process in which information is converted into knowledge through a process of interpretation, correspondence, representations and elaboration. The rapid development of information and telecommunications technology offers many new alternatives for learning and, as a consequence, shifts are occurring in learning.

Higher education requires lecturers to design the learning process, so as to prepare students to meet the needs of society in the 21st Century.

Competition will be tougher with technological developments that are very fast, and [with] increasing pressure on institutions of higher education to evolve, adapt, or [desist] [2].

Various methods are applied so that learning is attractive and students learn and absorb what is conveyed easily. Learning cannot be separated from the learning media used. Therefore, it is appropriate that the learning media chosen be fit for purpose. How lecturers select and use media, adapt them, the nature and characteristics of college students, affect whether the content is attractive and easily understood by students [3].

Education using information technology media will accelerate the process of the implementation of e-learning or electronic learning. Several types of e-learning platform are at present in wide use, such as Moodle, Blackboard, Sakai, Dokeas and Edmodo. The term, *e-learning*, was not generally used in education until 2002; other terms were used, such as *network learning*, *computer-aided learning*, *Web-based instruction* and *computer-mediated learning*, but e-learning increasingly is becoming the accepted term [4].

Learning in the e-learning mode transforms learning activities in the classroom with a whiteboard and markers to a Web-based on-line environment that supports student/student and student/teacher interaction, as well as on-line assessments. Learning electronically has been defined in various literature in different ways. In general, e-learning is defined as a system providing information through information technology resources, such as the Internet, intranet, satellite broadcasts and multimedia [5]. E-learning is widely used in distance education, conducted via the Internet through an electronic device to obtain learning materials. E-learning as part of blended learning is evolving from a traditional form of learning to that which is personalised and focused [6].

Digital technology permeates work and games. The rapid development of technology and the application of various media have changed the world of work and education [7]. The problems of the world of work and education can be overcome by altering the teaching material delivered by teachers to include images, animation or videos and by applying learning approaches that involve students. This can be done through the Internet as a communication tool to maximise student participation, so that time constraints can be overcome, and also by providing teaching material that can be studied individually by students outside the classroom.

One of the learning innovations is to integrate the learning design with information and communication technology (ICT), better known as e-learning-based interactive learning. E-learning can be implemented on various ICT platforms, which include television, radio, compact disc (CD), digital versatile disc (DVD), videoconferencing, cellular technology, Web-based technology and electronic learning platforms [8].

One of the e-learning interactive learning models most widely used in learning design is Edmodo's assisted interactive learning model. Edmodo has a site used by teachers/lecturers and students/parents to facilitate on-line learning. The main purpose of using Edmodo is to help connect teachers and students, and also to ensure they can be connected throughout the world. Edmodo offers classes that are safer and easier to connect with, by offering a real time-based platform to exchange ideas, content, and to access homework, grades, and important information from school. This interactive learning model helps in planning, analysing, implementing and managing learning. It also provides access to learning material whenever and wherever students are.

In the Medan State University postgraduate programme, these features are discussed in the Instructional Design course. The aim of this course is for students to conduct an analysis of teaching needs and to determine teaching objectives; to conduct learning analysis; to identify students' initial abilities and characteristics; to make reference criteria tests; to develop learning strategies; to choose and develop learning material for formative evaluations; and to carry out summative and other assessments.

A student-centred view in the learning process raises a new concept of student-centred assessment called learner-centred assessment. The definition of student-centred assessment aligns with the traditional definition of the criteria reference test, as a core element of systematically designed learning. This type of test is important for evaluating student development and the quality of learning. Almost all learning design models emphasise formative evaluation.

Data collected through this evaluation provide information needed for the revision of learning material. Formative assessment is done to find out the weaknesses of the learning process. To see whether it has been effective, summative assessments are required. Summative evaluation is the process of collecting data and information to determine if the learning objectives have been met. There are two stages of summative evaluation. The first focuses on the relationship between teaching, interests and organisational needs. The second stage is an instructional field trial.

A model can be defined as conceptualisation in the form of equations, physical equipment, descriptions or graphical analogies that describe a situation or the actual situation. The model, though it does not depict actual reality, is seen as an *original replica* [9]. The clearer the replica, the better the model. Referring to the learning model as an *instructional model* defines it as

...a set of integrated component strategies such as: a particular way of sequencing the ideas of employees, use of summaries and use of examples, use of practices, and use of various strategies to motivate students.

The learning model has a series of components that form an integrated learning strategy; namely:

1. Syntax and sequence of content.
2. Use of examples.
3. Use of practice.
4. Motivation of students to engage in learning.

The model can be either an object or a procedure or a description of the systematic steps of a process [10]. The learning model is a form of learning activity taken from beginning to end that is presented specifically by the teacher. The learning model consists of syntax, social systems, principles of reaction and support systems.

The interactive learning model, *learning design*, emphasises the subject as a guide in achieving effective, efficient, interesting and humanistic learning. In this study, interactive learning models were used [11] to develop learning plans. The Borg and Gall development model contains systematic guidelines for the steps taken, so that the product design has a standard of eligibility. The development research procedure aims to: a) produce the product; and b) assess the effectiveness of the product in achieving its objectives. Thus, the research concept is more precisely interpreted as a development effort complemented by validation.

Based on the problems that exist in the Instructional Design course and the rapid development of technology, the development of interactive learning models based on e-learning is most important, because the presentation to be delivered can include text, audio and images, according to the characteristics of the subject and characteristics of the students. Therefore, an interactive learning model based on e-learning is needed in on-line instructional design.

The results of the study indicate good results with animation, animation only, narration only, and no instructions (as a control). One set of studies has shown retention in the narration with the animation group not significantly different from the narration-only group, but the retention performance for each was significantly superior to the animation group alone and (as expected) the control group. In terms of transfer size, narrative performance with the animation group was significantly superior to the other three groups [12]. Designing multimedia in the form of sound, images and animation contributes greatly to students' understanding, including for example, the qualities of perception, performance, memory, visual memory, visual attention and motor skills [13].

METHOD

The research method chosen was a research development model. That model was combined with a learning development model. The results of the first phase were e-learning-based interactive learning modules with tutorial CDs used as a guide to implementing interactive e-learning. The interactive learning was based on e-learning assisted by Edmodo. The second stage consisted of testing the results of the first stage. The results of this test will be used later as material by which to revise the initial product. The third stage consists of disseminating the interactive learning models that have been developed.

The research discussed here was conducted over three years and consisted of three stages. The first year was spent on developing e-learning models with the help of Edmodo. In the second year (second phase) of the research, validation was carried out on the learning model. The validation of the device model included teaching materials, lecture material and other instruments. Limited experiments were conducted; namely, individual experiments and experiments on a larger scale with e-learning-based models assisted by Edmodo in the Instructional Design course. In the third year (the third stage) implementation of the product model was used to gauge its effectiveness.

RESULTS AND DISCUSSION

The implementation phase determines the effectiveness and efficiency of the learning model. This was carried out in class in large groups. A research and development approach was taken involving three stages; namely:

1. A preliminary study.
2. Planning and preparation of learning models.
3. Field tests of learning models developed.

Preliminary studies were conducted in the first year, to determine the need for the development of e-learning-based models. Based on the results of the preliminary study, it was found that lecturers and students who took the Instructional Design course felt there was a need for e-learning. The development of Edmodo-based e-learning models was informed by face-to-face and on-line learning. The phases of development were: analysis, design, development, implementation and evaluation.

Edmodo Display Menu

The Edmodo menu *sub-menus* contain theories, presentations, discussions, evaluations and examination for plagiarism. All of these are features used in supporting learning design activities. First, there is the presentation of lecture material. Discussion menus are prepared to facilitate interaction between lecturers and students and between students. To find out how well a student is coping, an evaluation menu is prepared, and the last is a plagiarism check menu to ensure the students' work, including the test results, is not the same as other students' (see Figure 1).

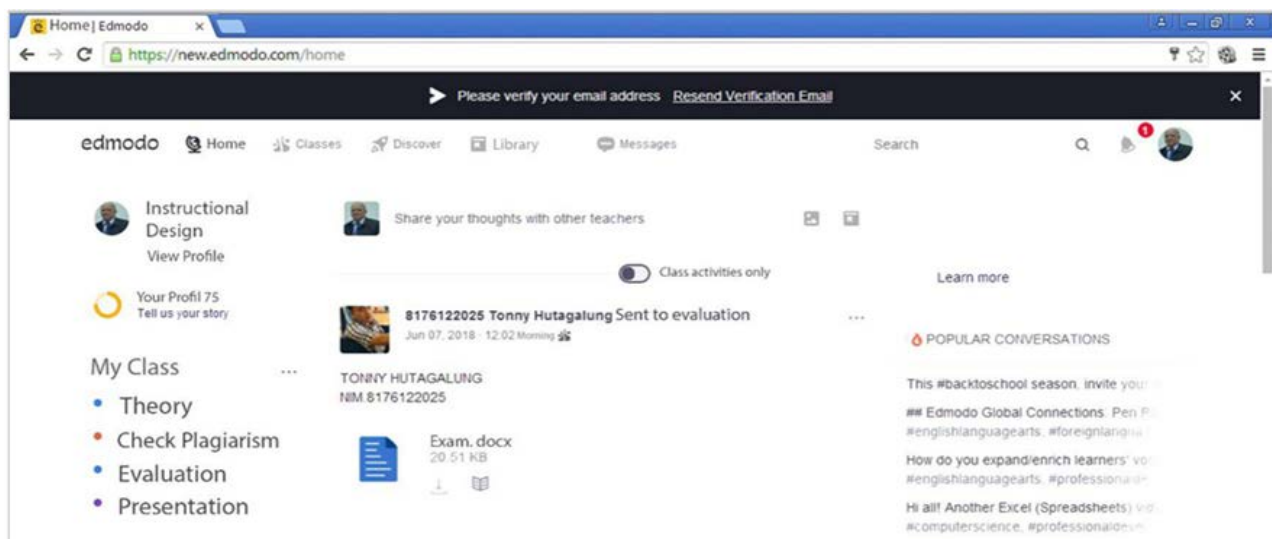


Figure 1: Edmodo display menu.

Student Learning Achievement Data

The success of the Edmodo design learning can be seen from the response of students and lecturers to the learning activities (Table 1).

Table 1: Student and lecturer attitudes towards the Edmodo menu.

No.	Display menu	Student statements				Lecture statements			
		Very good	Good	Pretty good	Not good	Very good	Good	Pretty good	Not good
1	Presentation	34	7	1	-	3	-	-	-
2	Media	34	6	1	1	2	1	-	-
3	Task	32	8	1	1	3	-	-	-
4	Deuteronomy	33	7	2	-	2	1	-	-
5	Evaluation	32	8		-	2	1	-	-

The students' attitude towards Edmodo used in design learning shows that 34 students stated it was very good; seven students stated it was good; while the rest stated it was quite good. For the media display menu, 34 students said it was very good; six students said it was good; one person said it was good enough and one person said it was not good. Furthermore, students generally claimed that the task, quiz and evaluation display menus were very good.

The lecturer attitude towards Edmodo shows that the presentation menu for all lecturers was very good; as for lecturers rating menu items as very good, the media menu had two, all lecturers for assignments, two for quizzes and evaluation. These results indicate that the attitude of students and lecturers towards the Edmodo display menu was very good. These results indicate that learning design using Edmodo has succeeded in increasing student learning. Likewise, these results also show that the facilities at Edmodo can increase student interest and learning outcomes. These results indicate learning with Edmodo is more effective. Shown in Table 2 are measurements of student attitudes toward learning.

Table 2: Student attitudes towards learning implementation.

No.	Instructional conditions	Student statement				Average	Category
		Very good	Good	Pretty good	Not good		
1	Implementation of e-learning	36	5	1	-	3.8	Very good
2	Edmodo facilities	34	6	1	1	3.7	Very good
3	Lecturer-student interaction	37	4	1	-	3.9	Very good
4	Time spent	35	7	-	-	3.8	Very good
5	Learning atmosphere/conditions	36	7	-	-	3.9	Very good

These results indicate that instructional design learning with Edmodo attracts the attention of students and makes it easier for them to learn. In addition, students can use Edmodo as one of the independent learning facilities. Thus, instructional design learning can overcome the problems of students who do not have time to learn face-to-face. Studying with Edmodo allows students to learn anytime and anywhere, thereby saving time and space. This model, therefore, is believed to be more effective than is the present learning model. Shown in Table 3 below are the results of student satisfaction levels to the learning conditions.

Table 3: Student satisfaction levels to learning conditions.

Student statement	Student reactions to teaching conditions				
	Implementation of e-learning	Edmodo facilities	Lecturer-student interaction	Time spent	Learning atmosphere/conditions
Very satisfied	33	33	33	33	33
Satisfied	7	7	7	7	7
Neutral	1	1	1	1	1
Dissatisfied	1	1	1	1	1
Very dissatisfied	-	-	-	-	-

Based on Table 3, it appears that 33 students were very satisfied, seven were satisfied, one was neutral, and one was not satisfied. None was very dissatisfied. This implies that the atmosphere for learning was more efficient.

CONCLUSIONS

The results of this study are summarised as follows:

1. The attitude of students and lecturers towards Edmodo was classed as very good and interesting in instructional design learning.
2. The e-learning model using Edmodo can overcome student learning problems related to place and time.
3. The level of student satisfaction in instructional design learning shows that this type of learning was more efficient.

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