



MEASURING UTILIZATION OF E-LEARNING COURSE DISCRETE MATHEMATICS TOWARD MOTIVATION AND EFFECTIVENESS OF STUDENT LEARNING (CASE STUDY FASILKOM MERCU BUANA UNIVERSITY)

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Abstract— In the implementation of learning E-Learning which has been implemented by the Mercu Buana University in recent years had a positive impact on students and lecturer. However, in some course such as Discrete Mathematics perceived by lecturer and student have several problems such as difficulty from lecturer to explain some of the logic material or analysis algorithm problem. Students also do not understand clearly if only read from the text that is presented through the e learning process. Effectiveness basically is attainment of precise goal or selecting the appropriate objectives from a series of alternative or choice of ways and determine the choice of several other options. Effectiveness can also be interpreted as a measure of success in achieving the goals that have been determined. As an example if a task can finish with choice of ways which is already determine, then that way is correct or effective.

Keywords— E-Learning; Mercu Buana University; Effectiveness;

I. PRELIMINARY

Technological developments from time to time has more advanced. Until now the development of information technology is very make easy for people in everyday life. The development of information technology that is already covering a wide range of fields, including education. Information technology widely used as a medium of teaching aid for various fields of study. Media learning aid can be an electronic book (e-book), interactive e-book, tutorial, and e-learning. The auxiliary media is expected to make more effective in student learning activities.

Effectiveness essentially is a precise goal attainment or selecting the appropriate objectives from a series of alternative or choice of ways and determines several other options. Effectiveness can also be interpreted as a measure of success in achieving the goals that have been determined. For example, if a task can be completed with the election of the ways that have been determined, then the way is correct or effective. In the implementation of learning E-Learning which has been implemented by the Mercuru Buana University in recent years had a positive impact on students and Lecturer. However, in some subjects such as Discrete Mathematics perceived by faculty and students have several problems including difficulty from lecturer to explain some of the logic material or analysis algorithm problem. Students also do not understand clearly if only read from the text that is presented through the e learning process. Based on that problem researchers feel the need to do research about the effectiveness of learning e learning in Discrete Mathematics course. Thereby researchers deducing title "Measuring Utilization of e-Learning Course Discrete Mathematics toward Motivation and Effectiveness of Student Learning (Case Study Fasilkom Mercuru Buana University).

A. Objectives and Benefits Research

The aim of this research is to analyse the learning outcomes of E learning courses Discrete Mathematics. While the benefits of this research is for consideration whether this discrete mathematics courses suitable as courses in E-Learning-right or not.

II. LITERATURE REVIEW

Information Technology (IT) has become a critical part in supporting higher education as University in the process of research, education, and community services. E-Learning system as one of supporting activities and service processes at Mercuru Buana University has been implemented to support IT Strategic Planning [1]. Systems electronic learning or e-learning can be defined as a form of information technology which is applied in education in form of virtual schools. E-learning is the foundation and the logical consequence of the development information technology and communication. With e-learning, teaching participants (learner or student) does not need to be sitting quietly in a classroom to listen to each utterance of a teacher directly. E-learning can also shorten the learning time schedule targets, and of course save costs to be incurred by a course of study or educational program. Mercuru Buana University uses "Moodle" CMS server technology and its infrastructure to server its 30,000 of its students and uses technology independent web browser to access the e-learning content [2]

A. User Acceptance

Dillon [3] defines user acceptance as the willingness of a group of users to use information technology in support of their work. Acceptance theory discusses the factors that influence the adoption of technology by the user so it can minimize the risk of rejection of the technology. In question of factors is the characteristic of user psychology. There are several models or theories of user acceptance in the field of information technology that has been formulated by some experts that involves analysis *socio-cognitive* someone who is dynamic that is the attitude of users to a new technology, by measuring the affective response initially. One of such model acceptance is the Unified Theory of Acceptance and Use of Technology (UTAUT).

B. Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology (UTAUT) is a technology acceptance model developed by Venkatesh, Morris, Gordon B. Davis, and Fred D. Davis [4]. As the previous model or theory reception, UTAUT also involve the analysis of user attitudes towards a new technology by measuring affective response. Expectation of this method is to predict the acceptance of users in the long-term toward a technology UTAUT models formulated by four main factors as determinants that affect the intention to act (behavioural intention) and behaviour to use a technology (use behaviour). According to Venkatesh, variable behavioural intention is determined by

1. Performance Expectancy, namely the level of one's belief that the use of technology can help maximize performance.
2. Effort Expectancy, namely one's perception of the level of ease to use the technology.
3. Social influence, namely one's awareness of the importance of a technology due to the influence of others or the environment.
4. Facilitating conditions, namely the infrastructure and other facilities which able to support the use of a technology.

Those four main factors are used by Din Jong and Wang in developing research models.

C. Student Acceptance of Web-based Learning System

Jong and Wang Din [5] research conducted to determine the admission of students to the web-based learning system. Research carried out at the Technical University of Taiwan during the spring of 2009. This study modifies the model of UTAUT, which involves other factors outside the model UTAUT. Factor written in penlitian are:

1. *Attitude toward using technology*, that is a person overall affective reactions in the use of technology, such as the notion of positive / negative about the use of a technology, self-motivated, and feeling happy or not happy in using the technology.
2. *Self-efficacy*, which is the ability of a person to use a technology to complete the work.

The research result Din Jong and Wang [5] may illustrated as follows :

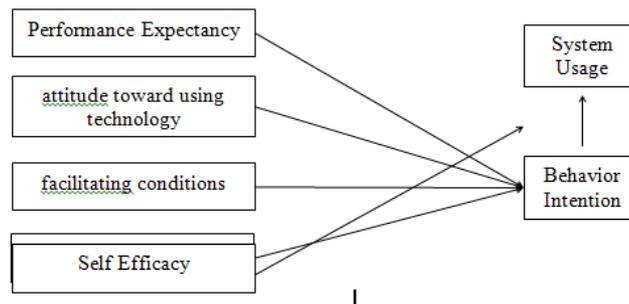


Figure 1 Final model Jong Ding and Wang.

Figure 1 shows that the variables that influence the behaviour intention is *performance expectancy*, Attitude toward using technology, facilitating conditions, and social influence. Research Din Jong and Wang (2009) suitable for use as reference material to make an application because this research made to discusses the implementation of E-learning

III. METHODOLOGY AND RESEARCH

A. Research Method

The method used in this research is quantitative method of explanation experiment. Research with a quantitative method of explanation experiment generally use a sample research conducted for generalization to the population. This method also uses the research hypothesis to be tested statistically. Quantitative methods of explanation experiment is a research method that is used to determine the effect of a media, a tool, or conditions that deliberately organized against a symptom of activity and behaviour of a person or group of individuals.

B. Research variable

The research variables in process of analyzing the object of research should be set variables that represent items experiments. The results of the study will depend on the interrelations between the variables studied, where the variable is an attribute, object or activity which may have certain variations defined by the researchers to learned and concluded. In this research, which is a variable is:

1. E-learning Discrete Mathematics which is the independent variable
2. Motivation is the dependent variable
3. Effectiveness is dependent variable

C. Design of Experiments

The object of this research is student class from DA2153EL (A404), DA2153EL (A402), DA2153EL (A401) in Discrete Mathematics subjects at Mercu Buana University Jakarta from Department of Information 2014/2015 generation. Election samples using probability sampling, which means sampling taken based on the premise that the whole class has the same opportunity to be sampled. Because all the students in the class that the sample has the same opportunities, the class DA2153EL (A404), DA2153EL (A402), DA2153EL (A401) must be randomized. The samples generated from this design remains a representative sample.

D. Method of Collecting Data

In outline, the data collection method used in this research is divided into three, namely:

1. Method experiments to prove the first hypothesis, namely, "student learning motivation using e-learning in the learning process", is used method of collecting data through questionnaires. A questionnaire was used because it's easily provided, that is a form of questions toward the respondents. In addition, the questionnaire has another advantage which is faster and cheaper than observation. Questionnaires will be sent to the respondent directly addressed to the concerned respondent. Respondents were asked to fill out all the questions contained in a questionnaire to give two kinds of Likert scale that is (a) a positive perception (favorable) (b) negative perception (unfavourable)
2. while to prove the second hypothesis, namely, "There is a difference in student learning outcomes are not yet using e-learning in the learning process with student results are already using e-learning", implemented the following procedures:
 - a. Setting goals of the experiment.
 - b. Preparing equipment or experimental needs.
 - c. Determining the experimental group
 - d. Implementation of experimental activity learning process

Primary data student results from these two groups were statistically tested fatherly determine whether there are differences in learning outcomes of students who are already using e-learning in the lessons with the learning outcomes that have not been using e-learning in the lessons.

IV. RESULTS AND DISCUSSION

A. Implementation of E-Learning Mercu Buana University

E-Learning or Lecture on Line Mercu Buana University aims to improve the quality of teaching and learning. With On Line lecturing allows students to learn without limits of time and place. We call Learning without Limits [<http://elearning1.mercubuana.ac.id/>]. Here is an overview of E-learning summit of Mercu Buana University:



Figure 2 Display E-Learning Mercu Buana University.

Figure 2 is an image display E Learning Mercu Buana University which can be accessed through <http://elearning1.ac.id/>, E-Learning Mercu Buana University has type of facilitated e-learning or a combination of learner-led e-learning and instructor-led e-learning. E-learning allows students to learn independently use teaching materials or web-based modules which are available and communicate interactively with the lecturer. Lecturers can also use e-learning as a medium or method of teaching using blended learning models, by uploading videos or link using web-based material. E-Learning provides several facilities shown as in figure 5.2, including discussion forums, providing quiz and supply modules must be completed at the weekend meeting or lecture in 3,4,5,6,9,10,11,12, and 13. While meeting 1,2,7 and 14 carried out face to face in the class.



Figure 3 Menu E-Learning.

B. Analysis and Interpretation

After carrying out a series of research at the Mercu Buana University, researcher obtained a number of data considered valid enough to explain the variable that is exist in this paper, and tested hypotheses which mentioned earlier. The numbers used for statistical calculations in this analysis were obtained from respondents' answers to the questionnaire which was asked to the respondent, then obtained a score for each variable. In this research, students in each class are grouped into two categories based on the pattern of the equivalent parallel group, namely the experimental group and the control group. The experimental group is a group of students were subjected to experimental a variable, that is the use of e-learning in the learning process. While the control group, is a group of students who apply conventional learning. Of the overall sample (100 students) in this research was obtained student with category the experimental group is 50 students and the group category were 38 students or 70% of male respondents and 12 female students or 30% of female respondents.

The list of questions contained in the questionnaire consists of 51 question items that will become the benchmark link between the effect of the use of e-learning on the motivation and effectiveness of students during the learning discrete mathematics process by using e-learning system which were obtained from experimental group students (student). Before proceeding to the main procedure of research, conducted a validation test data to test the level of correlation significance (r). Validation test will be conducted by pearson method or Product Moment method, namely with correlating the score of the item in the questionnaire with a total score. If the coefficient value is more than 0.3 then the questions can be considered valid. This validity test using SPSS 12 program for windows constants r count can be compared with r table with at least 95% significance level. from r data table, with a significance level of 95% and N = 50 is equal to 0.244. Having conducted the test of validity, it is known that the whole questionnaire has r count > r table, meaning all items considered valid question and can be used to collect data in research. After the test validity, conduct realibity test to test the tools (instruments). The method used in the reliability test is Cronbach's Alpha method

TABLE I - DATA VALIDITY ITEM QUESTIONNAIRE

Variabel	Indikator	Main Survey				
		KMO	Barlett Test of Sphercity Sig.	Keterangan	r	Keterangan
Performance Expeptancy	PE1	0.752	0.0000	Bisa dilanjutkan	0.803	Valid
	PE2				0.784	Valid
	PE3				0.916	Valid
	PE4				0.852	Valid
Effort Expectancy	EE1	0.731	0.0000	Bisa dilanjutkan	0.567	Valid
	EE2				0.814	Valid
	EE3				0.815	Valid
	EE4				0.870	Valid
Social Influence	SI1	0.614	0.0000	Bisa dilanjutkan	0.746	Valid
	SI2				0.751	Valid
	SI3				0.743	Valid
	SI4				0.812	Valid
Facilitating Condition	FC1	0.733	0.0000	Bisa dilanjutkan	0.769	Valid
	FC2				0.705	Valid
	FC3				0.629	Valid
	FC4				0.771	Valid
Attitude toward Using Technology	AUT1	0.826	0.0000	Bisa dilanjutkan	0.756	Valid
	AUT2				0.884	Valid
	AUT3				0.921	Valid
	AUT4				0.916	Valid
Self-efficacy	SE1	0.726	0.0000	Bisa dilanjutkan	0.702	Valid
	SE2				0.740	Valid
	SE3				0.907	Valid
	SE4				0.867	Valid
Information Quality	IQ1	0.769	0.0000	Bisa dilanjutkan	0.683	Valid
	IQ2				0.842	Valid
	IQ3				0.830	Valid
	IQ4				0.903	Valid
	IQ5				0.821	Valid
System Quality	SysQ1	0.853	0.0000	Bisa dilanjutkan	0.798	Valid
	SysQ2				0.819	Valid
	SysQ3				0.782	Valid
	SysQ4				0.798	Valid
	SysQ5				0.686	Valid
	SysQ6				0.809	Valid
	SysQ7				0.844	Valid
	SysQ8				0.850	Valid
	SysQ9				0.763	Valid
	SysQ10				0.665	Valid
	SysQ11				0.765	Valid
Service Quality	SerQ1	0.585	0.0000	Bisa dilanjutkan	0.731	Valid
	SerQ2				0.682	Valid
	SerQ3				0.748	Valid
	SerQ4				0.853	Valid
	SerQ5				0.756	Valid
Behavioral Intention	BI1	0.764	0.0000	Bisa dilanjutkan	0.938	Valid
	BI2				0.947	Valid
	BI3				0.930	Valid
Actual Use	AU1	0.611	0.0000	Bisa dilanjutkan	0.799	Valid
	AU2				0.858	Valid
	AU3				0.685	Valid

Calculation of Cronbach's Alpha. Done by calculating the average intercorrelation between statements items in questionnaire. Variable is relibel if the value of alpha is more than 0.3, which followed by testing using Spearman Brown formula.

As a result, from correlation between the scores of odd and even item questionnaire, found that research questionnaire feasible used as data collection instruments in order to determine whether there is an increase in motivation of student to learning using e-learning. Here are presented the test results of validation and rehabilitation. Based on the above validity table item questionnaire where r count > r table, meaning all items considered valid question and can be used to collect data in research.

TABLE 2- THE RELIABILITY DATA ITEM QUESTIONNAIRE QUESTIONS

Variabel	Indikator	Main Survey		
		Reability		
		Cronbach's Alpha (r ₁₁)	r _{tabel}	Keterangan
Performance Expeptancy	PE1	0.857	0,224	Reliable
	PE2			
	PE3			
	PE4			
Effort Expectancy	EE1	0.762	0,224	Reliable
	EE2			
	EE3			
	EE4			
Social Influence	SI1	0.759	0,224	Reliable
	SI2			
	SI3			
	SI4			
Facilitating Condition	FC1	0.691	0,224	Reliable
	FC2			
	FC3			
	FC4			
Attitude toward Using Technology	AUT1	0.892	0,224	Reliable
	AUT2			
	AUT3			
	AUT4			
Self-efficacy	SE1	0.818	0,224	Reliable
	SE2			
	SE3			
	SE4			
Information Quality	IQ1	0.877	0,224	Reliable
	IQ2			
	IQ3			
	IQ4			
	IQ5			
System Quality	SysQ1	0.933	0,224	Reliable
	SysQ2		0,224	
	SysQ3			
	SysQ4			
	SysQ5			
	SysQ6			
	SysQ7			
	SysQ8			
	SysQ9			
	SysQ10			
	SysQ11			
Service Quality	SerQ1	0.799	0,224	Reliable
	SerQ2			
	SerQ3			
	SerQ4			
	SerQ5			
Behavioral Intention	BI1	0.931	0,224	Reliable
	BI2			
	BI3			
Actual Use	AU1	0.681	0,224	Reliable
	AU2			
	AU3			

Based on the data processed on each indicator at the top, then for testing whether the correlation is significant or not, then the results of r₁₁ can be compared with r_{table} with significance level $\alpha = 0.05$ and $dk = 50 - 2 = 48$, then obtained r_{table} = 0.224. Rule-making: If r_{count} with r_{table}. If r₁₁ > r_{table}, means reliable. And if r₁₁ < r_{table}, means not reliable. Means all the items on the questionnaire expressed as reliable, if r₁₁ > r_{table}. This questionnaire is suitable as data collection instruments in order to determine whether there is an increase in student learning effective as the use of e-Learning.

C. Descriptive Statistical Analysis

Based on the 51 items of questions that refer to the relationship between the effect of the use of e-learning on the motivation and effectiveness of learning discrete mathematics courses for students which conducted at the Department of Informatics, Mercuru Buana University, obtained quantitative data that can be analyzed interpretive. Although theoretically discrete mathematics-based e-learning is believed to have a positive correlation with the motivation and effectiveness of student learning, but there are other things beyond e-learning itself, which also affect the success of discrete mathematics learning with e-learning. From the data obtained, it is known that there are various factors that influence the motivation and effectiveness of student learning discrete mathematics. Among these factors are the activities of the E-Learning is useful in the learning process in the Discrete Mathematics course, E-learning can be effective way of teaching and learning activities to facilitate and accelerate achieving the goals and objectives of learning materials, as well as students can improve the productivity of learning and better results by using E-Learning.

Statistical research show that the use of E-Learning in teaching and learning in Discrete Mathematics course is still considered to be less, so that the effectiveness of the achievement of the goals and objectives of the learning material also can not be the maximum. From that the two things resulted in productivity study and the results that collected is deficient in the learning process of e-Learning. In terms of institutional support, especially in the social environment in the form of training and provision of facilities are also deemed to be less stable where the server E-Learning ever happened down several times.

And the use of personal internet facility owned by the students also played a role in reducing the effectiveness of learning E-Learning is for example the Internet network is not stable. In terms of attitude following the technological developments especially learning E-Learning in discrete mathematics are also considered to be less attractive because for most of it material requires explanation mathematically which are elusive for student if only rely on the reading from module course, although there are discussion forums on the E-Learning but it considered less facilitated in terms of understanding the course material. Nevertheless, in spite of it all, was also found indications that in general in the use of E-Learning is considered as easy to learn and use so it can be mastered quickly by students who first learned the system of E-Learning. This learning E-Learning is also considered to facilitate the task of studying respondents. In terms of information, E-Learning also considered capable of providing up to date information needed by the students continuously.

D. Statistical Inferential Analysis

Inferential statistics analysis is associated with the data analysis. Analysis of this data is intended to perform a test for the hypothesis. The results of statistical inferential analysis of the hypothesis in this study

1. Test Hypothesis In the Variable Performance Expectancy

Based on the average total weight of respondents answer toward Performance Expectancy or expectations of the performance of the E-Learning in Discrete Mathematics courses namely $2.875 < 3$, which means that H_0 accepted and H_1 rejected. So based on the above data it can be concluded that the process of learning E-Learning in Discrete Mathematics subjects considered less effective.

TABLE 3- HYPOTHESIS PERFORMANCE EXPECTANCY

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
PE1	50	1.00	5.00	2.8800	1.09991
PE2	50	1.00	4.00	2.3800	.98747
PE3	50	1.00	5.00	2.6400	.98478
PE4	50	1.00	5.00	3.3200	.93547
Valid N (listwise)	50				
Mean				2.805	

2. Test Variable Behavioral Hypothesis Testing In intension

Based on the average total weights of respondents answer to the Behavioural intension or interest using the E-Learning in Discrete Mathematics course that is $2,805 < 3$, which means that H_0 accepted and H_1 rejected. Then based on the above data it can be concluded that the students expect the learning process Discrete Mathematics courses done conventionally or face to face in the classroom.

TABLE 4- BEHAVIORAL HYPOTHESIS INTENSION

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
BI1	50	1.00	5.00	3.0400	1.04900
BI2	50	1.00	5.00	2.5000	.94761
BI3	50	1.00	5.00	2.9600	1.04900
Valid N (listwise)	50				
Mean				2.8333	

V. CONCLUSION AND RECOMMENDATION

A. Conclusion

Based on the results of the data analysis and discussion on variable Performance Expectancy which valued 2,805 and Variable Behavioural intension which valued 2,833 then it can be concluded that the process of learning E-Learning in Discrete Mathematics subjects considered less effective by the respondents, students and Lecturer. Meanwhile, from the viewpoint of the availability of facilities and services E-Learning process as a whole is considered good.

B. Suggestion

Based on the above conclusions, there are some suggestions that may researcher convey:

1. Components of educators which is lecturers should take advantage of the learning functions of the e-learning-based optimally into the learning process so that students more easily to understand the material provide in the E-Learning.



2. The Chairman of the Department of Information as manager and supervisor of lectures should need to consider in order to Discrete Mathematics courses serve as subjects face to face rather than as subjects of E-Learning.

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