THE EFFECT OF MULTIMEDIA BASED ON STUDENTS' ENVIRONMENTAL AND COOPERATIVE LEARNING

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Abstract

The purpose of this study is to describe the concept of understanding and critical thinking skills in Hygiene and Sanitation subject course. This study is an experimental study that uses experimental and control design. Its sample was students of Politeknik Negeri Bali majoring in tourism in the fourth semester of the 2021/2022 academic year which was determined by non-probability sampling with a cooperative learning model. Instruments used to collect data in the form of concept mastery test sheets and critical thinking developed based on indicators of Hygiene and Sanitation learning materials on the sub-topic of waste and the environment. Meanwhile, the critical thinking skills test developed based on argumentation analysis indicators showed an average experimental class score of 85.33% with high criteria and a control class of 33.33% with medium criteria. While the mastery of the concept of the experimental group is 81% with high criteria and the control class is 33% with medium criteria. The results of the t-test for mastery of concepts and critical thinking skills show that the experimental class is significantly higher than the control class with a value of $t_{count} = 4.28 > t_{table} = 1.671$ then Ho or the hypothesis is rejected. Thus it can be concluded that the use of multimedia is more effective in increasing mastery of concepts and critical thinking than learning without multimedia or conventional learning on Waste and Environment material.

Keywords: Multimedia, Concept Mastery, Critical Thinking Skills, Hygiene and Sanitation

1) INTRODUCTION

Information and communication technology (ICT) in the 21st century plays an important role in human and organizational life as a means of driving a digital-based economy (Mahmud, 2020). By making students have character, they will be more responsible for the use of technology itself (Maharani & Nadiroh, 2019). Educational technology greatly affects the development of education, both in the learning process and in the preparation of the curriculum, especially in building adequate educational facilities and infrastructure so that the educational goals themselves are easy to implement (Muhammad, 2018). Educational technology is able to creatively develop technology to make education easy, effective and efficient in giving birth to the next generation of a great nation (Nurdyansyah, Pandi Rais, & Qorirotul Aini, 2017). The rapid development of technology in the current era of globalization has provided many benefits in progress in various social aspects (Muhammad, 2018). Human adaptation to new technologies that have developed is mandatory to be done through education (Shaharuddin, 2020). This is done so that the next generation does not lag behind in terms of new technologies. Thus, technology and education are able to develop together in line with the new generation as a successor to the old generation (Rusman, 2015).

Education is an effort to improve the quality of human life by developing the potential that exists within each individual (Hasibuan et al., 2022). Because education is not a simple activity, but a dynamic activity. Taking into account the dynamics of education, of course, education requires good management so that educational goals are achieved properly and effectively as desired (Rohman, 2021). In fact, it has a very important role in developing the potential of each individual, including human mental potential (Hasibuan & Rahmawati, 2022). Through education, it is expected that there will be a transformation that can develop positive characters and be able to change bad behavior into good (Isma et al., 2022). Because education is the main vehicle to foster good behavior in the learning process, especially in this era of educational autonomy.

Education currently faces very severe challenges, including being able to facilitate learners to build competencies according to the needs of this century (Nakiah, 2022). The learning environment developed by lecturers often does not prepare students to be involved in the process of constructing a concept in their minds, resulting in a lack of development of basic thinking patterns towards higher-level thinking patterns. Mastery of concepts and critical thinking skills of students regarding the concept of the environment as an indicator of the success of a teaching and learning process from various studies in general is still lacking (Husein et al 2015). Besides, the world of education is currently facing crucial problems on how to strive to build an understanding (Suryana, 2020) and empower thinking skills (Santyasa, 2018).. Because after all, in learning, understanding is much more important than learning achievement. With (achievement) as measured by the achievement of test scores (Suryana, 2020), which only emphasizes more on memorizing knowledge.

To be able to develop the use of concepts and critical thinking skills in concrete sanitation learning needs the help of Information Technology. Information technology in education is applied in the form of multimedia in the form of software, which provides facilities to students to learn a material. Multimedia is the use of computers to present and combine text, animation, sound, images and video with tools (tools) and links so that users can navigate, interact, work and communicate (Zainiyati (2017). It is said by Eliza Basir & Ikbal (2015) that the Multimedia learning model is part of a collaborative learning model that utilizes the help of computer technology so that it can be used by students with far distances and students can work together using internet media.. Multimedia component explained Purnama (2013: 8) that the merger of several components of the human senses. This means that collaboration components ranging from visualization, audio, and motor students can be channeled with the content of learning materials.

Fanny (2013) in his research suggests that when teachers deliver learning materials with conventional methods students will be easily bored. Then the teacher needs to create a variety of effective learning methods and models. The variety of methods and models is also equipped with a variety of learning media so that students are easy to receive material, interesting, and create a pleasant learning atmosphere and the use of multimedia makes the latest alternative in the learning process. In addition (Yusuf, 2017) explained that innovative learning media such as multimedia is effective and feasible to be applied in the learning process. Critical thinking

is the ultimate goal of learning at the college level (Heft &Scharff, 2017; Wilcox, et al, 2017; Schendel & Tolmie, 2017; Tiruneh, et al, 2018).

Universities are the backbone of total change in society because success at the university level is a bright spot for change to a lower level. Therefore, some countries such as Australia, Mexico, Singapore and Namibia place the function of higher education to produce graduates capable of critical thinking in their curriculum documents. (Vista, et al, 2018). According to Vista et al (2018), out of 153 countries studied there are seventy-six percent of the countries that included critical thinking skills (referred to as CTS) in higher education curriculum documents. Moreover, education on a national scale does not seem to be enough just to make changes to special programs and curriculum changes, but these changes should be interpreted with a change in thinking (Costa and McCrae (Brandstätter & Opp, 2014) and a commitment to self-development. This change in thinking and attitude refers to a paradigm shift from how to teach, how to learn and how to stimulate learning and learning how to teach (Longworth, 2019). Findings from the research of Santyasa et al (2020), and conceptual and theoretical studies from education experts of Clark and Mayer (2008), indicate that innovative e-learning content will result in better performance compared to less innovative content. The implication is that learning with the help of technology really needs content that is in accordance with the learning needs of students, so that learning products will be able to be produced as expected. In the study of Sutarno and Desi (2012), on multimedia found that the increase in mastery of the concept of students who follow the learning using multimedia-assisted Cooperative Learning Group is significantly higher than that of students who follow conventional learning. Furthermore, Gunawan (2011) showed that the use of multimedia is also proven to improve students ' ability to draw conclusions and solve problems.

2) RESEARCH METHODS

This type of research is an experimental research conducted by using Pretest-posttest control group design (Sugiyono, 2019:112) as shown in table 1 below:

Table 1: Research Design

Class	Design		Treatment	Test	
				Early	End
Experiment	O_1 O_2	X_1	X_1	Ya	Ya
Control	O_3 O_4	X_2	X_2	Ya	Ya

Information:

X_1 = Using interactive multimedia

X_2 = Using conventional learning

This research was conducted in the Hospitality Study Program, Tourism Department of Politeknik Negeri Bali. The samples in this study are Class A and B as experimental class and Class C and D as control class. Data were collected using test instruments in the form of mastery of concepts and critical thinking skills that have been tested for validity and reliability. Data processing techniques using descriptive and statistical analysis. Improved test results mastery of concepts and critical thinking skills of students were calculated using the normalized gain formula (N-gain) (Meltzer, 2002) in (Muh.Tawil, 2012: 4).

$$g = \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}}$$

In this case, it states the final Test score; it states the initial test score, and it states the material score of the students of the experimental class and the maximum control class. N-gain level criteria can be seen in the following table 2.

Table 2: Categories of N-Gain Levels

Restrictions	Category
$g > 0,7$	High
$0,3 \leq g \leq 0,7$	Medium
$g < 0,3$	Low

Comparison of N-gain between experimental class and control class was tested using T test at a significant level of 5% after going through the control Class normality test and homogeneity of data variants.

3) RESULTS AND DISCUSSION

3.1 Research Results

This section describes matters relating to data processing and hypothesis testing based on the data obtained in accordance with the techniques and procedures for data collection in research. The data processing referred to includes descriptive analysis, normality and homogeneity testing, and hypothesis testing.

1. Instrument Trial Analysis

Before the student learning outcomes test instrument is used in research, it is first tested on respondents outside the experimental class and control class.

This can be described as follows:

a. Validation Test

The validation test was carried out to determine the validity of the instrument or item items. For the validation test in this study using the product moment formula with 45 multiple choice items with a value of $\alpha = 0.05$ and rcount = rtable = 0.433 and it is known that N = 43 because there were 43 students in the respondents. If rcount > rtable then the item is said to be valid and vice versa if rcount < rtable then the item is said to be invalid. Based on the results of the calculation of the test instrument validation test with the number of items on understanding the concept of 45 items and 45 items on critical thinking, with the type of multiple choice questions, valid questions are obtained with a total of 40 items each, and 10 items that are invalid with the number (4, 8, 10, 11, 20) and (7, 10, 32, 34, 39) are stated to have no function as a test measuring tool.

b. Reliability Test

In this study the calculation of the reliability index of the test was carried out on a test item totaling 40 multiple choice questions which would be used to collect data. According to Ghozali (2011), a variable can be said to be reliable if it gives a value of Cronbach alpha (α) > 0.6. Meanwhile, according to Riwikdigdo (2007) the value of Cronbach alpha (α) > 0.7, and here will use (a) > 0.6. The following is a summary of the results of the reliability test of the items.

Table 3.1: Summary of Instrument Reliability Test

| TESTING CRITERIA		
Value Reference	Value Croubach's	Conclusion
0.6	0.921	Reliabel

Based on table 3.1 above, it is known that the Cronbach's test value has a reliability index of 0.921. The data is then compared with the table of interpretation of the reliability correlation figures in the reference value column. Based on the results of the comparison, it was found that the degree of reliability of the multiple choice questions in this study was included in the very high criteria and deserved to be tested.

c. Difficulty Level Test

Difficulty level test (Arikunto, (2013, 223) with the following formula:

$$P = \frac{B}{JS}$$

Figure 3.1: Difficulty Level Test
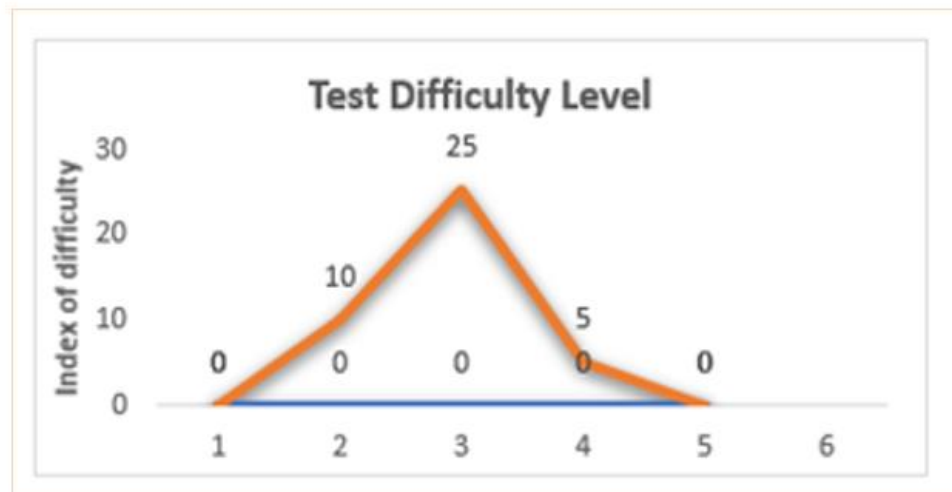
The items that have been tested are 40 multiple choice questions, then the level of difficulty is tested, such as "very easy, easy, moderate, difficult and very difficult". Based on the test results it is known that the item difficulty index has criteria of 5 items with easy criteria, 10 items with medium criteria, 25 items with difficult criteria, very easy and very difficult 0 items each, so 40 items are eligible for testing to students.

d. Discriminating Power Test

According to Arikunto (2013, p. 228) the discriminating power of a problem is the ability of a question to distinguish between smart students (high ability) and stupid students (low ability). To calculate the discriminating power of each item using the following formula:

$$D = \frac{BA}{JA} - \frac{BB}{JB}$$

The differential power test aims to determine whether the ability of a test can distinguish between high and low ability students. Based on the results of the analysis, it can be seen that the results of calculating the differential power of the questions on student learning outcomes can be seen from the 40 items with 1 bad criterion, 4 moderate criteria and 35 good questions. This means that 39 items are suitable for use and 1 item can be corrected, so that 40 items can be used.

Figure 3.2: Power Difference Test
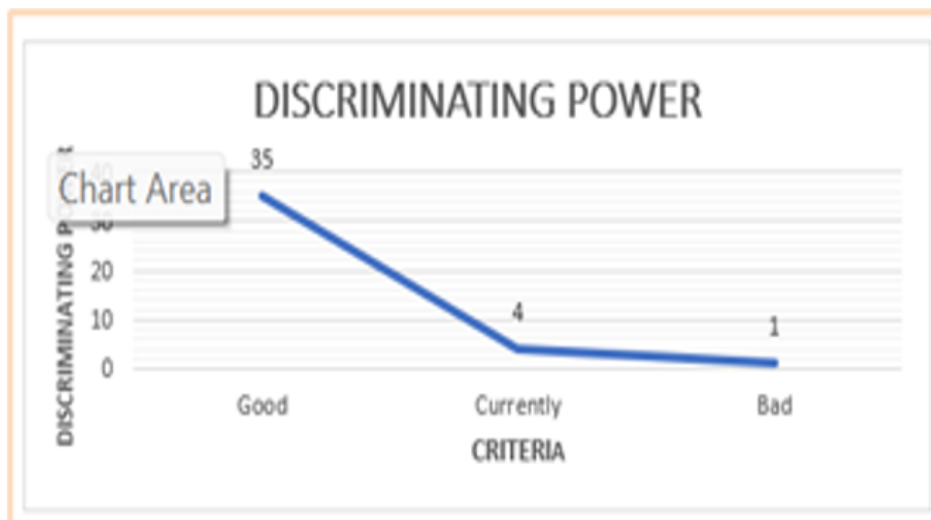
e. Conclusion of Instrument Testing Results

Based on the results of the calculations that have been carried out, namely by means of validation tests, reliability tests, difficulty level tests and differentiating power tests. So it can be concluded table 3.2 as follows:

**Table 3.2: Conclusion of Instrument Testing Results**

Lots of questions	Validity	Reliability	Difficulty level	Discriminating power
45 Question item	40 valid 5 invalid	Reliable	a. 5 easy b. 10 currently c. 25 hard	a. 35 very good. b. 8 currently. c. 1 not good

3.2 Discussion

1. Data mastery of experimental and control Class concepts

The image histogram data mastery of the concept of each sub-material experimental and control class students, among others:
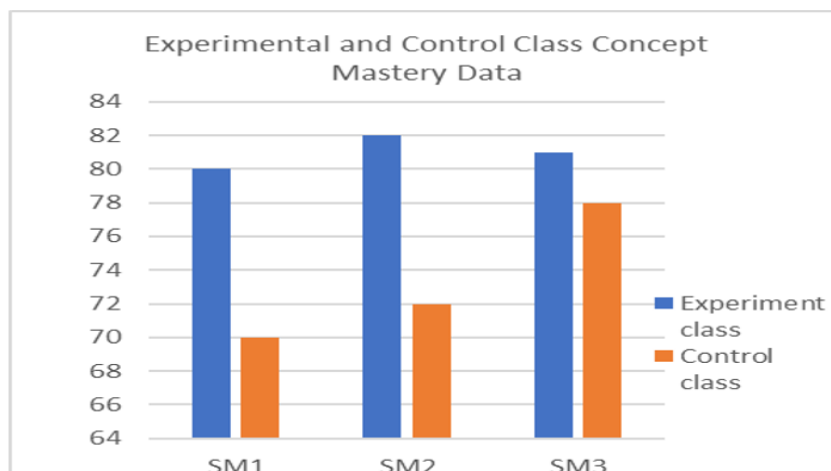
Figure 1: Data mastery of the concept of each sub-material experimental and control class students.

Description: SM1= waste; SM2=environment; SM3=tourism waste.

Based on the graph above, the average value of mastery of the concept is in the range of 80 to 82, where the average value of the experimental class is 80 (23%), 81 (35%) and 82 (42%). As for the control class, the average value is in the range of 70 to 78, where 70 (29%), 72 (49%) and 78 (22%). This means that the use of multimedia is very influential on the understanding of concepts in the experimental class compared to the control class.

2. Critical thinking skills data of experimental class and control Class

Coolum data picture of critical thinking skills each indicator of experimental class and control class is as follows:
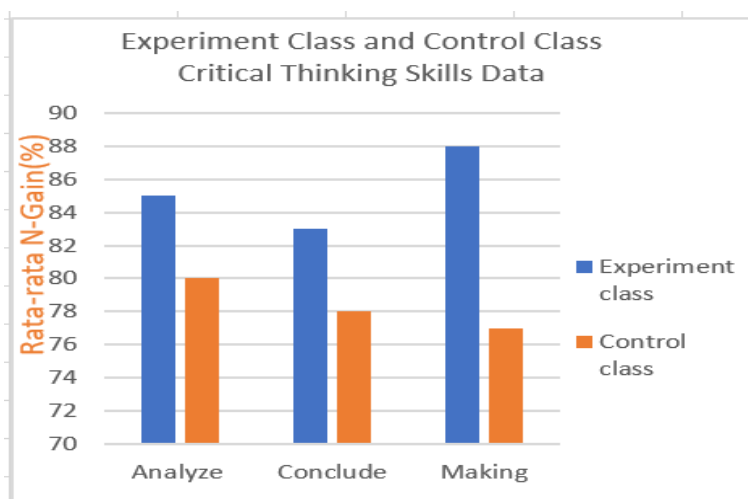
Figure 2: Data critical thinking skills of each indicator between the experimental class and the control class.

Based on the graph above, the value of critical thinking skills on average is in the range of 83 to 88, where the average value of the experimental class is 83 (24%), 85 (28%) and 88 (49%). As for the control class, the average value is in the range of 77 to 80, where 77 (51%), 78 (32%) and 80 (17%). This means that the use of multimedia is very influential on the experimental class in critical thinking skills compared to the control class.

In this study the data collected is adjusted to the needs of analysis, namely the analysis of the mastery of concepts and critical thinking skills of students in Hygiene and sanitation materials taught using multimedia in the experimental class, with mastery of concepts and critical thinking skills of students who are taught without the use of multimedia in the control class. The following will be presented the results of research on the effect of the use of environmental and cooperative multimedia on the mastery of concepts and critical thinking skills in the fourth semester students of classes a,B and C,D Department of tourism, Bali State Polytechnic Hospitality Studies Program.

3. Multimedia influence on the mastery of the concept

The material of Sanitation, Hygiene and Sanitation in this study which is discussed consists of three sub-materials, namely environment, waste and tourism waste. The average gain of N-gain for experimental class is 81% and control class is 73%. The average N-gain for the experimental class and the control class is included in the high category. Based on the data seen in the same category but the average N-gain for the experimental class is higher than the average N-gain of the control class.

The results of the comparison of the average N-Gain mastery of the concept in the experimental class and the control class for each sub-material, the largest average N-Gain obtained in the waste sub-material while the smallest N-gain of both classes obtained in the environmental sub-material. This is thought to be due to the characteristics of each sub-material that ultimately affects the delivery of material in multimedia used. The waste Sub-material is a material that contains preventive health that focuses its activities on human environmental health efforts in comparison with other sub-materials. Most of what is presented at each meeting requires a prerequisite understanding of the materials presented at the previous meeting, also required knowledge of the environment and the principles or methods of sanitation related to waste.

Based on the t test, the results obtained that there is a significant difference between the mastery of the concept and critical thinking experimental class compared to the control class with the value of thitung = 4.28 > ttabe = 1.671, then Ho or hypothesis rejected. Thus it can be concluded that the use of multimedia is more effective in improving mastery of concepts than learning without multimedia or conventional. The improvement of learning outcomes after the use of multimedia shows that the influence of multimedia use on mastery of the concept of waste material, the environment and tourism waste.

4. The effect of multimedia usage on critical thinking skills

Indicators of critical thinking skills used from several indicators according to Ennis (2011), Duron (2006), Paul and Elder (2006) Hendriana et al (2017) is a systematic thinking activity to analyze and evaluate a problem and build basic skills and make inferences. The results of the initial test and the final test of critical thinking skills resulted in N-gain experimental class by 66% and the control class by 54% the average N-gain for the experimental class and the control class included the medium category. Based on these data, it can be seen that the average N-gain for the experimental class is higher than the control class.

The results of data analysis showed that critical thinking skills on indicators of the ability to make arguments, build basic skills and make inferences in the experimental class is higher than in the control class, it shows that the systematic exposure of the material in the multimedia used is able to provide convenience to students to understand the experiment. In addition, the animations displayed and simulations that must be done by students through discussion sheets can train students ' thinking logic in solving Hygiene and sanitation problems related to the concept of waste and the environment.

Improvement of critical thinking skills on indicators make inferences are high compared to other indicators, it shows that exposure to waste and environmental materials in multimedia are described in a sequence with examples of problems, exercises and tests, assignments to work on problems, as well as activities to make conclusions on each worksheet students in the simulation proved to be influential in solving the problem. Based on the results of the t test, it was found that there was a significant difference between the improvement of critical thinking skills of the experimental class and the control class with a value of T= 15.53 > ttable=1.671, then the Ho or hypothesis was rejected . This shows that the use of multimedia is more effective in improving critical thinking skills than learning without multimedia. The improvement of learning outcomes after the use of multimedia shows that the influence of multimedia use on students ' critical thinking in the field of making arguments, building basic skills and making inferences.

4) CONCLUSION

Based on the results of the research and discussion, the following conclusions can be drawn: (a) the use of multimedia affects the mastery of student concepts in Hygiene and sanitation materials in class A and B of the Tourism Department, Politeknik Negeri Bali for the 2021/2022 academic year (b) the use of multimedia affects the critical thinking skills of students in Hygiene and sanitation materials in the class A and B.

For the next researcher, time planning in learning between theory and practice (semester credit unit and practical hours) must be in accordance with the MBKM 2022 curriculum, so as to obtain maximum results, considering the many unexpected things that can arise in learning activities.

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