

# The Effect of the Usage of Interactive Multimedia on the Students' Concept Mastery and Critical Thinking Skill

\*I Ketut Suja

Tourism Department  
Politeknik Negeri Bali  
Badung, Indonesia  
suja@pnb.ac.id

Ni Luh Eka Armoni

Tourism Department  
Politeknik Negeri Bali  
Badung, Indonesia  
suja@pnb.ac.id

I Gusti Agung Sadnyana Putra

Tourism Department  
Politeknik Negeri Bali  
Badung, Indonesia  
agungsadnyana@pnb.ac.id

Ni Luh Ayu Kartika Yuniastari Sarja

Tourism Department  
Politeknik Negeri Bali  
Badung, Indonesia  
yuniastari@pnb.ac.id

**Abstract**—This study aims to determine the influence of the use of interactive multimedia on the mastery of concepts and critical thinking skills of students in courses. Some of the most important findings expected in this study are (1) the influence of this model can improve students' learning competence in the cognitive realm. (2) through software, students' skills and independence can improve critical thinking, creativity, collaboration, and communication. This research is an experimental study using pretest-posttest control design. The research sample is even semester students in 2020/2021 with random sampling cluster technique. The instrument used to collect data is a concept mastery test sheet developed based on data analysis indicators and provides interachievement. While the critical thinking ability test developed based on argumentation analysis indicators showed that the average concept mastery score of the experimental group was 69% and the control group was 55%. The results of the t-test mastery of critical concepts and thinking skills showed that the experimental group was significantly higher than the control group. This means that the use of interactive multimedia affects the mastery of students' critical thinking concepts and skills in data analysis and achievement materials.

**Keywords**— *interactive multimedia, concept mastery, critical thinking skills, data analysis and achievement*

## I. INTRODUCTION

Learning is a part of science that requires abstract concepts. These statistical characteristics are expected to be used to familiarize and develop students' thinking skills towards critical thinking skills. Critical

thinking skills are thinking skills that not only require memory skills, but also require other skills that are in the form of concepts. Critical thinking skills are basically problem solving skills. According to Paul and Elder (2007)[2], critical thinking is a way for one to improve the quality of thinking results by using systematic thinking techniques and generating intellectual thinking power in initiated ideas. Statistical learning models developed by most lecturers often do not prepare students to engage in efforts to use and develop basic thinking patterns towards high-level thinking patterns. Mastery of concepts and ability to think critically of students to the concept of statistics as an indicator of the success of a teaching and learning process from various researches in general is still lacking. One of the reasons for the lack of mastery of statistical concepts and critical thinking skills is that students are not involved in the process of constructing a concept. To be able to develop mastery of concepts and critical thinking skills in the learning of abstract statistical concepts, information technology is required. Information technology in education is implemented in the form of interactive multimedia in the form of software, which provides facilities for students to learn a material. The use of interactive multimedia applications in learning will increase efficiency, motivation, and facilitate active learning, learning, experimental, consistent, with student-centered learning (Baker, (2008)[3].

The use of interactive multimedia in learning is also very possible to improve the expected thinking

ability. In general, the benefits that can be obtained through the use of interactive multimedia is that the learning process can be more interesting, more interactive, the amount of teaching time can be reduced, the quality of student learning can be improved and the teaching and learning process can be done. process can be done. The process can be done anywhere and anytime, and can improve students' reasoning skills. Heinich (1996) in Sutarno (2011)[4].

According to Slavin, (1995)[5], with research on interactive multimedia found that the improvement of mastery of the concepts of students who followed the learning using cooperative learning of interactive multimedia-assisted groups was significantly higher than that of students who followed conventional learning. Brookfield, (1997)[6] found that the mastery of concepts and critical thinking skills of students who participated in magnetic field learning using online interactive multimedia was significantly higher than students who followed conventional learning. Furthermore, Tan,[2000][7] points out that the use of interactive multimedia has also been shown to improve students' ability to draw conclusions and solve problems.

Based on the background and some research results as outlined above, it is necessary to develop learning by utilizing interactive multimedia. Furthermore, it will be examined how the influence of interactive multimedia usage on the mastery of concepts and critical thinking skills of students.

II. RESEARCH METHODS

Type of research is experimental research conducted using pretest-posttest control group design (Sugiyono, 2012)[8] as shown in Fig 1.

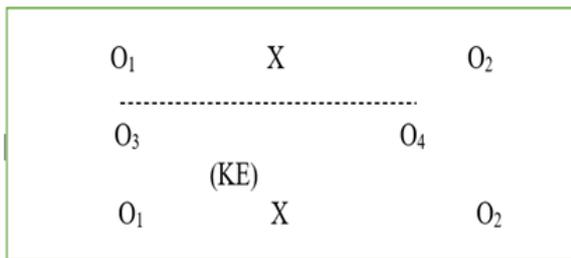


Fig. 1. Nonequivalent control group design (Sugiyono, 2012)

Description : X = Treatment O1 = Pretest Experimental Class O2 = Posttest Experimental Class O3 = Pretest Control Class O4 = Posttest Control Class.

In this model before the start of treatment both groups were given a pretest that serves to know the initial state, namely the level of knowledge of students to be delivered, is there a difference between the experimental group and the control group. Furthermore, the experimental group received

treatment in the form of Two Stay Two Stray learning and in the control group with conventional learning. After completion, both groups were given another test in the form of a posttest that serves to measure the ability.

This research was conducted in one of the vocational education in Bali. The samples in this study were class IIA as experimental class and IIB class as control class. The data was collected using test instruments in the form of mastery of critical thinking concepts and skills that have been tested for validity, and reliability. Data management techniques using descriptive and statistical analysis. The improvement of the initial test results and the final test of mastery of concepts and critical thinking skills of students are calculated using the normalized gain formula (N-gain) (Meltzer, 2002)[9].

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

In this case the final test score states the initial test score, and the maximum score. The criteria for N-Gain levels can be seen in Table 1.

TABLE I. CATEGORY LEVEL N-GAIN

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

The average N-gain comparison between the experimental class and the control class was tested using the Experiment t test at a significant rate of 5% after passing the data variant normality and homogeneity test. The analysis of the assessment results is done by paying attention to the grades obtained by students. Analysis of students' critical thinking skills test is conducted using formula according to description 3.3 (Riduwan. 2010)[10].

$$(\%) = \frac{\text{Total correct answer score}}{\text{Score Maximum}} \times 100 \%$$

The criteria for the percentage of students' thinking skills can be seen in Table 2 as follows.

TABLE II. CRITERIA FOR THE PERCENTAGE OF STUDENTS' THINKING

Interpretation (%)	Critical Thinking Category
$80\% < X \leq 100 \%$	Very High
$60\% < X \leq 80 \%$	High
$40\% < X \leq 60 \%$	Low
$20\% < X \leq 40 \%$	Very Low

Source : Modification of Riduwan (2012:18).

III. RESULT AND DISCUSSION

3.1. Result

1. Data Mastery Concepts Experimental and Control Class As for the histogram image of the mastery data of each sub material students experimental class and control class among others: indicators between the experimental class and the control class.

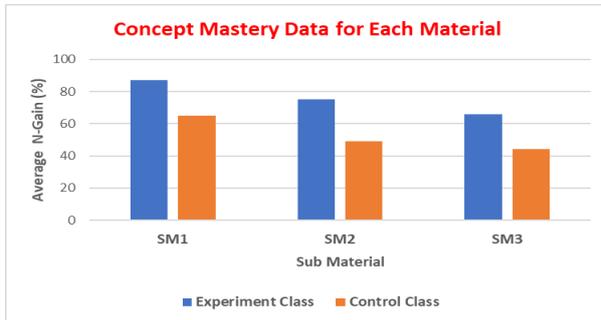


Fig. 2. Data mastery concept of each sub material experimental class and control class.  
Description : SM1= systematic data preparation SM2 = create table SM3= provide achievement

2. Data on Critical Thinking Skills of Experimental Classes and Control Classes

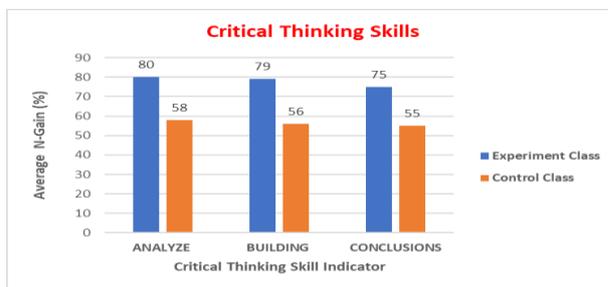


Fig. 3. Critical Thinking Skills between Experimental and Control classes

3.2 . Discussion

The data collected in this study is tailored to the needs of analysis, namely the analysis of students' mastery of concepts and critical thinking skills on data analysis and achievement materials taught using interactive multimedia in experimental classes, while the control class mastery of the concept of critical thinking skills of students without the use of interactive multimedia. The following will be presented the results of research on the influence of interactive multimedia usage on the mastery of critical thinking concepts and skills in students of semester IIA and IIB.

1. The influence of interactive multimedia on the mastery of concepts.

Data analysis materials and achievements in research are given about systematic data preparation, creating tables and providing

achievements. The average N-gain for the experimental class was 69% while the control class was 55%. The average N-gain for the experiment class and control class is included in the moderate categorization. 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 average comparison of N-Gain mastery of concepts in experimental classes and control classes for each sub-material, obtained the largest N-Gain average obtained on sub-materials of systematic data preparation, while the smallest N-gain of both classes was obtained in interachievement sub-materials. This is thought to be due to the karekteristic of each sub-material that ultimately affects the delivery of material in the interactive multimedia used. The basic sub-material of achievement is material that analyzes and compares between some data and conclusions and this really requires simulation and training. The material delivered to each meeting requires the prerequisite of understanding concepts, analyzing and concluding. The delivery of meter through interactive multimedia also requires thoroughness because in the creation of design, content, images and technology must be really interesting, so it is easy to learn and can foster interest in learning. While the achievement is the result of all the material summaries that have been studied either through interactive multimedia or not, and is the conclusion of each class. In interactive Multimedia simulations used should really require thoroughness and understanding of the concept so that the results we get as expected, but of the three materials interachievement puts the lowest position. However, based on the analysis of the data obtained that the N-gain sub-material interachievement of experimental students is higher than the control class.

Based on the results of the test t obtained results that there is a significant difference between the improvement of mastery of experimental class concepts and control classes with a value  $t_{count} = 2.75 > t_{table} = 1,129$ , this shows that the use of interactive multimedia is more effective in improving mastery of concepts than learning without unconventional multimedia. There is an improvement in learning outcomes after using interactive multimedia mastery of concepts and critical thinking on materials of systematic data preparation and table creation.

2. The influence of interactive multimedia usage on critical thinking skills. Indicators of critical thinking skills used according to (Shahfriana et al., 2015)[11]. i.e. analyzing arguments, building basic skills and creating inferences. The initial test results and the final test of critical thinking skills resulted in an N-gain of the experimental class of 67% and a control class of 57% on average N-gain

for the experimental class and the moderate category's class of advanced control. Based on the data, it appears that the average N-gain for the experimental class is higher than in the control class.

The results of the 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 higher than in the control class, this showed that systematic exposure to material in interactive multimedia used was able to provide ease to students to understand experiments and simulations. In addition, the animations displayed and interactive simulations that must be done by students through the discussion sheet can train students' thinking logic in solving statistical problems related to the concept of analyzing, making and concluding.

Improvement of critical thinking skills in indicators makes high inference compared to other indicators, this shows that exposure to materials analyzing, making and conclusion on interactive multimedia described in a runut accompanied by examples of questions, interactive exercises and tests, assignments to work on questions, as well as the activities of making conclusions on each student worksheet in interactive simulations proved to be influential in solving problems.

Based on the results of the test t obtained results that there is a significant difference between the improvement of critical thinking skills experimental class and control class with a value  $t_{count} = 3.57 > t_{table} = 1,544$ , this shows that the use of interactive multimedia is more effective in improving critical thinking skills than learning without interactive multimedia. The improvement of critical thinking skills after the use of interactive multimedia shows that there is an influence on the use of interactive multimedia on the improvement. The implication of the study is to improve students' conceptual mastery and critical thinking skills by using interactive multimedia. In mastering concepts and critical thinking, students in the experimental class and group class showed different results. the experimental class has bigger point compare to group class. This means that the use of multimedia in all classes will result in increased understanding of concepts and critical thinking, and the teaching and learning process will be easier and less boring both for students and lecture.

#### IV. CONCLUSION

Based on the results of research and discussion can be drawn conclusions as follows: (a) The use of interactive multimedia affects the mastery of student concepts in data analysis materials and achievements in gradeS IIA and IIB even semester 2020/2021. (b) The use of interactive multimedia affects students' critical thinking skills in data analysis materials and even semester IIA achievement in 2020/2021.

#### ACKNOWLEDGMENT

Based on the results of research and discussion can be drawn conclusions as follows: (a) The use of interactive multimedia affects the mastery of student concepts in data analysis materials and achievements in gradeS IIA and IIB even semester 2020/2021. (b) The use of interactive multimedia affects students' critical thinking skills in data analysis materials and even semester IIA achievement in 2020/2021.

#### REFERENCES

- [1] A. Borghi and F. Cimatti. "Words as tools and the problem of abstract words meanings", Proceedings of the 31st Annual Conference of Cognitive Science Society. Amsterdam: Cognitive Science Society, 2009, pp. 2304–2309
- [2] R.Paul and L. Elder, *Consequential Validity: Using Assessment to Drive Instruction*, Foundation for Critical Thinking. Berkeley: University of California, 2007.
- [3] E.L. Baker and G.C. Delacruz, A framework for the assessment of learning games. In H.F.O'Neil and R.S. Perez (Eds.), *Computer games and team and individual learning* (pp. 21-37). Oxford, UK: Elsevier, 2008.
- [4] Sutarno. "Penggunaan Multimedia Interaktif Pada Pembelajaran Medan Magnet Untuk Meningkatkan Keterampilan Berpikir Generic Sains Mahasiswa", *Jurnal Exacta*. 2011, Vol IX (1), pp 60- 66.
- [5] S., Cohen, RN, BS, CEN, *Critical Thinking in Long-Term Care Nursing: Skills to Assess, Analyze, and Act*. United States of America : HCPro, Inc, 2008.
- [6] R.E. Slavin, *Cooperative Learning. Teory, Research and Practice*. Boston : Allyn and Bacon, 1995.
- [7] S.D. Brookfield, "Assessing critical thinking. *New Directions for Adult and Continuing Education*", 1997, No. 75, pp 17-29.
- [8] O. S. Tan, *Thinking Skills, Creativity and Problem-Based Learning*. Paper presented at the 2nd Asia Pacific Conference on Problem - Based Learning: Education Across Disciplines, December 4-7, 2000, Singapore
- [9] Sugiyono. *Metode Penelitian Kombinasi*. Bandung: Alfabeta, 2012.
- [10] N. Eddy, *Penggunaan teknologi multimedia interaktif dalam pembelajaran ilmu pengetahuan sosial untuk meningkatkan pemahaman dan retensi siswa*. Tesis PPs UPI. Bandung: tidak dipublikasikan, 2008.
- [11] Meltzer and E. David. *The Relationship Between Mathematics Preparation And conceptual learning gain in physics: A possible inhidden Variablei in Diagnostic pretest scores*. Ames: Department of physics and Astronomy, Iowa State University, 2002.
- [12] Riduwan. *Belajar Mudah Penelitian untuk Guru-Karyawan dan Peneliti Pemula*. Bandung: CV Alfabeta, 2010.
- [13] G.A. Cabrera. "A Framework for Evaluating The Teaching of Critical Thinking", dalam R.N Cassel (eds). *Education*. 1992, 113 (1). 59-63.
- [14] A.L. Costa, *Developing Minds, A Resource Book for Teaching and Thinking*. Association Supervision and Curriculum. USA, 1985.
- [15] A. Arsyad, *Media Pembelajaran*. PT Rajagrafinda Persada, 2016.
- [16] R. H. Ennis. "The Nature of Critical Thinking", *Informal Logic*, 2011, 6(2), 1–8.