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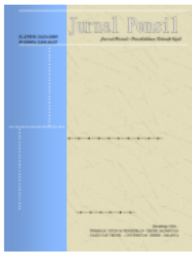

EFFECTIVENESS OF THE USE OF MULTIMEDIA-BASED LEARNING MEDIA IN BUILDING CONSTRUCTION COURSES

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Abstract

This research aims to find out the effectiveness of the use of multimedia-based learning media in building construction courses I. The research method used is quasi experimental with a randomized form of pretest-posttest control group design. Data collection is done with pretest and posttest instruments given to two classes of experiments and controls. The results of this study are derived from the Whitney U-Mann test and the N-gain test, which showed that there was a significant difference between the results of the experimental class learning and the control class, and there was an increase in learning outcomes with intervals of 56%-76% in column material, plate material, window door sill material, ladder material, and roofing materials. As a result, the use of multimedia learning materials in these materials is effective for online learning in building construction courses.

Keywords: Effectiveness, Multimedia, Building Construction I

Introduction

In the current era of the industrial revolution 4.0, there has been a change in various areas of life. This change in the education system, including learning conditions, learning methods, learning devices, curriculum, student development, and graduation competencies (S. Hadi, 2017)(Widjayanti et al., 2018)(Risdianto, 2019).

One form of advancement of information and communication technology in the world of education is the development of teaching materials by optimizing the use of media more effectively and interactively (Haryoko, 2019)(Luh & Ekayani, 2021). Advances in information and communication technology also provide benefits for humans, especially in the world of education which is currently the learning process can be done anywhere and anytime (Falahudin, 2014), without restrictions on both space and time (Maharani, 2015). This indicates an attachment between information and communication technology to education (Ardianti et al., 2019). Therefore, educators can strive to utilize technology in the learning process in order to create ease and optimization in the learning process (Indra et al., 2021)(Nurdyasyah et al., 2018)(Putra et al., 2019).

The application of teaching materials by utilizing technology becomes a firm obligation that must be done by educators to make learning media more innovative so as to improve good learning outcomes for learners (Muzijah et al., 2020)(Indra et al., 2021).

The teaching and learning process will be effective and successful if educators are able to apply teaching materials that are in accordance and adequate to the needs and conditions of learners (Setyadi & Saefudin, 2019)(Nurdin & Anhusadar, 2020)(Akrim, 2018). In addition, teaching materials also need to be adjusted to the learning strategies that will be applied by educators (A. D. Astuti & Prestiadi, 2020)(Elvarita et al., 2020). The current condition of the Covid-19 pandemic also affects the teaching and learning process, where previous learning was done offline or face-to-face directly, then adjusted to the conditions that must remain at home, so that learning is done online or distance learning (Hapsari & Fitria, 2020)(Cahyanti et al., 2022) (Herliandry et al., 2020). Adjust these conditions, teaching materials have an important role as a means of supporting the competence and learning outcomes of maximum learners (Fitriah, 2019), with the advantage that learners can manage their time effectively and comfortably to achieve learning goals (Sohibun & Ade, 2017)(Suwannaphisit et al., 2021)(Nur Jannah, 2020). Given this, the appropriate teaching materials and can support the current learning process is assisted by using multimedia-based learning media (Susanto & Akmal, 2018).

Learning media is a medium or intermediary that is physically used to convey the content of teaching materials or to represent educators in presenting learning information to learners (Nurrita, 2018)(Prasasti et al., 2019)(A. F. Hadi et al., 2020). Meanwhile, multimedia is a combination of three media elements, namely audio, visual, and writing packaged in the form of application files using certain software (Hrabovskyi & Fedorchenko, 2019)(Damayanti et al., 2020).

Thus, multimedia-based learning media are a teaching tool or intermediary in the form of a combination of text, audio, and images that can present information from sources clearly, interestingly and easily understood by learners (Lastrijanah et al., 2017)(Novita et al., 2019)(Nur Jannah, 2020). In addition, multimedia-based learning media can also provide an impressive understanding of learning materials to the learners (Nasrudin et al., 2018)(Sulistianingsih AS., 2020).

In the building construction I course, Amalia (2020) developed multimedia-based learning media to help learning building construction courses I. to find out the success of the development of multimedia-based

learning media, effectiveness tests were conducted on their use during the learning process. Effectiveness test is a test in measuring activities carried out to achieve predetermined results (Astuti et al., 2014)(Setiani, 2020)(Rahma & Pujiastuti, 2021), so that effectiveness becomes the most important component to know the success rate of the application of the business or product that is being applied (Mutiarni, 2016).

The study of the effectiveness of multimedia-based learning media has been conducted, among others, (Maharani, 2015) which discusses the effectiveness of interactive multimedia and the results show that the effectiveness of multimedia application can improve learner's learning outcomes, which are characterized by pretest and posttest results. Then, (Arsyad & Fatmawati, 2018) in his study stated that student learning outcomes, increased after applying multimedia-based learning media to civilization history materials, this is seen from the average results of pretest and posttest which increased by 12,67%.

Based on the above presentation, this study will test the effectiveness of multimedia-based learning media in building construction I courses conducted during online learning, to find out whether multimedia are effective or not, in view of improving student learning outcomes. For this reason, this research was conducted by the title: "Effectiveness of The Use of Multimedia-Based Learning Media in Building Construction Courses I Building Engineering Education Study Program of Jakarta State University".

Research Method

This research uses quantitative approaches and comparative research methods (experiments) with quasi experimental design. Quasi experimental design research is conducted by providing treatment to the experimental class and comparing the impact resulting from the treatment with the control class. Experimental classes will be given treatment in the form of the use of multimedia-based learning media during the learning process, while control classes are not given treatment. This research design uses randomized pretest-posttest control group design with the following design:

Tabel 1. Research Design

	Group	*Pretest*	*Treatment*	*Posttest*
R	E	O1	X	O2
	K	O3	-	O4

This research was conducted in the building construction class I semester 115 of Building Engineering Education study programs, Faculty of Engineering, State University of Jakarta. The study sample numbered 67 people, consisting of 31 experimental classes and 36 control classes.

The data collection technique carried out in this study is to use pretest and posttest, the form of test in the form of multiple choice and the scoring method used is the right only method. For data analysis techniques are carried out by testing the results of pretest and posttest learning students from each given material. Each of these learning outcomes was then conducted a T-test or a U-Mann Whitney test to find out if there was a significant difference between the results of the experimental class learning and the control class. And also conducted data analysis to find out the effectiveness of the use of learning media from improving the results of experimental classroom learning and control classes by conducting N-gain test.

Results and Discussions

In the online learning process of building construction courses I in the Building Engineering Education study program,

Faculty of Engineering, State University of Jakarta in semester 115, student learning outcomes have a different average value on each material given, both experienced by experimental classes and control classes.

Tabel 2. Pretest and Posttest Study Results of Experimental Groups

Group	Material	Learning Outcomes	
		pretest	posttest
Eksperiment	Column	54.19	84.19
	Beam	53.55	78.39
	Plate	54.52	80.32
	Floor & Wall	67.1	84.84
	Door Frame & Window	65.16	87.1
	Ladder	61.29	85.16
	Roof	64.52	86.13

The pretest and posttest learning results of the above experimental groups are the results of gain through descriptive statistical test analysis using the SPSS program version 25.0, which is taken from the mean value or an average grade of the experimental class.

Tabel 3. Pretest and Posttest Study Outcomes Control Group

Group	Material	Learning Outcomes	
		pretest	posttest
Kontrol	Column	56.11	77.5
	Beam	59.44	73.89
	Plate	64.44	73.33
	Floor & Wall	70.28	82.78
	Door Frame & Window	66.94	80.83
	Ladder	61.67	81.11
	Roof	61.39	80.56

The pretest and posttest learning outcomes of the above control groups are the result of gains through statistical test analysis using the SPSS program version 25.0, mean or average value of the control class.

Based on the results of calculations using the SPSS program version 25.0, the results of the normality test and the homogeneity test of pretest data show that normal and homogeneous distributed data only occurs in beam material, while other materials show data is not normal and not homogeneous. So the types of statistics used in pretest data are parametric and non-parametric. Independent two sample T-Test tests are conducted on beam material, while other materials, namely column material, plate material, floor &wall material, door & window sill material, roofing material, and ladder material are analyzed using the Whitney U-Mann test. Whitney U-Mann test is used to test the independence of 2 samples and as a substitute for the Independent two sample T-Test (Sulaiman, 2005).

Tabel 4. Pretest Data Hypothesis Test Results

Material	Level sig.	Asymp. Sig. (2-tailed)	Ket. H_0
Column	*0.05*	*0.641*	*Accepted*
Beam		*0.952*	*Accepted*

Plate	*0.05*	*Accepted*
Floor & Wall	*0.521*	*Accepted*
Door Frame & Window	*0.646*	*Accepted*
Ladder	*0.763*	*Accepted*
Roof	*0.309*	*Accepted*

From the results of calculations with independent test two sample t-test on beam material and U-Mann Whitney test on other materials obtained values Asymp.Sig. (2-tailed) ≥α table (0.05) means that in the data of pretest learning results do not have a significant difference between the value of the experimental class and the control class.

Furthermore, for the results of normality tests and homogeneity tests conducted on posttest data using the SPSS program version 25.0 shows that all learning data in each material is homogeneous, but not a normal distribution. Because one of the requirements for the T-test does not meet, the statistical test is conducted on posttest data using the Whitney U-Mann test.

Tabel 5. Posttest Data Hypothesis Test Results

Materi	**Taraf sig.**	**Asymp. Sig. (2-tailed)**	**Ket. H_0**
Column	*0.05*	*0.031*	*Ditolak*
Beam		*0.086*	*Diterima*
Plate		*0.023*	*Ditolak*
Floor & Wall		*0.313*	*Diterima*
Door Frame & Window		*0.034*	*Ditolak*
Ladder		*0.022*	*Ditolak*
Roof		*0.006*	*Ditolak*

From the results of calculations with the *Whitney U-Mann* test obtained the value of Asymp.Sig. (2-tailed) $\geq\alpha_{table}(0.05)$ occurred in the material of the beam and floor and wall material, so H_0 received yang means that the *posttest* learning data does not have a significant difference. Between the experiment class, and the control class. Meanwhile, for other materials, namely column material, plate material, door & window sill material, ladder material, and roofing material obtained Asymp.Sig. (2-tailed) values $<\alpha_{table}$ (0.05), so H_0 is rejected, which means that data from *posttest* learning experimental classes and control classes have significant differences.

To find out the improvement of learning outcomes from each class conducted an *N-gain* test analysis, the *N-gain* test was obtained from the difference in *posttest* value and *pretest* value. As for the interpretation of the effectiveness of *N-gain,* according to Hake, R.R (1999) as follows:

Tabel 6. Interpretation of the Effectiveness of N-gain

Persentage (%)	**Interpretation**
<40	Ineffective
40 – 55	Less Effective
56 – 76	Effective Enough
>76	Effective

The N-gain test is performed with the help of the SPSS version 25.0 program and is tested on each material.

Tabel 7. N-Gain Test Results

Material	Group	%N-*gain*	Interpretation
Column	Eksperiment	67	Enough
	Control	50	Less
Beam	Eksperiment	53	Enough
	Control	30	Ineffective
Plate	Eksperiment	59	Enough
	Control	23	Less
Floor & Wall	Eksperiment	48	Less
	Control	44	Less
Door Frame & Window	Eksperiment	63	Enough
	Control	39	Less
Ladder	Eksperiment	63	Enough
	Control	47	Less
Roof	Eksperiment	56	Enough
	Control	46	Less

Analysis of *N-gain* value calculations for column material in the experimental class by 67%, while in the control class by 50%. For plate material, *N-gain* gained in the experimental class by 59% and the control class by 23%. For window door sill material, the *N-gain* results obtained in the experimental class were 63% and the control class was 39%. For ladder material, the experimental class obtained an *N-gain* of 63% and a control class of 47%. And for roofing materials obtained *N-gain* values in experimental classes and control classes of 55% and 46%. The results of *N-gain* analysis on these materials show that the results of experimental class learning in column materials; beam material; plate material; material of door and window sills; ladder material; and roofing materials fall into the category of average (Sundayana, 2014) or quite effective (Hake, R.R, 1999), while the control class on column material; ;plate material; floor and wall materials; door and window sill material; ladder materials; and roofing materials fall into the low or less effective category.

Based on the results mentioned above, the statistical hypothesis in this study can be stated that H_0 is rejected and H_1 is accepted, which means that there is an increase in the average learning outcome in experimental classes that are treated in the form of better and effective application of multimedia-based learning media compared to control classes that are not given *treatment*. Thus, multimedia-based learning media building construction courses I effective towards improving learning outcomes in the Building Engineering Education study program, Faculty of Engineering, State University of Jakarta.

This Hal is relevant to research that has been done previously by Badarudin et al., (2018) which states that multimedia-based learning media is effective in improving learning outcomes, it is evidenced by the *pretest* and *posttest* conducted in two classes, namely experimental classes and control classes. Then, the data is calculated using the *N-gain* formula, so that the results of *N-gain* values in the experimental class 62% and control class 53%, where the percentage of *N-gain* of the experimental class is greater than the control class. The difference that stands out between the research and this experimental research is in its learning methods, in Badarudin et al., (2018) using *direct* learning methods (offline), while in this study using learning methods used *online* supported by the *UNJ Online Learning platform*.

There are about 74.19% of the overall sample of experimental class students who like to access multimedia-based learning media that have been input into UNJ *online learning*, while for others only access once a time. Which means most students are very active in using multimedia-based learning media independently through the *platform* provided by the Jakarta State University.

The limitations experienced by this study are the limited time to test, the test instruments of learning results, the delay of students in following *the pretest* and *posttest* for certain reasons, not all students who are in the experimental class access the learning media inputted into *online learning*. UNJ and effectiveness testing are conducted in half the study semester, so this effectiveness test is only done on materials relevant to the next course.

Conclusion

Based on the results of analysis and discussion from the previous description of the effectiveness of multimedia-based learning media in the Building Construction I course in the Building Engineering Education study program of The State University of Jakarta, it can be concluded that from each material has different conclusions.

The use of multimedia-based learning media on column materials, plates, door frames & models, stairs, and roofs is quite effective for online learning of building construction courses I. While in beam and floor materials & walls are less effective for online learning building construction courses I.

As for suggestions or recommendations that can be used as a reference for further research, namely multimedia-based learning media building I courses can be further developed, especially in beam materials and lantao & wall materials both in terms of context and more attractive media display, so that the use of learning media can be better and effective than before.

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