PROCEEDINGS

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Technical and Vocational Education and Training for Sustainable Societies

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FOREWORD

Welcome for all respected scholars, researchers, post graduate studentsand especially Keynote Speakers to the 4 ICTVET. The theme of the conference focus on Technical and Vocational Education and Training for sustainable societies and consist of six subthemes. i.e Development of learning model on TVET, Workplace Learning and entrepreneurship, Innovationon applied engineering and information technology, Management and Leadership on TVET, Vocational and Technical Teaachers education, and Assessment and Evaluation on TVET.

Sustainable society shoul be followed by the improvement of various factors that have impacts to the quality of vocational and technical education and training, particularly to overcome the competitiveness of the world business. As we have already known the rapid change of technology as well as the change of demography, having a great effects to the life of peoples in this world, The competitiveness need a collaborativeness to survive the life of millions peoples who lost their jobs. Young peoples as aproductive generation have to be creative and innovative to face the competitiveness. So this prociding contents consist of various findings of research in the field of vocational and technical education as well as applied technology and mainly based on the subthemes of the conference.

Finally, we would like to thank a million for all participants of this conference and all parties who support the success of this conference. Hopefully the seminars and scientific work of this seminar can be a reference material for basic education and elementary school teacher education in Indonesia.

Padang, July 2, 2018

Tim Editor

CONTENT PROSIDING ICTVET 2017 REPOSITORY UNP

EFFECTIVENESS OF INTERACTIVE INSTRUCTIONALMEDIA ON ELECTRICAL CIRCUITS COURSE: THE EFFECTS ON STUDENTS COGNITIVE ABILITIES

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ABSTRACT: This study discussed on the effectiveness of interactive instructional media on the learning process of electrical circuit grade X students in Vocational High School and Technology (SMKN) 5 Padang. Design of the research used is One Group Pretest-Posttest design that is research done on 30 students in one class then compare students cognitive abilities between before with after use of interactive instructional media by using Paired Sample T-Test analysis. An objective test is used as an instrument to measure students' cognitive abilities. The results showed that there were significant differences between students' cognitive abilities before and after the use of interactive instructional media, where the cognitive ability after the use of interactive instructional media had a mean value better than the cognitive ability before the use of interactive instructional media. It can be concluded, that interactive instructional media is effective to improve the student's cognitive abilities in electric circuits subjects.

Keywords: Effectiveness, Interactive Instructional Media, Students Cognitive Abilities, Electrical Circuits Course

1. INTRODUCTION

Education is a sustained process and always requires development and renewal so that it can always run well and achieve the goals that nerve. The quality of education should always be improved by fulfilling, implementing, evaluating, and developing the elements that support the ongoing process of education. One of the elements is learning media. Learning media is an important aspect in the implementation of education that is integrated with appropriate learning methods. Learning media is something that is used to convey information, learning materials between teachers and students in the learning process, learning media can be hardware or software that serves to help teachers in delivering learning materials and help students understand learning materials (Ansyar, 2011 ; Rusman, 2011).

The learning process will run well if the learning media is chosen appropriately and adaptive with the development of the science of technology and art (IPTEKS). In the learning process, the presence of learning media has a very important role. Difficulties in delivering abstract, theoretical, and general material can be overcome with the help of relevant and good learning media. Hence, the selection of relevant and good learning media is essential to maximize the function of learning media in a learning process. (Djamarah, 1997; Sudjana, 2008). The choice of instructional media should be appropriate and relevant to the needs and nature of the learning materials and should be relevant to the learning method desired by the teacher. The need for a large learning media and the influence of technological progress requires the emergence of some new learning media that is integrated with computers and mobile to facilitate its use. In addition, learning media should also be able to overcome the problems of delivering material between teachers and students in a learning process.

Electrical Circuit is one of the basic subjects in Vocational High Schools (SMK) which discuss many learning materials that are conceptual and abstract that requires students to fantasize about something that is not visible. If the teacher is not able to concretely abstract the material well then the students will have difficulty to understand it. In the end, the learning outcomes of students will be low and do not reach the target of the implementation of the learning process. This is evidenced by the results of preliminary observations on the implementation of the learning process of Electric Circuits in Vocational High School (SMKN) 5 Padang. Teachers have difficulty in delivering student materials. For that, media selection because the unavailability of learning media that is able to help the explanation of learning materials that are abstract, consequently the electrical circuit learning process is not running optimally. Indicated by the low cognitive ability of students about electrical circuit concepts. Cognitive ability on the concept of the low electrical circuit will cause difficulties for students to carry out practicum and continue on other subjects related to electrical circuit concept. Because electrical circuit subjects are the basic

subjects that every student must understand and comprehend and will always apply to every other subject at the next level.

The subjects of class X electric circuit in SMK have the final competency standard that is Analysis of Electrical Circuit. This competency standard is developed into four basic competencies namely (1) Describing electrical circuit concept; (2) Analyzing direct current electric circuits; (3) Analyzing alternating current electric circuits; (4) Analyzing the series of magnetism. All the basic competencies in electrical circuit subjects have learning materials that are conceptual and abstract nature that requires students to fantasize in interpreting the concept of the theories studied. If it is not supported by good and relevant learning media then the learning process will not run optimally.

Learning communication by using oral will not be able to help students to understand abstract learning materials, it needs an equipment or media that can help to concretize abstract material (Howlitschek & Joeckel, 2017). Thus, it takes a learning medium that is able to overcome the problem. One alternative choice is the interactive computer-based learning media as a form of learning media capable of concreting material that is abstract and adaptive with technological developments. In accordance with the demands of the 21st-century learning process that requires the process of computer-based learning and technology in an integrated manner. Interactive learning media is one of the answers to the problem of abstract learning materials, packing interactive learning media with computer or mobile base in a form of animation display will attract students' desire to learn and understand the concept of learning with abstract bereft. In addition, it adaptive with the development 21st-century technology to integrate into a learning process (Benjamin et al, 2015; Howlitschek & Joeckel, 2017).

Learning media before use must go through some testing process so that the resulting instructional media really able to overcome the problems in the implementation of the learning process. One such process is testing the effectiveness of instructional media. There are several methods in testing the effectiveness of instructional media such as analysis of classical mastery result implemented by Chan et al., 2016; the improvement of the learning process for each learning cycle as a reference to the conclusion of the effectiveness of instructional media used as implemented by Murti, 2014. Analysis of learning outcomes before and after the learning process as a reference reveals the effectiveness of a learning media conducted by Gufron & Jasman, 2012.

In this study the effectiveness of instructional media is revealed by using one group pretest-posttest design, then the result of pretest learning is analyzed by comparison with posttest learning result. This is chosen because it is considered relevant to the needs of interactive learning media and electrical circuit learning materials. Learning outcomes reviewed focused on cognitive abilities because in the subjects of basic electrical circuits more dominant cognitive ability is used as a reference achievement of learning process objectives. The purpose of this study is to reveal the effectiveness of interactive learning media on the cognitive ability of students on learning materials Electric Circuit Concepts. So that later can be applied in the process of learning electrical circuit to improve the cognitive ability of students.

2. METHODS

The research method used is quantitative research method of a queasy-experiment type because in this research some nondominant aspects influence the research result can be ignored, the aspect that becomes the reference in the research is the aspect that influences the research result dominantly and becomes the focus of research.

2.1 Research Design

The research design applied in this research is the One-Group Pretest-Posttest design. The study was conducted on one group of samples consisting of 30 students. At the beginning of the study carried out an early cognitive trained test of the student before being given a treat, then carried out the treatment of the implementation of the learning process by using interactive learning media. At the end of the study carried out the cognitive end-ability test of students after the treatment was done. Then the final outcome of cognitive ability of students was analyzed by comparing with the cognitive early ability of students with a different analysis. The research design of interactive learning media effectiveness is presented in table 1.

Table 1. Research Design

Pretest	Treatment	Posttest
O_1	X	O_2

Keterangan :
O_1 = Test of early cognitive abilities of students
X = Implementation of interactive learning media on electrical circuit subjects
O_2 = The final cognitive ability test of the students

2.2 Research Instruments

The research instrument used is the instrument of cognitive ability in the form of objective test with 5 answer choices. The research instrument was developed based on the electrical circuit learning materials used as the research focus. The research instrument is divided into two, namely pretest instrument and posttest instrument both through several testing processes and then the analysis process before can be used. Such as analysis of validity, reliability, different power index, and difficulty level.

2.2.1 Pretest Instrument

The pretest instrument is an instrument used to measure students' early proficiency in applying interactive learning media. The pretest instrument was developed based on basic competence material 1 which is a basic competency learned without using interactive learning media. Pretest instrument grilles are presented in Table 2.

Table 2. Pretest Instrument Grille

Code	Basic Competency	Indicators
KD.1	**Describe the concept of electrical circuits**	a. Atomic structure b. Terms of the emergence of the emf(ggl) c. The process of the emergence of the emf(ggl) d. The process of flowing currents

Based on the grille then obtained 30 objective questions to be tested. Then based on the results of the analysis of the instrument after the instrument tested then obtained the results as presented in table 3 below.

Table 3. Pretest Instrument Analysis Results

Aspect	Result
Validity	25 Validitems, 5 items invalid
Reliability	High reliability
Power Different	13 good items, 13 medium items, & 4 pool items
Difficulty level	1 difficult item, 19 medium items, & 10 systems

The results of the analysis indicate that only 25 questions are valid and can be used as a pretest instrument while 5 invalid items are removed from the instrument. Thus, the pretest instrument consists of 25 items of the objective.

2.2.2 Posttest instrument

The posttest instrument is an instrument used to measure the final ability of students after the application of interactive learning media. The posttest instrument is developed based on basic competence material 2 which is the basic competency learned during the application of interactive learning media. The posttest instrument grid is presented in Table 4.

Table 4. Posttest Instrument Grille

Code	Basic Competency	Indicators
KD.2	**Analyze direct current electric circuits**	a. The basic laws of electricity b. Terms of the emergence of the emf(ggl) c. The process of the emergence of the emf(ggl) d. The process of flowing currents

Based on the grille above then obtained 30 objective questions to be tested. Then based on the results of the analysis of the instrument after the instrument tested then the results obtained as presented in table 5.

Table 5. Results of posttest instrument analysis

Aspect	Result
Validity	26 Validates, 4 invalid items
Reliability	High reliability
Power Different	15 good items, 11 medium items, & 4 poor items
Difficulty level	1 difficult item, 18 medium items, & 11easy items

The results of the analysis indicate that only 26 questions are valid and can be used as a pretest instrument while 4 invalid items are removed from the instrument. But there is one more problem item that has a high level of difficulty and a poor power different, thus established 25 items for the posttest instrument.

2.3 Techniques of Data Analysis

Data analysis techniques used to capture the effectiveness of interactive learning media is using the formula Paired-sample T-test. The result of measurement of the cognitive ability of students after use of interactive learning media compared with primary ability of students before use of interactive learning media. The Paired-Sample T-Test formula as suggested in Sugiono (2008: 32) is presented as follows.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{{S_1}^2}{n_1} + \frac{{S_2}^2}{n_2} - 2r\left(\frac{S_1}{\sqrt{n_1}}\right)\left(\frac{S_2}{\sqrt{n_2}}\right)}} \qquad (1)$$

Keterangan :

t = value of t count
$\bar{X}_1$ = the average of pretest value
$\bar{X}_2$ = the average of posttest value
S_1 = standard deviation of pretest
S_2 = standard deviation of posttest
n_1 = number of pretest subjects
n_2 = numberof posttest subjects
r = the correlation between two samples

In this study t-pair, paired sample analysis is done using SPSS 20. Criteria decision is if the significance value ≤ 0.05 then there is a significant difference in the cognitive abilities of students between before and after the implementation of the learning process using interactive learning media, so the media effective interactive learning is used on subjects of Electricity Circuit. However, if the significance value> 0,05 then there is no significant difference in the cognitive ability of students between before and after the implementation of the learning process using interactive learning media so that interactive learning media is not effective to be used on the subjects of Electricity Circuit (Sugiyono, 2008: 33). The level of effectiveness is also known by referring to the average class. Where the highest grade average values have a higher efficiency on others.

3. DATA AND DISCUSSION

The result of this research consists of two main data that is pretest data and posttest data. Both data are obtained based on the results of the use of instruments for each test.

3.1 Pretest Data

Pretest data is data obtained based on the measurement of the cognitive ability of students before the application of interactive learning media. the results of the pretest data analysis are presented in table 4.

Table 4. Results of Pretest Data Analysis

N	Minimum	Maximum	mean	Std. deviation
30	**48**	**88**	68	**9,798**

3.2 Posttest Data

Posttest data is data obtained based on the measurement of the cognitive ability of students after the implementation of interactive learning media. Posttest data analysis results are presented in table 6.

Table 6. Results of Pretest Data Analysis

N	Minimum	Maximum	mean	Std. deviation
30	**60**	**92**	80	**7,575**

Based on these results can be seen that the cognitive abilities of students after the use of interactive learning media is higher when compared to the cognitive ability of students before the use of interactive learning media. It indicates that the interactive learning media gives a positive effect on the improvement of the cognitive ability of students. To get the effectiveness of interactive learning media it is necessary to do further data analysis that is using data analysis paired sample t-test.

3.3Effectiveness Of Interactive Instructional Media

The effectiveness of interactive learning media is revealed by performing a comparative statistical analysis between pretest and posttest results. Before can be analyzed with paired sample t-test formula, firstly tested requirement of analysis that is normality test of data normality testing done by using formula Kolmogorov-Smirnov Z. Normality test result presented in table 7 and table 8.

Table7. Pretest Data Normality Test

		PRETEST VALUE
N		30
Normal Parameters[a,b]	Mean	68,00
	Std. Deviation	9,798
Most Extreme Differences	Absolute	0,100
	Positive	0,074
	Negative	-0,100
Kolmogorov-Smirnov Z		0,548
Asymp. Sig. (2-tailed)		0,925

a. Test distribution is Normal.

b. Calculated from data.

Table 8. Posttest DataTest Normality Test

		NILAI POSTEST
N		30
Normal Parameters[a,b]	Mean	80,00
	Std. Deviation	7,575
Most Extreme Differences	Absolute	0,135
	Positive	0,079
	Negative	-0,135
Kolmogorov-Smirnov Z		0,737
Asymp. Sig. (2-tailed)		0,649

a. Test distribution is Normal.

b. Calculated from data.

Based on tables 7 and 8 it can be seen that the significance value of the test is 0.925> 0.05 for pretest, and 0.649> 0.05 posttest, hence it can be concluded that pretest data and posttest data are normally distributed. Normally distributed pretest and posttest data can be analyzed by using paired t-test data analysis to reveal the effectiveness of interactive learning media. The result of a t-test of pairwise data is presented in table 9.

Table 9. Paired Sample T-Test Test Results

	Paired Differences			T	Sig. 2-tailed
	Mean	Std. Deviation	Std. Error Mean		
NilaiPostest - Nilai Pretest	12,0	8,78	1,605	7,47	,000

Based on the results of data analysis presented in table 9 can be seen that the value of t arithmetic> t table that is 7,479> 1,699 and significance value smaller than 0.05 it is found that there is a significant difference between the results of cognitive ability at posttest and cognitive ability results at the time of pretest, the posttest cognitive ability is better than the pretest cognitive ability. This can be known through the average cognitive ability class of posttest students greater than the average of cognitive ability results at the time of pretest (80> 68). Thus it can be stated that interactive learning media is used to improve the cognitive abilities of students in the subjects of the electrical circuit in Vocational High School Technical Expertise of Electric Power Installation.

4. CONCLUSION

Interactive learning media is one of the answers to the difficulties of teachers in optimizing the learning process, especially in conveying learning abstract materials. Effective interactive learning media is used to improve the cognitive ability of students to understand the abstract material on electrical circuit subjects when compared with conventional media, such as whiteboards and other presentation media. Thus the interactive learning media can be used as an alternative choice of learning media to deliver abstract learning materials that are difficult to concretize with the media whiteboard and verbal presentation.

5. REFERENCES

[1] Ansyar, Rayandra., 2011,*Kreatif Mengembangkan Media Pembelajaran*,Jakarta: Gaung Persada.

[2] Chan H. S., Morgan S., Effectiveness Analysis of Interactive Learning Media to Enhancing Student' Learning Process, International Journal of Elsevier. Educational Research Review. Vol 14, Issue 5, 2015. Pp. 1467-1472

[3] Diergarten K. A., Mockel T., Nieding G., Ohler P., The Impact of Media Literacy on Children's Learning from Films and Hypermedia. International Journal Elsevier. Applied Developmental Psychology, Vol. 48, 2017, pp. 33-41.

[4] Djamarah, Syaiful Bahri., 1997,*Strategi Belajar Mengajar*,Jakarta : Rineka Cipta.

[5] Elida T., Nugroho W., Suyudi I., Cost-Effectiveness of Web-Based Learning, International Journal of Elsevier. Procedia-Social and Behavioral Sciences, Vol. 65, 2012, pp. 1071-1076.

[6] Gan B., Menkhoff T., Smith R. Enhancing Student' Learning Process through Interactive Digital Media: New Opportunities for Collaborative Learning, International Journal of Elsevier. The computer in Human Behavior, Vol. 62, 2015, pp.1541-1553.

[7] Gufron A., Jasman I., Peningkatan Hasil Belajar Peserta didik Menggunakan Media Pembelajaran Interaktif pada Mata Pelajaran

Fisika. National Journal of PortalGaruda. 2012
[8] Hawlitschek A., Joeckel S., increasing The Effectiveness of Digital Educational Games: The Effects of a Learning instruction on Student' Learning, Motivation and Cognitive Load, International Jurnal of Elsevier. The computer in Human Behavior,Vol. 66, 2017, pp. 1243-1251.
[9] Machts N., Kaiser J., Schmidt F. T. C., Möller J., Accuracy of Teacher judgments of Studen' Cognitive Abilities: A meta-analysis. International Journal of Elsevier, Educational Research, Vol. 14, 2015, pp. 1134-1146
[10] Murti A. R., 2014. Pengembangan media pembelajaran interaktif untuk meningkatkan hasil belajar peserta didik. Tesis. Universitas Negeri Yogyakarta.
[11] Rusman dkk., 2011,*Pembelajaran Berbasis Teknologi Informasi dan Komunikas*,Jakarta: Rajawali Pers
[12] Sudjana, 2008,*Penilaian Hasil Proses Belajar Mengajar*,Bandung : PT. Remaja Rosdakarya.
[13] Sugiyono, 2008,*Metode Penelitian Pendekatan Kualitatif, Kuantitatif dan R&D.* Bandung : Alfabeta.
[14] Trianto, 2009,*Mendesain Model Pembelajaran Inovatif Progresif*,Jakarta : Kencana.