

**PROCEEDINGS**  
**4<sup>th</sup> International Conference on Technical  
and Vocational Education and Training (TVET)**

**Theme:**  
**Technical and Vocational Education and Training  
for Sustainable Societies**

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# **PROCEEDINGS**

## **4<sup>th</sup> International Conference on Technical and Vocational Education and Training (TVET)**

**Theme: Technical and Vocational Education and Training for Sustainable Societies**

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## FOREWORD

Welcome for all respected scholars, researchers, post graduate students and 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, Innovation on applied engineering and information technology, Management and Leadership on TVET, Vocational and Technical Teachers education, and Assessment and Evaluation on TVET.

Sustainable society should 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 a productive generation have to be creative and innovative to face the competitiveness. So this proceeding 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

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## EFFECT OF MIND MAPPING LEARNING METHODS ON LEARNING OUTCOMES

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**ABSTRACT.** This study aims to analyze the effectiveness of Mind Mapping learning method compared with Problem Based Learning. This research is experimental with quasi-design method through posttest control analysis. The number of samples used in the study were 55 students with two different classes. The first class is the experimental class while the other class is the control class. Survey data would be analyzed using homogeneity test, normality test and hypothesis test. The results showed that mind mapping method is more effective than problem based learning method with significance level 0,05. The average value of student learning outcomes rose from 76.7 to 83.2 to become method in the application of learning

**Keywords:** Mind Mapping, Quasi Experimental, increase learning outcomes

### 1. INTRODUCTION

Vocational High School (SMK) is an educational institution that strives continuously and programmed to conduct self-improvement in various fields both facilities and infrastructure, administrative services and information and the quality of learning as a whole. SMK is a school that educates students with skills and skills, as well as educating students to be able to choose a career, competence and develop a professional attitude in the field of expertise.

Vocational High School as a learning environment has a system of teaching theory and practice for the field of productive study, where the learning process involves several factors including teachers, students and infrastructure facilities. In general, some of the subjects in SMK are related to each other and are a requirement to move on to the next lesson. One of them is the subjects of Electrical Engineering. Each student is required to attend the subject and must pass for each subject that has been studied.

In order for the subject matter to be more easily understood, the teacher must be able to choose the right method in the learning process. Method is a way or a path that must be passed to achieve a certain goal [5]. By choosing and applying appropriate learning methods in the learning process will be able to improve student learning outcomes. Learning outcomes are the abilities students have after they have received their learning experience [3]. To assess and know the achievement of learning outcomes, the educational unit must establish Learning Completeness Learning Completeness is a minimal level of attitudinal competence attainment, knowledge competence, and skills competencies [4]. The completeness of Learning is set at 80.

Table 1. Value of Semester Test of Electrical Engineering in Audio Video Technique

No	class	The number of students	UAS value		Average Class
			≥80	<80	
1	X AV-A	33	13	20	73,01
2	X AV-B	33	12	21	73,94
3	X AV-C	33	14	19	72,58
amount		99	39	60	
Percentase		100%	39,39 %	60,61 %	73,18

Based on table 1, as many as 60.61% of students whose value is under Learning Completeness and 39.39% are above it. This shows that the value of learning outcomes is still much under the Completed Learning.

To improve learning outcomes requires the right method. One method that can be applied is the method of mind map learning (mind map). The mind map is a technique of utilizing the entire brain by using visual imagery and other graphical infrastructure to form an impression [2]. Mind map is the easiest way to put information into the brain and retrieve information out of the brain. Mind map is a creative, effective, and literally creative method of mapping out thoughts [1]

With the mind map learning method, students will more easily understand the material given, because in this method the material is presented in the form of full drawings, symbols and colors of interest. so as to motivate students in learning and can improve student learning outcomes towards the better.

## 2. RESEARCH METHODOLOGY

This research is a quasi experiment research using design pattern (Posttest Only Control Design). The research was conducted at SMK Negeri 1 Padang. This research begins by making observations on the place and subject of research, sampling and data collection.

Population is a generalization area consisting of subjects and objects that have the qualities and characteristics set by the researchers to be studied and drawn conclusions [6]. The population in this research is the students of class X SMK Negeri 1 Padang, which consists of 3 classes namely X AV-A, X AV-B and X AV-C.

Table 2. Number of Students of Class X Audio Video Technique

No	class	The number of students
1	X AV-A	33
2	X AV-B	33
3	X AV-C	33
<b>amount</b>		99

The sample is part of the number and characteristics possessed by that population [6]. All the characteristics of the population are reflected in the samples taken. In this research we need 2 sample class that is experiment class to apply Mind Map method and control class for scientific approach of Problem Based Learning. The sample selection was done by nonprobability sampling technique with purposive sampling. Sampling purposive is sample determination technique with certain consideration. Requirements are taken classes that the average value is almost the same. The average class acquisition of almost the same is the class X AV-B and X AV-C. Then a homogeneity test was conducted to see the second sample homogeneous data and normality tests to see if data is spreading normally.

Table 3. Sample Research

class	The number of students	Average Class
X AV B	25 students	76,60
X AV C	30 students	75,17

The variable is an attribute or the nature or value of the person, object or activity that has certain variations set by the researcher to be studied and then drawn the conclusion

### 2.1. Variable Free

The independent variable is a variable that influences or becomes the cause of the change or the incidence of the dependent variable [6]. The independent variables in this study is the treatment given to the experimental group students ie learning by using the method of learning with the mind map.

### 2.2. Dependent variable

The dependent variable is an influenced variable or a result, due to the independent variable [6]. The dependent variable in this study is the result of the student's learning on the Electrical Engineering subject after being given the treatment.

The instrument used in this study is an objective test of multiple choice questions. instruments that have been made directly tested try other class who have studied this material. The test results are tested for validity, reliability, differentiation and difficulty. Problems that have been tested, used as an instrument for data retrieval in the experimental class and control class.

After the final test is given to the experimental class and control class, the learning results of each meeting are obtained. The test results are then analyzed to be tested statistically. Data analysis is used to prove hypothesis. Data analysis techniques include: Descriptive analysis and inductive analysis.

The research instrument is based on learning device. Learning tools used in this study consist of syllabus, learning implementation plan, teaching materials, and learning media. The test given is an objective test. The material tested in the test corresponds to the material provided during the study.

### 2.3. Mean

The mean is obtained by summing the data of all individuals in the group, then divided by the number of individuals in the group.

$$\bar{X} = \frac{\sum X}{N}$$

Where: Mean, X: Individual data, N: Lots of observational data

### 2.4. Standard Deviation

As a prerequisite hypothesis test performed some testing:

### 2.5. Normality test

Normality test aims to determine whether the sample data is normally distributed or not. This is done by Liliefors test.

formulated by step:

- Data  $X_1, X_2, X_3, \dots, X_n$  obtained from the smallest data to the largest data.



b. The data  $X_1, X_2, X_3, \dots, X_n$  are made into raw numbers  $Z_1, Z_2, Z_3, \dots, Z_n$  by the formula:

$$Z_i = \frac{X_i - \bar{X}}{S}$$

Where:

$X_i$  = score earned by the students

$\bar{X}$  = average score

S = standard deviation

c. Using the standard normal distribution list, then calculated the probability  $F(Z_i) = P(Z < Z_i)$

d. By using a proportion  $Z_1, Z_2, Z_3, \dots, Z_n$  smaller than or equal to  $Z_i$  if this proportion is expressed by  $S(Z_i)$  then:

$$S(Z_i) = \frac{\text{banyaknya } Z_1, Z_2, Z_3, \dots, Z_n \text{ yang } \leq Z_i}{n}$$

e. Calculate the difference  $(F(Z_i) - S(Z_i))$  then specify the absolute price.

f. Taken the largest price among the absolute price of the difference  $L_o$

g. Compare the value  $L_o$  with the critical value  $L$  that is at the real level  $\alpha = 0,05$

The test criteria are as follows:

If  $L_o \leq L$ , then the data is normally distributed, If

$L_o > L$ , then the data is not normally distributed.

## 2.6. Test homogeneity

Homogeneity test aims to see whether the two homogeneous samples that have the same or no variance, to test it is done F test as follows:

a. Looking for the variance of each data then calculated the price of F [6] by the formula:

$$F = \frac{\text{Varians Terbesar}}{\text{Varians Terkecil}}$$

b. Compare the price F calculated with the price F contained in the distribution list F at the significant tariff of 0.05 and the degrees of freedom denominator (dk) = n-1 and the degree of freedom of the numerator (dk) = n-1. If the price of F arithmetic <F table, then both groups of samples have homogeneous variance. Conversely, if F arithmetic > F table means both groups of samples have heterogeneous variance.

## 2.7. Hypothesis testing

There are several possibilities that will be chosen to be used as hypothesis test formula is:

a. If the number of sample members is different and the two groups are homogeneous, then in testing the

statistical hypothesis used is t test with Polled variant [6]:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[ \frac{(n_1 - n_2)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2} \right] \left[ \frac{1}{n_1} + \frac{1}{n_2} \right]}}$$

Where:

$\bar{X}_1$  = average of experiment class grade1,  $\bar{X}_2$  =

average of experiment class grade2,  $s_1$ : standard deviation of experimental class student grade1,  $s_2$ :

standard deviation of student grade of control

class,  $n_1$ : number of experimental class students,

$n_2$ : number of control class students.

There are several considerations in choosing the t test formula:

1) If the number of sample members  $n_1 = n_2$  and variant homogens  $\sigma_1^2 = \sigma_2^2$ , it can be used t test formula, both for separated and polled. To know t table used dk the magnitude dk =  $n_1 + n_2 - 2$

2) If  $n_1 \neq n_2$ , homogens variance  $\sigma_1^2 = \sigma_2^2$  can be used t test with polled variance. Large dk =  $n_1 + n_2 - 2$

3) If  $n_1 = n_2$ , the variance is not homogeneous  $\sigma_1^2 \neq \sigma_2^2$  can be used separated or polled formulas, with dk =  $n_1 - 1$  or dk =  $n_2 - 1$ . Thus degrees of freedom (dk) instead of  $n_1 = n_2 - 2$ .

4) If  $n_1 \neq n_2$  and variants are not homogeneous  $\sigma_1^2 \neq \sigma_2^2$ . For this is used separated formula, price t as a substitute price t table is calculated from the difference in price t table with dk =  $n_1 - 1$  and dk =  $n_1 - 1$ , divided by two and then coupled with the smallest t price.

b. Price t arithmetic compared with t table, contained in table t distribution. Testing criteria required if - ttable  $\leq$  titung > + ttable then the null hypothesis (H0) is rejected while the working hypothesis (H1) is accepted, and if - ttable  $\leq$  titung  $\leq$  + ttable then the null hypothesis (H0) is accepted, while the working hypothesis (H1) rejected.

## 3. RESEARCH RESULT AND DISCUSSION

### 3.1. Research result

The results obtained in this study in the form of data. This data is obtained through post-test technique after an application of mind mapping learning method in experiment class and Problem Based Learning model in control class. This study aims to determine how much influence the method of learning Mind Map Against Learning Results

Electrical Engineering Class X Audio Technique  
Video SMK Negeri 1 Padang.

### 3.1.1. Implementation of Learning

Prior to the research activities undertaken, the researcher determines the subject matter and subject matter and develops the lesson plan. The subject chosen is to apply a series of inductors in the electronics circuit and to apply, manage the electrochemical energy source.

### 3.1.2. Descriptive Analysis

This analysis aims to describe the state of what data is collected from the two sample groups. The results of the research data were obtained from the post-test results of each meeting, the sample class consisted of 25 students of AV-B X which was the experimental class and 30 students of X AV-C for the control class. After being given different treatment, in both of these classes, we got each post-test difference value from both groups of samples.

#### 1) Average ( )

For the experimental class

$$\bar{X} = \frac{\sum(f \cdot Xi)}{N} = \frac{2079}{25} = 83,2$$

For control class

$$\bar{X} = \frac{\sum(f \cdot Xi)}{N} = \frac{2299}{30} = 76,7$$

#### 2) Variance (S<sup>2</sup>)

For the experimental class

$$S^2 = \frac{\left(174509 - \frac{(2079)^2}{25}\right)}{25 - 1}$$

$$S^2 = \frac{174509 - 172889,64}{24} = \frac{1619,36}{24} = 67,473$$

For control class

$$S^2 = \frac{\left(178113 - \frac{(2299)^2}{30}\right)}{30 - 1}$$

$$S^2 = \frac{178113 - 176180}{29} = \frac{1932,967,16}{29} = 66,654$$

#### 3) Standard Deviation(S)

For the experimental class

$$S = \sqrt{67,473} = 8,21422 \text{ dibulatkan } 8,21$$

For control classes

$$S = \sqrt{66,654} = 8,16419 \text{ dibulatkan } 8,16$$

### 3.1.3. Inductive Analysis

#### 1) Normality Test Result

Terms of hypothesis testing using parametric statistics is normal distribution, therefore before

this data is tested hypothesis using t test statistic, previously done first test data normality. In this research, normality test is done by Lilliefors test at alpha level 0,05, done on average value data of experiment class and control class cover posttest of each group. The sample group data is said to be normally distributed if the lilliefors (L<sub>0</sub>) count is smaller than the lilliefors table (L<sub>tabel</sub>) (L<sub>0</sub>count ≤ L<sub>tabel</sub>) and is in the normal region. Based on the normality test of the data the average value of experiment class and control class can be seen in the following table:

Table 4. Normality Test Results

class	A	L <sub>0</sub>	L <sub>t</sub>	distribute d
experiment	0,05	0,0422	0,1726	normally
control	0,05	0,0516	0,1590	normally

Based on table 4, it can be seen that L<sub>0</sub> < L<sub>t</sub> for both sample classes, means that data in both classes is normally distributed.

#### 2) Homogeneity Test Result

Homogeneity test aims to know both groups of data have a homogeneous variant or not. To find out the homogeneity of the two sample groups, the test was conducted using F test. One of the requirements to know the variance is homogeneous when,

If F<sub>count</sub> ≥ F<sub>tabel</sub> means not homogeneous

If F<sub>hitung</sub> ≤ F<sub>tabel</sub> means homogeneous.

Table 5. Homogeneity Test Value

Group	F <sub>hitung</sub>	F <sub>tabel</sub>	explanation
Experiment and control	1,01	1,90	homogeneous

In table 5, it turns out 1.01 < 1.90 thus all the research group data is homogeneous.

### 3.1.4. Hypothesis testing

To test the hypothesis used t-test formula, which results as in table 6.

Table 6. Test Results with t-test

No	class	Average Class	t <sub>hitung</sub> α = 0,05	t <sub>tabel</sub> α = 0,05
1	experiment class	83,2	3,01	1,674
2	control class	76,7		

Seen in table 6, with a significant level α = 0.05. If compared t<sub>hitung</sub> > t<sub>tabel</sub>, so it looks that t<sub>count</sub> > t<sub>tabel</sub> (3.01 > 1.674), then H<sub>0</sub> rejected while H<sub>a</sub> accepted. The results of this test provide an interpretation that there is a significant effect of learning methods Mind Map on student learning outcomes on the subjects Electrical Engineering

Class X Audio Technique Video SMK Negeri 1 Padang.

### 3.2. Discussion.

Based on result of hypothesis test, where  $H_a$  accepted indicate that there is difference of result of experiment class study and control class at real level 0,05%. The average post-test of experimental class learning outcomes was 83.2 higher than the post-test average of control grade learning outcomes 76.7

Based on the results of data analysis there is an increase in learning outcomes after the implementation of Mind Map Learning Method in class X AV-B. Learning using Mind Map Learning Methods is able to attract students' attention to pay attention to the subject matter delivered by teachers, students become more active in asking so that between students and teachers interaction occurs in teaching and learning process.

### 4. CONCLUSION

There is difference of mean value of result of student learning, where with mind map learning method get mean value 83,2 and with approach of Saintific Problem Based Learning get mean value 76,7 with difference value is 8,5% so mind map learning method give influence to student learning outcomes. This means there is an increase in student learning outcomes by applying mind-mapping learning methods. Hypothesis testing results, obtained  $t_{count} > t_{table}$  ie  $(3.01 > 1.6874)$ . The results of this test provide an interpretation that  $H_0$  is rejected and  $H_a$  accepted, means there is Influence of Mind Map Learning Method

### REFERENCES

- [1] Buzan, Tony. 2008. *Buku Pintar Mind Map*. Jakarta: PT Gramedia Pustaka Utama.
- [2] DePorter, Bobbi & Hernacki, Mike. 2001. *Quantum Learning: Membiasakan Belajar Nyaman dan Menyenangkan*. Bandung: Kaifa
- [3] Nana Sudjana. 2011. *Penilaian Hasil Proses Belajar Mengajar*. Bandung: PT. Remaja Rosdakarya
- [4] Permendiknas. 2014. *Undang-undang Republik Indonesia Nomor 104 tahun 2014 Tentang Penilaian Hasil Belajar Oleh Pendidik Pada Pendidikan Dasar Dan Pendidikan Menengah*.
- [5] Slameto. 2010. *Belajar & Faktor-Faktor Yang Mempengaruhi*. Jakarta: PT. Rineka Cipta
- [6] Sugiyono. 2012. *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.