

CHAPTER III RESEARCH METHODOLOGY

A. Research Design

Ary et al (2015) state that "the design of experimental research is to allow the researcher to estimate the effect of an experimental treatment". Experimental research can be carried out in the laboratory, in the classroom and in the field. In this study, experimental research was conducted in the classroom by taking students as the population. The researcher selects a design to determine the validity of conclusions that can be drawn from the study. The researcher want to know the effectiveness of using the crossword puzzle on students' vocabulary mastery with experimental research using pre-test, treatment and post-test instrument.

The impact is assessed by providing special treatment. The effectiveness will be known to be significant differences between students who are taught without using the crossword puzzle and those taught using the crossword puzzle.

B. Research Variable

Variables are variations of the research object. Variable is object of research or something of concern research. There are two types of variables: dependent variable and independent variable. The dependent variable is the variable focus or central variable on which other variables will act if any relationship. The independent variable is selected with researchers to determine the relationship with dependents variables. So, the variables in this study are:

1. The independent variable (X) is the input variable, which is cause, partially or completely, a particular outcome, it is the stimulus that influences the response, and the antecedent or modifiable factor to influence an outcome. This is a variable that influences or causes a change or emergence of the dependent variable. The independent variable in this research is the use of crossword puzzle.
2. The dependent variable (Y) is the result variable that caused totally or in part by the input, antecedent variables. This is the effect, consequence or response to the independent variable. Is a variable that is influenced by the independent variable. The dependent variable in this study is the students' vocabulary mastery.

C. Research Population, Sample and Sampling Technique

This research will be conducted of Senior High School State 3 Metro, and the research will be implemented in the tenth grade.

1. Population

The population is all research subjects. The population in this study is the students of class X. The total population is 321 students divided into 9 classes. Class X MIPA consists of 5 classes and class X IPS consists of 4 classes. The population in this study is the students of X grade of Senior High School State 3 Metro. Each class consists of 33 and 36 students.

2. Sampling Technique

According to Mujj (2014) sampling technique which based itself that every member of the population has an equal chance to be selected as sample. From this definition above, sampling is the technique a researcher chooses the students' sample. Sampling technique is a sampling technique to determine the sample to be used in research. The examples mean other than the characteristics possessed by the population to be observed. Sampling is a technique for taking samples. In this study, the researcher used cluster random sampling technique, because the researcher are random from a large population. So that the population is selected based on the group/class, the use of cluster random sampling is also based on efforts to maintain the existence of the sample in each treatment given and due to external and internal conditions. The selecting from the nine X classes at Senior High School State 3 Metro by using random selection and random assignment. According to Fraenkel (2015) random selection is every member of the population have the same opportunity to be selected as members of the research sample. While the random assignment of each individual participating in the study has the same opportunity to be assigned to one of the experimental groups or the control group to be compared.

In this research, the researcher will take several steps in determining the sample using cluster random sampling, includings:

- 1) The first step taken was that each class was given a name with the initials A to J. The draw was carried out by random selection from nine

class names that had been written on a piece of paper and rolled up, then the results were taken by two classes to be used as samples.

- 2) The two selected classes is a random assignment to determine which group A and group B. The function of the random assignment is so that before carrying out the experiment, both group A and group B conditions are the same (homogeneous), so that there are differences in the two groups, the difference that occurs is the effect of the treatment.

3. Sample

The sample is a part of the total and the characteristics possessed by the population selected as the data source. It is called a sample study when we want to generalize a sample of research results. The researcher can use samples taken from the population X MIPA 5 as the experimental group and X MIPA 4 as the control group. Therefore, samples taken from the population must be truly representative. The quality of research is not only determined by suitability of the methodology and instrumentation but also by the suitability of the sampling strategy that has been adopted.

Finally, class X MIPA 4 selected as the control class which consists of 33 students and class X MIPA 5 as the experimental class which consists of 36 students.

D. Research Instrument

The instrument is very important for a researcher in conducting research before collecting data. According to Ary (2015), "choosing the right and useful measuring tools is very important for the success of any research study." This means that appropriate and useful instruments are needed in conducting a research. Moreover, the instrument itself will indicate whether it is working properly or not. In this study, the researcher used the test as the instrument.

According to Ary (2015), "a test is a set of stimuli presented to an individual to obtain a response on the basis of which an annumeric score can be assigned." That is, the test is an instrument given by the teacher which aims to identify student scores. In this study, the test was intended to determine the effectiveness of using the crossword puzzle on improving students' vocabulary mastery. There are two kinds of tests used in this study, namely pre-test and posttest. The purpose of giving the pre-test was to determine the students'

vocabulary mastery and their scores before applying the treatment. Meanwhile, the post-test was used to determine the increase in their vocabulary mastery and vocabulary mastery scores after applying the treatment. In addition, both pre-test and post-test are in written form, questions are in multiple choice and there will be questions about synonyms, antonyms, and others. The test items that will use are as follow:

1. Pre-Test

Richards (2013), pre-test is a test before learning has occurred. The researcher made 50 multiple choice questions for two classes. There is X MIPA 4 as the control class and X MIPA 5 as the experimental class. The material in this test is a vocabulary test. The pre-test will be used for pre-activities to know the students' vocabulary mastery before using crossword puzzle.

2. Treatment

Richards (2013) states that instrument is a measurement tools used to obtain and collect the researcher data as a step to find the results or conclusion for research without leaving the characteristics of making good instrument. The researcher will distribute the sheets containing crossword puzzle about kinds of vocabulary to class X MIPA 4 as the control class, the instrument will be used the conventional learning methods which is usually carried out by the teacher. Whereas, for class X MIPA 5 as an experimental class by following the instructions provided. There are 6 treatments that will be carried out by researchers, namely:

- 1) The researcher explains briefly about the crossword puzzle game method that will be used during learning and provides an example of filling in the table according to the clues that have been given and the instructions in the method. After that, the researcher will give the 2 crossword puzzle sheets with easy groups to be worked on by students.
- 2) The researcher will give back 2 sheets of crossword puzzle with easy groups. After completion the researcher will discuss with the students related to the results of the work.
- 3) At the third meeting, the researcher will provide a crossword puzzle sheet with a moderate level of difficulty to find out more about the students' understanding and results.

- 4) The researcher will discuss related to the obstacles faced by students in working on the treatment sheet. Then, the researcher continued the treatment by giving 2 question sheets that were still at a moderate level to students
- 5) At the fifth meeting, the researcher will provide crossword puzzle sheets with difficult levels to hone students' skills in learning vocabulary.
- 6) In the last treatment, the researcher will give 2 pieces of crossword puzzle again with a difficult level. After that, the researcher will evaluate and discuss the results of the first to last treatment with the students.

3. Post-Test

According to Richards (2013), post-test is given after learning has occurred or supposed to have occurred. In the pre-test and post-test, the researcher makes 50 questions of multiple choices for two classes. There are X MIPA 4 as control class and X MIPA 5 as experiment class. The material in this test is vocabulary test. Post-test used to know the students' vocabulary mastery after using crossword puzzle.

C. Validity and Reability Instrument

1. Validity

In quantitative research, validity must be used. Validity is defined as the degree to which a concept is accurately measured in quantitative studies (Heale & Twycross, 2015). It is defined as measuring your research concept accurately.

Validity refers to extent to which the test measures what it was intended to measure (Sugiyono, 2014), it means that the test measures what was claimed to measure. To measure whether the test has a good validity, the researcher analysis the test form empirical validity.

The validity formula as follows:

$$R_{xy} = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}}$$

Where :

r_{xy} : Coefficient between variable X and Y

$\sum xy$: sum of the result of X and Y for each students

$\sum x^2$: sum of each item

$\sum y^2$: sum of total score/total items

2. Reability

The second measure of quality in quantitative research is the reliability or accuracy of an instrument. Creswell (2013), states that reliability means the consistency and stability of the score of an instrument. In addition, Heale and Twycross (2015), stated that the research instrument consistently had the same situation on the repeated opportunities.

Arikunto (2014) says that the reability of the test is an instrument can be trusted to be used for collecting data because it has been good. It's means that reability is needed to know whether the test has a good quality or not.

The reability test by the formula as stated by Arikunto (2014) as follows:

$$r_{11} = \frac{2 (r_{xy})}{(1+r_{xy})}$$

Where:

r_{11} = Coefficient reliability is appropriate

r_{xy} = Coefficient between variable X and Y

The criteria of reliability based on Arikunto as follows:

Table 4. The Criteria of Interval Coefficient

Interval Coefficient	Criteria
0,00 – 0,19	Very low
0,20 – 0,39	Low
0,40 – 0,59	Medium
0,60 – 0,79	High
0,80 – 1,00	Very High

(Source: Arikunto, 2006: p.216).

D. Data Collecting Technique

Data is very important in conducting research. Need to know a lot information about the research topic. In conducting research, the researcher can use a lot of data collection such as tests, interviews and observations. In this study, researchers will take several steps, namely:

1. Preparing research instruments

Before conducting the research, the researcher prepared several research instruments. The researcher made several tests for pre-test and post-test. Each test consists of 50 multiple choice questions.

2. Giving pre-test to students

The researcher conducted research by giving tests to students before being given treatment. Students must complete 60 minutes and work individually

3. Providing treatment to students

The researcher provide materials and use crossword puzzle to teach students. The researcher asked the students to divide them into 8 groups. Each group consists of 4-5 students. Then, students work in groups.

4. Giving post-test to students

The researcher conducted research by giving tests to students after being given treatment. The questions in the post-test are different from the pre-test and treatment.

5. Analyzing the results of both tests

The researcher analyzed the per-test and post-test data from the students. After the researcher calculates the results of this study, the researcher can conclude whether the crossword puzzle is effective or not.

6. Rating

In assessing objective tests, each correct answer is counted as one pointuse the formula below:

$$S = R \times 50$$

Where:

S = Score

R = Total number of correct answers

E. Data Analyzing Technique

In this study, the data was obtained from the experimental group and the control group. To know the difference between the groups.

The t-test formula as following:

$$T = \frac{Mx - My}{\sqrt{\left(\frac{\sum x^2 + \sum y^2}{Nx + Ny - 2}\right)\left(\frac{2}{Nx} + \frac{2}{Ny}\right)}}$$

Where :

T : Total score

Mx : Mean of Experimental Group

My : Mean of Control Group

- N_x : Numbers of students in Experimental Group
 N_y : Numbers of students in Control Group
 X² : Standard of Deviation of Experimental Group
 Y² : Standard of Deviation of Control Group

1. Normality Test

The object test for normality to determine the distribution of the data follows a normal distribution or not. One of the test assumption of the statistic computation is that the data must fulfill the qualification of normal distribution. Therefore analyzing the normality of distribution the students' score is crucial. That calculates by using SPSS (Statistical Package for Social Science) for normality. The tests of normality employed were Shapiro Wilk.

The hypothesis for the normality test is formulated as follows:

H₀ = The data have normal distributed

H_a = The data do not have normal distributed.

While the criteria of normality test are follows :

H₀ is accepted if Sig ≥ α = 0.05

H_a is accepted if Sig < α = 0.05

2. Homogeneity Test

A homogeneity test was applied to analyze whether or not the scores of one group have homogenous variance compared with the score of other groups. In this study, the researcher used T-test. The formula can be seen as follow:

The hypothesis formula:

H₀ = σ₁² = σ₂² both sample have the quality of variants.

The used statistic formula of the test is:

$$F = \frac{\text{Biggest variants}}{\text{Smallest variants}}$$

The test criterion

Accepted H₀ if F_{ratio} ≥ F₂¹α (V₁ - V₂), with V₁ = n₁ - 1 and V₂ = n₂ - 1 (Setiadi,

2018)

F. Statistic Hypotesis

A hypothesis is an assumption about a population parameter. This assumption can be true or not. It is a method of making statistical decisions using experimental data, the best way to determine whether a statistical hypothesis is true would examine the entire population. After collecting the data, the researcher analyzed them in order to find out whether the use of reliable could increase the students' achievement in reading related to things in the classroom.

Hypothesis testing is intended to see whether the hypothesis that is proposed in this research is accepted or not, to test the hypothesis.

The T-test formula as follows:

$$t_{\text{-test}} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

Notes:

\bar{X}_1 = the means of the experiment class

\bar{X}_2 = the means of the control class

S = the standard devitiation

N_1 = the number of students' in the experimental class

N_2 = the number of students' in the control class

Before using t-test formula the researcher would determine the average variant (S^2)

The variant (S^2) is calculated by formula:

$$S^2 = \frac{(N_1-1)S_1^2 + (N_2-1)S_2^2}{N_2(N_2-1)}$$

Notes:

N_1 = Number of students' in experimental class

N_2 = Number of students' in control class

S_1^2 = Variant of experimental class

S_2^2 = Variant of control class

S^2 = Variant

The criteria are:

H_0 : H_0 is accepted if t-ratio < t-table

H_a : H_a is accepted if t-ratio > t-table

Based on the explanation above, the researcher concludes that the statistical hypothesis is an assumption about a population parameter. This assumption may or not be true. If sample data are not consistent with the statistical hypothesis, the hypothesis is rejected, because the test will be used to know whether the hypothesis that is proposed can be accepted or rejected. The formula which is used in this test is t-test.