

CHAPTER III

RESEARCH METHOD

A. Research Design

Quantitative research is a scientific approach that focuses on collecting and analyzing numerical data to examine relationships between variables, test hypotheses, and determine the effect of a treatment. This approach is based on the positivist paradigm, which assumes that reality is objective, measurable, and can be analyzed using statistical procedures. In educational research, quantitative methods are widely used to measure students' learning outcomes and the effectiveness of a teaching method.

According to Sugiyono (2013), a research design is an essential framework that guides the researcher in planning data collection and analysis procedures. A good research design helps ensure that the data obtained are systematic, valid, and suitable for answering the research questions.

In this study, the researcher uses a quantitative approach with a quasi-experimental design. This design is applied because the researcher cannot fully control all variables and cannot randomly assign subjects individually. Therefore, the study is conducted in a natural classroom setting.

The quasi-experimental design used in this research is the Pretest–Posttest Control Group Design, which involves two groups: an experimental class and a control class. Both groups are given a pre-test to measure their initial vocabulary mastery before the treatment. After that, the experimental class is taught using crossword puzzle games, while the control class is taught using conventional teaching methods without crossword puzzles. After the

treatment period, both groups are given a post-test to measure their final achievement.

The design of the study can be illustrated as follows:

$K1 = T1 - X - T2$
$K2 = T1 - O - T2$

K1 = Experimental group (kelas eksperimen)

K2 = Control group (kelas kontrol)

X = Treatment using crossword puzzle game

O = Conventional teaching method (without crossword puzzle)

T1 = Pre-test

T2 = Post-test

Through this design, the researcher is able to compare the improvement in vocabulary mastery between the experimental class and the control class. The difference in the post-test results of both groups will indicate whether the use of crossword puzzle games is effective in improving students' vocabulary mastery.

This design is considered appropriate for the study because it allows the researcher to measure the effect of the treatment more accurately by comparing two groups under different learning conditions.

B. Population and Sample

1. Population

According to Sugiyono, population is a generalization area consisting of objects or subjects that have certain qualities and characteristics determined by the researcher to be studied and from which

conclusions can be drawn Sugiyono (2013). The population of this research includes all eighth-grade students of SMP Negeri 1 2 x 11 Enam Lingkung, Padang Pariaman. The total number of students in the eighth grade is 63 students, consisting of two classes, namely Class VIII D and Class VIII E.

Class VIII D consists of 31 students, while Class VIII E consists of 32 students. From these classes, 40 students were selected and analyzed in this study, consisting of 23 students in the experimental class and 17 students in the control class. The distribution of the analyzed students is presented in the table below.

Table 3.1 The distribution of the analyzed students

No	Grade	Male	Female	Total
1	VIII D	16	15	31
2	VIII E	19	13	32

2. Sample

A sample is a part of the population that represents the characteristics of the population. In this research, the sample was taken using random sampling, in which every class had an equal opportunity to be selected as the research sample Sugiyono (2013).

The sample consisted of two classes selected randomly from the population. One class was assigned as the experimental group, and the other class was assigned as the control group.

The experimental class was taught vocabulary using crossword puzzle games, while the control class was taught using traditional teaching methods.

C. Variables of the Research

A research variable is defined as anything in any form that is determined by the researcher to be studied so that information about it can be obtained, and conclusions can be drawn.

In quantitative research, variables play a crucial role, as they serve as the basis for formulating hypotheses, designing research instruments, and selecting data analysis techniques.

This research uses two variables, namely the independent variable and the dependent variable.

The independent variable is the use of crossword puzzles.

Indicator: The use of crossword puzzles in vocabulary learning is shown through interactive activities that involve students in solving vocabulary-based puzzles during the lesson.

The dependent variable is students' vocabulary mastery.

Indicator: Students are able to understand, recall, and use English vocabulary correctly in context, as shown through their performance in tests and vocabulary tasks.

D. Instrument

The research instrument used in this study is a written vocabulary test. The test is divided into two parts, namely the pre-test and the post-test. The pre-test is designed to determine students' initial knowledge of English

vocabulary before the treatment, while the post-test is used to measure students' vocabulary improvement after being taught using the treatment.

The vocabulary test in this study consists of multiple-choice questions based on vocabulary items related to parts of speech, including nouns, verbs, adjectives, and mixed vocabulary. The test items are developed from simple contextual texts related to students' daily life, such as classroom activities, school environment, daily routines, and descriptive texts.

The test consists of 20 items for both the pre-test and post-test, with different sets of questions used in each test to avoid memorization effects. Each item is designed to assess students' understanding of word meanings and their ability to recognize vocabulary in context. The same format is applied in both pre-test and post-test to ensure consistency in measuring students' vocabulary mastery improvement.

E. Research Procedure

Treatment Procedure

The treatment procedure in this research was adapted from the crossword puzzle teaching procedure proposed by Pinuria et al. The treatment was conducted through three stages: pre-teaching, whilst-teaching, and post-teaching.

1. Pre-Teaching Activities

- a. The researcher greeted the students and checked their attendance.
- b. The researcher reviewed the material from the previous meeting to activate the students' prior knowledge.

- c. The researcher introduced the learning objectives and the vocabulary topic to be learned.

2. Whilst-Teaching Activities

- a. The researcher introduced the crossword puzzle activity.
- b. The researcher explained the purpose of the activity and demonstrated how to complete the crossword puzzle.
- c. The researcher distributed the crossword puzzle worksheets to the students.
- d. The students completed the crossword puzzle individually using the target vocabulary.
- e. The researcher monitored and guided the students during the activity.
- f. The researcher checked the students' answers.
- g. The researcher discussed the correct answers and clarified the meaning and pronunciation of unfamiliar vocabulary.

3. Post-Teaching Activities

- a. The researcher reviewed the vocabulary that had been learned through the crossword puzzle activity.
- b. The researcher asked several questions to evaluate the students' understanding of the vocabulary.
- c. The researcher gave feedback on the students' performance.
- d. The researcher concluded the lesson and closed the class.

F. Method of Collecting Data

1. Test

According to Brown (2004) a test is one of the methods used to measure a person's ability, performance, or knowledge. It requires a set of procedures, techniques, and items that must be systematic, explicit, and structured in order to ensure accurate measurement.

In this research, the data were collected through test techniques consisting of pre-test and post-test. These tests were used to measure students' vocabulary mastery before and after the treatment.

2. Pre-Test

The pre-test was conducted at the beginning of the research before the treatment was given. It was administered to both the experimental group and the control group.

The purpose of the pre-test was to measure students' initial vocabulary mastery and to determine whether both groups had similar ability levels before the treatment. The pre-test consisted of written vocabulary tasks, such as writing the meaning of words and classifying vocabulary items.

3. Post-Test

The purpose of the post-test was to measure students' vocabulary mastery after the treatment. The effectiveness of using crossword puzzle games was determined through ANCOVA by comparing the post-test

scores of the experimental and control groups while controlling for the pre-test scores.

The post-test had the same format and level of difficulty as the pre-test but used different questions. This was done to ensure the consistency and validity of the measurement results.

After collecting the data from the pre-test and post-test, the researcher analyzed the data using SPSS version 32. The analysis included testing the validity and reliability of the instruments as well as statistical analysis of students' scores. The data were required to be valid and reliable before being further analyzed to test the research hypothesis.

G. Method of Analyzing Data

The data obtained from the pre-test and post-test were analyzed statistically. Before testing the hypothesis, several prerequisite tests were conducted to ensure that the data met the assumptions required for parametric statistical analysis. In this research, the data were analyzed using SPSS 32 version.

1. Normality Test

The normality test was conducted to determine whether the data were normally distributed or not. The researcher used SPSS 32 version to test the normality of the data.

The steps of calculation are as follows:

- a. First, open SPSS and fill the Variable View by writing the names of the variables (experimental class and control class).

- b. Input the data into the Data View.
- c. Click Analyze → Descriptive Statistics → Explore.
- d. Move the data into the dependent list.
- e. Click Plots and check “Normality plots with tests”.
- f. Click Continue, then click OK.

The hypothesis of the data:

H_0 : Data are normally distributed.

H_a : Data are not normally distributed.

2. Homogeneity Test

The homogeneity test was used to determine whether the variance of the data from both groups was homogeneous or not. This test is important before conducting ANCOVA analysis.

The researcher used SPSS 32 version to calculate the homogeneity test.

The steps of calculation are as follows:

- a. Open SPSS and fill the Variable View by writing the name of the classes.
- b. Input the data into the Data View.
- c. Click Analyze → Compare Means → One-Way ANOVA.
- d. Input the data into the dependent variable list.
- e. Click Options and check “Homogeneity of variance test”.
- f. Click Continue, then OK.

The hypothesis of the data:

H_0 : The data are homogeneous.

H_a : The data are not homogeneous.

3. Hypothesis Testing

After the data met the assumptions of normality and homogeneity, the hypothesis was tested using Analysis of Covariance (ANCOVA) to determine whether there was a significant difference in students' vocabulary mastery between the experimental and control groups after the treatment.

The ANCOVA test was conducted using SPSS 32 version. The steps of calculation are as follows:

- a. Open SPSS and fill the Variable View by writing the names of variables (pre-test, post-test, and group).
- b. Input the data into the Data View.
- c. Click Analyze → General Linear Model → Univariate.
- d. Put the post-test score as the Dependent Variable.
- e. Put the group (experimental and control) as the Fixed Factor.
- g. Put the pre-test score as the Covariate.
- h. Click Options and select Descriptive statistics, Estimates of effect size, and Homogeneity tests.
- i. Click Continue, then OK.

The decision of hypothesis testing is based on the significance value (Sig. < 0.05), which means there is a significant effect of the treatment on students' vocabulary mastery.