CHAPTER III

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology of the conducted study to answer the two questions previously stated in chapter one. It covers research design, data collection, research procedure, and data analysis.

In conducting the study, research methodology is very essential as a guideline to get the answer to the problem proposed in the study. According to Fraenkel and Wallen (1990:481), research is the formal and systematic application of scholarship, disciplined inquiry, and most often the scientific method to the study of problems.

3.2 Research design

Regarding the main aim of the study, quantitative method was used because the study needed a statistical analysis in analyzing the acquired data, while experimental research design was used in the study to test the hypothesis served. The study used the framework of quasi-experimental design since it was not feasible to use true experimental design because of some limitations, such as what Kerlinger (1970, cf; Cohen and Manion, 1994) states that quasi experimental refers to a compromised design, an apt description when applied to much educational research

where the random selection or random assignment of schools and classrooms is quite impracticable.

The study involved two classes; the first class was chosen as an experimental group which was given crossword puzzle treatment while the second class was chosen as a control group which was not given crossword puzzle treatment.

Variables

Independent variable is the major variable which is investigated. It is the variable which is selected, manipulated and measured in this study. Therefore, the independent variable of this study is the use of crossword puzzles. Meanwhile, dependent variable is the variable which determines to investigate the effect of independent variable, which in this study is students' vocabulary achievement.

The experimental design in the study can be illustrated as:

G1	T1	X	T2
G2	T1		T2

(Hatch and farhady, 1983: 22)

G1: Experimental group

G2: Control group

T1: Pretest

X: crossword puzzle treatment

T2: posttest

3.3 Research Hypotheses

A hypothesis is formulated to show the effect of two variables' relationship (Arikunto, 2006). The study proposed the null hypothesis (denoted by H_0) and alternative hypothesis (denoted by H_A) which are formulated as follows:

$$H_0 = \bar{X}_1 = \bar{X}_2$$

$$H_a = \bar{X}_1 \neq \bar{X}_2$$

The null hypothesis (H_0) in this study is that there is no significant difference in mean adjustment level between those who used crossword puzzle and those who did not. Whereas, the alternative hypothesis (H_A) is that there is significant difference in mean adjustment level between those who used crossword puzzle and those who did not.

Therefore, by rejecting the null hypothesis, the study was able to support the correctness of the alternative hypothesis, which means that the experiment worked.

3.4 Data Collection

The data collection in the study includes population and sample, and research instrument.

Population and Sample

Fraenkel and Wallen (1990) state that population is the group interest to the researcher, the group to whom the researcher would like to generalize the result of the study. Therefore, the population of this study was the fifth grade students of SD Laboratorium Percontohan UPI Bandung. The population was selected based on the curriculum of simple descriptive text which given as the topic in the classroom that was reviewed by using crossword puzzle. The simple descriptive text was simply stated in the curriculum of fifth graders. And the selection of the population site was based on the access of the school that is located inside UPI, and it was a very welcome school to conduct a study.

The selected population then was narrowed into a sample. A sample is a part of the population which will be investigated (Arikunto, 2006). Two classes which had been chosen were labeled into experimental (5A) and control group (5B). Each class consisted of 24 students; therefore the total number of students were 48.

Experimental group and control group were given pretest and posttest to measure the vocabulary knowledge. But, treatment was only given to experimental group.

Research Instrument

In collecting the data, there were two kinds of instruments used in the study, namely vocabulary test and interview.

The vocabulary test of multiple choices was used in pre-test and post-test. Pre-test was used to measure students' previous knowledge of descriptive vocabularies, such as adjective vocabulary and simple present vocabulary. Pre-test and post-test consisted of 25 items. Pre-test was administered before the treatment, while post-test was held in the end of the program after several treatments.

The interview was used to gain the data to investigate the advantages and disadvantages of crossword puzzle in teaching vocabulary based on students' perception. The aim of the interview was to gain the respondents' perception toward the use of crossword puzzle, whether it had advantages or disadvantages. In gathering the data, the respondents were chosen from the experimental group only. The interview instrument included up to four items to investigate the advantages and disadvantages of crossword puzzle.

3.5 Research Procedure

Research procedure includes organizing teaching procedure, administering pilot-test, conducting treatment, administering pre-test post-test and interview.

3.5.1 Organizing Teaching Procedure

In conducting the study, the researcher acted as a teacher and a facilitator. The preparation of the study was implemented into two steps. The first step was preparing appropriate materials for teaching and learning process during the treatment, and the second step was organizing teaching procedures in control and experimental group.

Crossword puzzle treatment was given to the experimental group related to the teaching materials and procedures, while control group was given conventional vocabulary teaching and procedures.

3.5.2 Administering Pilot-test

Before the study was conducted, a pilot-test was administered to investigate the validity, reliability, difficulty and discrimination of the instrument item.

The pilot-test consisted of fifty items in the form of multiple choice tests. The pilot-test was given to the fifth grade students who were not the sample. It was given to the students from other site of school on the same level as the sample.

3.5.3 Conducting Treatment

In the process of treatment, two classes of the fifth grader were chosen and categorized as experimental and control group. The crossword puzzle treatment was implemented in the experimental class, while conventional teaching strategy was given to control group.

The treatment schedule was set to make the experiment run well. The materials and themes were also set to follow the material schedule of the school. The lesson plans used in the study were divided into two different categories, which were one for experimental class and one for control class.

Table 3.1

Schedule of the treatments

No.	Experimental group (5A)		Control group (5B)	
	Date	Material/theme	Date	Material/theme
1.	January 20, 2009	Pre-test	January 20, 2009	Pre-test
2.	January 20, 2009	Parts of body	January 20, 2009	Parts of body
3.	January 22, 2009	Physical appearance	January 22, 2009	Physical appearance
4.	January 27, 2009	My classroom	January 27, 2009	My classroom
5.	January 29, 2009	My clothes	January 29, 2009	My clothes
6.	January 29, 2009	Post-test	January 29, 2009	Post-test
7.	January 29, 2009	Interview	-	-

3.5.4 Administering Pre-test and Post-test

Pre-test was administered to measure students' prior vocabulary knowledge. It was given to both experimental and control group. After pre-test was given, several crossword puzzle treatments were given to only the experimental group, while conventional treatments were given to the control group. In the end, post-test was held to investigate the effectiveness of the crossword puzzle treatment in teaching vocabulary.

3.5.5 Interview

To investigate the advantages and disadvantages of using crossword puzzle in teaching vocabulary based on students' perception, interview was used in the study. The study used open-ended interview to ensure that the participants would speak up on their own behalves, expressing their own personal perceptions. The interview consisted of up to four questions which were categorized into some points, such as the advantages, the disadvantages, and how students deal with the difficulty found in crossword puzzle.

3.6 Data Analysis

Data analysis includes scoring technique, data analysis on pilot-test, data analysis on pre-test post-test, and data analysis on the interview.

3.6.1 Scoring Technique

The test used in this study was multiple choice tests. According to Arikunto (2007), two types of formulas can be used to process the multiple-choice item data; the formula with or without punishment. This study used the formula with punishment. The formula is stated as follows:

$$S=R$$

In which, S is score; and R is right answer.

3.6.2 Data Analysis on Pilot-test

The instrument used in the study was a vocabulary test which was aimed to measure the students' mastery in vocabulary. Before applying the instrument to experimental and control group, the value of its validity and reliability was sought. Therefore, pilot test was administered. 50 items of multiple choices were tested to the students who were not the sample of the study.

Moreover, difficulty (item facility) and discrimination test of the instrument were also analyzed to discriminate between the higher ability test takers and the lower

ability test takers. This test must be done to see the relevance of the test item with the population. Below is the analysis of the instrument.

Validity Test

Validity refers to the appropriateness, meaningfulness, and usefulness of the inferences a researcher makes (Fraenkel & Wallen, 1990). It is stated as the best available approximation to the truth or falsity of a given inference, proposition, or conclusion. In short, it is the accuracy of a measurement. Therefore, validity test was measured to support any inferences that the writer made based on the data gained using particular instrument.

Pearson product moment correlation was used to analyze the validity of each item. The result of the pre-test was calculated using SPSS 17 for windows. The criteria that determine the degree of the item validity are shown below:

Table 3.2

r Coefficient Correlation (Validity)

Raw Score	Interpretation
0.8 – 1.0	Very High
0.6 – 0.8	High
0.4 – 0.6	Moderate
0.2 – 0.4	Low
0.0 – 0.2	Very Low

(Arikunto, 2002)

Difficulty Level

Difficulty level (item facility) was defined as the proportion of the test takers who answer the correct item (Fulcher, 2007; cf. Aprian, 2009). Difficulty level test was used to measure whether the item is relevant with the students' (in this case, the test takers) ability level or not.

In addition, the difficulty level should not be too easy or too difficult either. Therefore, items with facility value around 0.500 were considered to be ideal, with an acceptable range being from around 0.250 to 0.750 (Fulcher, 2007).

Discrimination

The ability to discriminate is important in an approach to scoring because getting correct answer is directly related to more ability in question and getting wrong answer is directly related to less ability in question (Fulcher, 2007).

We are able to discriminate between higher ability and lower ability test takers from responses to individual. Point biserial correlation is commonly used in calculating the discrimination item. The test item can be manually calculated by using the following formula:

$$r_{pbi} = \frac{x_p - x_q}{s_x} \sqrt{pq}$$

(Fulcher, 2007)

Where:

r_{pbi} = point biserial correlation

X_p = mean score on the test for those who answer the correct item

X_q = mean score on the test for those who answer incorrect item

S_x = Standard deviation of test scores

Reliability test

In a research study, reliability test also plays an important part in gathering the data. According to Fraenkel and Wallen (1990), reliability refers to the consistency of scores or answers from one administration of an instrument to another, and from one set of items to another. A measure was considered reliable if the students' scores on the same test given twice were similar.

Therefore, to measure the reliability of the item, internal consistency method was used in the study. To facilitate internal consistency method, KR-21 formula was used in this study. This formula is based on the mean of samples and the number of the items. The formula is stated as:

$$r = \frac{k}{k-1} \left[1 - \frac{\bar{x}(k-\bar{x})}{ks^2} \right]$$

Where: k = the number of items in the test

$\bar{X}$ = the mean of the sample

s^2 = the variance of the sample

3.6.3 Data Analysis on Pre-test and Post-test

After the pre-test on control and experimental group were held, the next step was analyzing the output data. The output data were analyzed using independent t-test to determine whether there is a significant difference between the means of two

independent samples (Fraenkel and Wallen, 1990). Before performing the independent t-test, the output data of the pre-test should fulfill the criteria underlying t-test as stated in Coolidge (2000) as follows:

1. The participant must be different in each group
2. The data should have a normal distribution
3. The variance of the two groups must be homogenous

For that reason, homogeneity of variances test and normal distribution test were performed before calculating the data using t-test formula.

Homogeneity of variance test

In analyzing the homogeneity of variances of the scores, Levene's test formula was used in this study. Levene's test tested the hypothesis that the variances in the groups are equal; or the difference between variances is zero. The test was performed using statistic software SPSS 17 for windows.

From the SPSS data output we can see that if the significance value is more than the level of significance (0.05), the null hypothesis is accepted, the variance of control group and experimental group are homogenous. On the other hand, if the significance value is less than the level of significance (0.05), the null hypothesis is rejected, the variance of control and experimental group are not homogenous.

Normal distribution test

To analyze the distribution of the score, Kolmogrov-Smirnov formula was used in this study. Kolmogrov-Smirnov compared the scores in the sample to a normally distributed set of scores with the same mean and standard deviation (Field, 2005). The Kolmogrov-Smirnov test was performed by using SPSS 17 for windows.

The table of the data output from the SPSS 17 computation was simply concluded as: if the test is non-significant (column labeled sig. > .05) it tells us that the distribution of the sample is not significantly different from normal distribution (probably normal). If, however, the test is significant (column labeled sig. < .05) then the distribution is significantly different from normal distribution (Field, 2005).

The independent t-test

Independent group t-test is used to analyze a causative relationship between the independent variable (treatment) and the dependent variable that is measured on both groups (Coolidge, 2000).

Therefore, after the data had been proven as a normal distribution, the data were calculated using independent t-test. The independent t-test was analyzed using SPSS 17 for windows by comparing the significance value with the level of significance to test the hypothesis. If the significance value is more than or equal to the level of significance (0.05), the null hypothesis is retained, and it will be concluded that there is no significance difference between the two means. On the other hand, if the

significance value is less than the level of significance (0.05), the null hypothesis is rejected, and it will be concluded that the mean is significantly different from the other mean.

The dependent t-test

Dependent t-test was used to analyze the difference between two groups' means in experimental design where the participants in both groups are related each other in some way (Coolidge, 2000). In line with this, Hatch and Farhady (1982: 114) state that dependent t-test or matched t-test is used to analyze the pretest and posttest score and to investigate whether or not the difference of pretest and posttest means of each group are significant.

In the study, the dependent sample test was analyzed using SPSS 17 by comparing the significance value with the level of significance to test the hypothesis. If the significance value is more than the level of significance (0.05), the null hypothesis is retained, and it will be concluded that there is no significance difference between two means. On the other hand, if the significance value is less than the level of significance (0.05), the null hypothesis is rejected, and it will be concluded that the mean is significantly different from the other mean.

The calculation of effect size

The effect size refers to the effect of the influence of independent variable upon the dependent variable (Coolidge, 2000: 151). The calculation of effect size was

conducted to measure how well the treatment works. For instance, if the difference between the two groups' means is large, then there is said to be a large effect size; if the difference between the two groups' means is small, then there is said to be a small effect size.

In order to determine the effect size in the independent t-test, a correlation coefficient of effect size can be derived as follows:

$$r = \sqrt{\frac{t^2}{t^2 + df}}$$

Where:

r = effect size

t = t_{obt} or t-value from the calculation of independent t-test

$df = N_1 + N_2 - 2$

To interpret the computational result, the following scale was used as guidance in determining the effect size on the dependent variable.

Table 3.3

The effect size scale

Effect size	r value
Small	0.100
Medium	0.243
Large	0.371

(*adapted from Coolidge, 2000)*

1.6.4   Data Analysis on the Interview

In analyzing the data of the interview, the answers of the students on the interview were transcribed. The answers were then categorized into three major findings which were related to the advantages, the disadvantages, and how students deal with the difficulty found in the crossword puzzle. Then, the three major points were also elaborated based on students' answers of the interview.

In the end, interpreting the data to reveal the points which have been categorized. The findings of students' answers on the interview were calculated and depicted in the charts.