

CHAPTER III

METHODOLOGY

3.1 Formulation of Problems

The difficulty of students in mastering vocabulary becomes the major problem for those who learn language, especially foreign language. Because of that, learners need a tool to accompany them learning vocabulary. Vanvlodorp [July 2nd, 2007, available at: <http://uk-online.uni-koeln.de/cgi-bin/show.pl/>] said that why difficulty occur in mastering vocabulary is mainly because of missing motivation of most students in learning vocabularies. So, a tool that provides comprehensive amount of words and gives them motivation to use the words in the real life is needed.

The use of technology on the learning process by some experts believed can construct a tool in learning language, especially vocabulary. For instant, Brown (2001) stated that Computer Assisted Learning Language (CALL) can serve constructive tool of language learning. The same argument is stated by Walton (1999), he said that we can learn history, math, geography, current event, theology, management and also language by using computer.

Based on the previous statements, computer-based game which is served as one of a feature of CALL has been applied as a tool for learning language in England and Wales and it has been studied by Richard Sandford, Mary Ulicsak, Keri Facer and Tim Rudd. This way of learning language is applied in Senior High School Students by giving them an example of computer-based detective game to be played. Afterward, the study is used to seek:

1. Can a computer-based detective game develop vocabulary mastery of senior high school students?
2. Is the effect of playing a computer-based detective game significant to the students' vocabulary mastery?

3.2 Research Methods

This research used quantitative method to conclude the data. While, experimental method was chosen to test the hypothesis served, because of that, this research entangled two classes; the first class is served as control class and the second class is served as experimental class or usually called intact group design (Tuckman, 1982: p. 128) cited from Riduwan (2004).

Later, the result of the research was enlightened by putting the description of the result data. In addition, the calculation result was comprehended by explaining the result of interview.

3.3 Hypothesis

This research is begun with Null Hypothesis (H_0) where both classes conducted; experimental and control classes are similar.

$$H_0 : \mu_{experimental} = \mu_{control}$$

It means that there is no difference between experimental class and control class in the *mean* adjustment level (Gerald Kranzler and Janet Moursund; 1999). By using null hypothesis, every possibility of the research can be shown. If the hypothesis is rejected, it can be concluded that experiment works. While, if the hypothesis is accepted, the experiment does not work.

So, the null hypothesis of this research is playing computer-based detective game cannot develop students' ability in vocabulary mastery.

3.4 Population and Sample

The main criterion of population and sample for this research is they should know how to operate computer and engage with them continually. Because of that, Students of SMKN 4 Padalarang was chosen as sample for this research. Below there is the explanation about the population and sample for this research.

3.4.1 Population

The target population of this research is homogeny population that is the first year of senior high school students who sit in Computer-networking Program. Therefore, the first year of senior high school students who sit in Computer-networking Program in SMKN 4 Padalarang become the accessible population for this research.

3.4.2 Sample

Moreover, the population selected was narrowed into sample. Sample for this research was taken by using clustered random sampling from the population (students of Computer-networking Program in SMKN 4 Padalarang). So that everyone within the population or sample frame has same chance to be chosen as sample.

Since there were two classes conducted for this research, two classes have been chosen for this research by applying clustered random sampling. There were control class which was taken by *TKJ-A* and *TKJ-C* took part as experimental class. Furthermore, both classes were tested by pre and post test.

3.5 Research Instruments

Vocabulary test which has aim to measure students' ability in mastering vocabulary was used as the instrument of this research. This vocabulary test comprises 30 multiple choice items which were tested to the experimental and control classes.

However, before applying the instrument to control and experimental class, the value of its validity and reliability was sought. So that 50 items of multiple choice items were tested to another class in order to gain 30 question items which are valid and reliable. Below is the analysis of the instrument.

3.5.1 Analyzing test

The test is analyzed to seek validity and reliability of instrument before it is tested to control and experimental classes.

3.5.1.1 Test Items

The analysis works with 50 question items of vocabulary test in order to gain 30 question items. All question items are developed from SMKN 4 Padalarang syllabus which is covered four basic competences and several indicators (see table 3.1).

Therefore, from 10 vocabulary skills proposed by Gairns and Redman (1986) cited from Lewis (2001), this test items are

covered 5 of them. There are boundaries between conceptual meaning, synonym, chunks of language, translation, grammatical of vocabulary. Meanwhile, questions items can be seen in the Appendix B.

To make clear understanding about the items, below is the specification used to construct the test:

Table 3.1 Instruments Staging based on SMKN 4 Padalarang Syllabus

No	Basic competence	(%)	Indicator	Vocabulary skill	Item Num
1	Mentioning things, people, characteristic , time, day, month and year.	8	Students are able to mention things and words used to describe them.	Boundaries between conceptual meaning	7,28
			Students are able to describe people based on their profession, nationality, physical characteristics, quality, and their activities correctly	Synonym	11
			Students are able to mention time, days, date, month, year correctly	Chunks of language	9
2	Describing things, people, characteristic , time, day, month and year.	40	Students are able to string words correctly in order to describe things based on their color, form, origin, size, shape, age, sum, quality and material	Synonym	5, 6,48
			Students are able to string words correctly in order to describe people based on their profession,	Translation	8, 13, 20
			Students are able to string words correctly in order to describe people based on their profession,	Synonym	4,10,49, 50

			nationality, physical appearances, characteristic, quality, and activities		
				Synonym	2,31,35,47
			Students are able to string words correctly in order to describe events held	Grammatical of vocabulary	1,32
				Translation	22,36,37,40
3	Producing simple expressions for basic purposes	6	Students are able to express any kinds of expression correctly	Translation	14,18, 41
				Synonym	6,19
			Students are able to recount event in the correct order based on time and place.	Translation	24, 25,30
				Grammar of Vocabulary	12
				Synonym	21,43,45,46
4	Explaining activities which are being held simply	46	Students are able to state happened events correctly	Translation	3, 5, 23, 27, 39
				Grammar of Vocabulary	29,34, 42, 44
				Chunks of language	16
			Students are able to express feeling/argument in regard to the event correctly	Grammar of Vocabulary	17,33, 38
	SUM	100			50

3.5.1.2 Validity test

Arikunto (1993; 63-69) explained that validity is a measurement of instrument. If the validity value of the instrument is low/poor, the instrument cannot be trusted to measure something. It means, the invalid instrument cannot be applied to the respondents. Arikunto also proposed the use of *Pearson Product Moment Correlation Coefficient Values* to seek the value of instruments' validity.

To analyze validity of the test, this research used external validity analysis by correlating the students' score of vocabulary test with students' summative score of English which was taken from their mid-term report book. To correlate them, the formula of *Pearson Product Moment Correlation Coefficient Values* is used.

$$r = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{[N \sum x^2 - (\sum x)^2][N \sum y^2 - (\sum y)^2]}} \quad (\text{Riduwan, 2003:227})$$

Where r is Pearson Product Moment Correlation Coefficient Values, N is number of students who are analyzed, x is students' vocabulary score (first variable) and y is students' summative score (second variable).

Afterwards, every item on the instrument was also calculated by using Pearson Product Moment Correlation Coefficient Values to seek correlation index for every items through correlating every single item of instrument (x) with total score of instrument (y). Next, the r is interpreted as follows:

Table 3.2 Index of Validity Level

Coefficient Interval (r)	Validity Level
0.800 - 1.000	Excellent (Ex)
0.600 - 0.799	Good (Gd)
0.400 - 0.599	Satisfying (St)
0.200 - 0.399	Poor (Pr)
0.000 - 0.199	Very Poor (Vp)

(Riduwan 2004:110)

3.5.1.3 Reliability test

This research used *KUDER RICHARDSON-20* (KR-20) method to analyze reliability of instrument. It is because in this research instrument, every single right answer is valued 1 and every wrong answer is 0. In addition, this method was used to gain a higher reliability value, since the result of *KR-20* tends to give a higher value than the other methods such as *KR-21*, *Anova Hoyt*, *Alpha* and so on. (Arikunto 1993: 101).

KUDER RICHARDSON-20 (KR-20) formula :

$$r_{11} = \left(\frac{K}{K-1} \right) \left(\frac{s^2 - \sum pq}{s^2} \right)$$

r_{11} = Internal reliability coefficient for all items

K = sum of question item

p = proportion of subjects who answer right

$$p = \frac{\text{sum of those who answer right in an item}}{N(\text{number of respondents})}$$

q = proportion of subjects who answer wrong ($q = 1 - p$)

s^2 = variance total

$$s^2 = \frac{N \sum y^2 - (\sum y)^2}{N(N-1)}$$

Afterward, the value of r_{11} is compared with index of Pearson Product Moment Correlation Coefficient Values (see Appendix F) to see whether the value is reliable or not.

3.5.2 The Result of Test

On November 17th, 2007, the instrument has been applied to respondents, students of SMKN 4 Padalarang to seek the validity and reliability of the instrument. The result is shown as follow.

3. 5.2.1 Test Items

The calculation shows that from 50 questions items of vocabulary tested, 37 items are categorized valid and 13 items are invalid. So that 30 valid items of vocabulary test are taken as the instrument of this research and the instrument is covered as shown on the table below.

Table 3.3 The Result of Instruments Staging based on SMKN 4 Padalarang Syllabus

No	Basic competence	(%)	Indicator	Vocabulary skill	Item Num
1	Mentioning things, people, characteristic , time, day, month and year.	6.7	Students are able to mention things and words used to describe them.	Boundaries between conceptual meaning	7
			Students are able to describe people based on their profession, nationality, physical characteristics, quality, and their activities correctly	Synonym	-
			Students are able to mention time, days, date, month, year correctly	Chunks of language	9
2	Describing things, people, characteristic , time, day, month and year.	46.7	Students are able to string words correctly in order to describe things based on their color, form, origin, size, shape, age, sum, quality and material	Synonym	26,48
			Students are able to string words correctly in order to describe people	Translation	13
			Students are able to string words correctly in order to describe people	Synonym	4,10,, 50

			based on their profession, nationality, physical appearances, characteristic, quality, and activities		
				Synonym	2,31, 35,47
			Students are able to string words correctly in order to describe events held	Grammatical of vocabulary	1,32
				Translation	22,37
3	Producing simple expressions for basic purposes	6.7	Students are able to express any kinds of expression correctly	Translation	14,18
				Synonym	6,19
			Students are able to recount event in the correct order based on time and place.	Translation	24,
				Grammar of Vocabulary	12
				Synonym	21,43
4	Explaining activities which are being held simply	39.9	Students are able to state happened events correctly	Translation	3, 39
				Grammar of Vocabulary	29,42
				Chunks of language	16
			Students are able to express feeling/argument in regard to the event correctly	Grammar of Vocabulary	33
SUM		100			30

3.5.2.2 Validity and Reliability Instrument

The first step is instrument validity. As has been explained before, this research uses external validity to seek the correlation value. From the calculation (see, Appendix A), the instrument is valid in level .001 which has minimum value 0.5541 with $r=0.8306$.

Second step is instrument item validity. The instrument item was analyzed by using *anabut; analisis butir* (item analysis) proposed by Arikunto (1993). From the calculation (see Appendix C), it is shown that:

Table 3.4 Index of Validity for Question Items

Coefficient Interval (r)	Validity Level	Question Item number
0.800 - 1.000	Excellent (Ex)	-
0.600 - 0.799	Good (Gd)	1,2,4,7,9,33
0.400 - 0.599	Satisfying (St)	3,6,10,12,13,14,16,18,19, 21,22,24,26,27,29,31,32 35,37,39,42,43,47,48,50
0.200 - 0.399	Poor (Pr)	5,8,15,20,46
0.000 - 0.199	Very Poor (Vp)	30
<0.00 - 0.000	Invalid	11,17,23,25,28,34,36,38, 40,41,44,45,49

Furthermore, the result of reliability question item by using *KR-20* is reliable (see Appendix D). From the calculation, it is shown that the reliability value (r_{11}) is 0.7546 this result is reliable in level .001 which has minimum value 0.5541. It means that selected question items which have higher validity and reliability is presumed can be used to measure students' ability.

3.5.3 Vocabulary Test (pre-test and post-test)

As has been explained previously, 30 question items are taken as an instrument to measure students' ability. The question items were taken from six question items which are classified as good and twenty four question items which are classified as satisfying. Those question items can be seen on Appendix E. Then, the selected question items were given to respondents as pre-test and post-test.

3.6 Data Collection

The data for this research are gathered from:

1. Syllabus of SMKN 4 Padalarang. This data is used as question items staging to develop instrument (vocabulary test).
2. Students' summative score. This data is used to be correlated with students' score of vocabulary test in order to analyze validity level.

3. Nancy Drew; the Creature of Kapu Cave. This game is used as a tool in learning vocabulary; this game also provides vocabularies which are used to develop the instrument.
4. And, some useful resources.

3.7 Data Analysis of Pre and Post tests

To verify the hypothesis of this research, *t-test* was chosen. *t-test* has primary purpose to see whether the mean score of two groups differ to a statistically significant degree (Kranzler and Moursund, 1999: p. 89).

This study works with *t-test* for independent sample to compare both classes. It has aim to analyze the result significance of this study.

3.7.1 Homogeneity Variance

To verify whether the subject of this study homogeny or not, Chi-square test was used. Kranzler and Moursund said that chi-square test is specifically used for testing the category data of hypotheses.

The data taken from pre-test was used to seek the homogeneity of subject by taking the pre-test variance calculation of both classes. The formula of variance for each variables and total variance are:

- Variance for variable x

$$s_x^2 = \frac{n_x \sum x^2 - (\sum x)^2}{n_x(n_x - 1)}$$

- Variance for variable y

$$s_y^2 = \frac{n_y \sum y^2 - (\sum y)^2}{n_y(n_y - 1)}$$

- Total variance

$$s_{tot}^2 = \frac{(n_x \cdot s_x^2) + (n_y \cdot s_y^2)}{n_x + n_y}$$

Afterward, chi-square test (χ^2) is ready to be calculated by using the formula which is proposed by Riduwan (2004). The formula is provided below.

$$\chi^2 = (\log 10)(B - \sum (df \cdot \log S_n^2))$$

Where B equals with $(\log S_{tot}^2) (\sum df)$ and df is total subject in one variable minus 1.

Finally, the result of χ^2 is compared with table of chi-square test (see Appendix H), so the criteria of subject are found. It can be described as follow:

- The result of $\chi^2 \geq \chi^2$ on the table of chi-square test. It means that the subject is not homogeny, so the comparative test cannot be held.
- The result of $\chi^2 \leq \chi^2$ on the table of chi-square test. It means that the subject is homogeny, so the comparative test can be held.

3.7.2 Calculating t-test

After the treatment is given to the experimental class, post-test score of both classes was taken. Then, those scores are calculated by using t-test for two independent samples to seek the difference between the *mean* of both classes, so that the significance of the result is appeared.

To calculate the result, t-test formula which is proposed by Kranzler and Moursund is used. There are four steps to calculate the result:

1. Calculate the post test variance (S^2) of each class by using;

$$s^2 = \frac{N \sum x^2 - (\sum x)^2}{N(N-1)}$$

Where N is the number of subject and x is the score of variable x .

2. Calculate the t obtain of the result (t_{obt})

$$t_{obt} = \frac{M_1 - M_2}{S_{M_1 - M_2}}$$

$$S_{M_1 - M_2} = \sqrt{\frac{S_p^2}{N_1} + \frac{S_p^2}{N_2}}$$

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

Note :

t_{obt} = the value of t obtained through the data

N_1, N_2 = the number of subjects in each of the two classes

S_1^2, S_2^2 = the estimates of the variances of the two classes

M_1, M_2 = the mean of two classes

$S_p^2, S_{M_1-M_2}$ = the values that is needed to calculate t_{obt}

3. After t_{obt} is found, to find the meaning of the calculation, use the critical value of t (t_{crit}). To find the t_{crit} , go to see Appendix G (labeled “Two-Tailed or Nondirectional Test”).
4. The last step is to decide whether the hypothesis is rejected or not. If t_{obt} has equal value or higher than t_{crit} , it means that H_0 is rejected and vice versa. In addition, level of significance which is usually chosen is $\alpha = 0.05$

The conclusion of this research is taken from the result of t-test calculation.