CHAPTER III

RESEARCH METHODOLOGY

In this chapter, the researcher would like to give the description about the research method which is used to conduct the study. This chapter consists of research design, population and sample, research instrument, and procedure of collecting data.

3.1 Research Design

The purpose of this study is to investigate the effectiveness of use inquiry based learning toward students' critical thinking at eleventh grade in SMA NU 1 Gresik. Because in this study want to test the theory, so the researcher used quasi-experimental design. According to (Miller, 1984: 4) experiment is a research collection of data to know the effect of variable and the other variable. There are two variable in this study, they are inquiry based learning and critical thinking ability. The dependent variable is inquiry based learning and the independent variable critical thinking.

There will be two big groups. Those are control group and an experimental group. The experimental group will get treatment use inquiry based learning, while the control group becomes group which use their own teacher's method in teaching learning process that is round robin brainstorming strategy. The teacher use round robin brainstorming strategy because he wanted to provide each student get opportunities to share their thoughts. Because before sharing their argument they should identify, analyze the issue and share their argument with their group.

In the round robin brainstorming there is a student in each group will become a notulen. Notulen will conclude all of their members in the group, when their friends share their arguments.

In this study, the researcher use pre-test and post-test both of the two groups. Pre-test conducted before treatment, while post-test was held after the applying treatment. Those tests are to know the effect of inquiry based learning in students' critical thinking at eleventh grade of Senior High School students.

This design was adopted from Donal Ary 1979:163

Group	Pre-test	Independent Variable	Post-test
E	Y_1	X	Y_2
C	Y_1	-	Y_2

Table 3.1 Research Design

Notes :

E : Experimental group

C : Control group

Y_1 : Pre-test

X : Inquiry Based Learning

Y_2 : Post-test

Steps for conducting the experimental study are the researcher identifies the problem by asking questions about critical thinking and inquiry based learning in that school. Then, identifies the population and sample. The researcher measures the instrument. The last, researcher collects the data in testing for each group in the sample. Then, the researcher analyses the data from instrument.

3.2 Population and Sample

3.2.1 Population

The population of this research was the second semester 11th grade students in SMA 1 NU Gresik in second semester 2015/2016 academic year which consisted of 363 students with 10 classes.

Population is the area in when you are trying to get information. Burns (1990:62) states that population is the all groups of students or objects or events that all have one characteristic one scope and must be defined specially and not ambiguously. The researcher chooses SMA 1 NU Gresik because this school never used inquiry basic learning before. That was known by the researcher interview with an English teacher in SMA 1 NU Gresik.

3.2.2 Sample

In this study, the researcher used quasi-experimental research design because the school did not allow the researcher to do randomization. Sample is the part of the population that you really want to survey. McMillan and Schumacher (1984:32), state that the sample is a group of subjects had chosen from the population. Because the population was large, so the researcher use cluster sampling technique to take the sample. Ary (1990), argue that cluster sampling is choosing a group already together not an individual. The experimental group was XI-IPA 8 which consisted of 36 students while the control group was class XI-IPA 7 with 35 students, so the total number of students as sample was 71 students.

3.3 Data Collection

In this study, the researcher collect the data from speaking test by conducting a test before the treatment (pre-test) to Control Group and Experimental Group. It used to know the influence of inquiry based learning in students' critical thinking in making deducing and reasoning orally at eleventh grade of Senior High School students.

3.3.1 Research Instrument

3.3.1.1 Scoring Rubric

The data for this study were taken from two classes in SMA 1 NU Gresik, each class consist of 36 and 35 students. In collecting the data, kinds of instruments that researcher used is scoring rubric. This rubric is used to measure students' critical thinking about the effect of inquiry based learning in students' critical thinking. The scoring rubric adopted from Peter A and Norean C. Facione (2009), Valencia (2004), Neius (2003) and Fresno (2003). The criteria critical thinking consists of identifying, analyzing of issue, conclusion, word choices and confident. The researcher use rubric to help the teacher to give scores for the test.

No	Aspect	Score	Description
1	Identify of Issue 15%	Excellent 91-100	Giving simple opinion related the topic
		Good 76-90	Giving complicated opinion, related the topic
		Enough 61-75	Giving simple opinion unrelated the topic

		Poor < 60	Giving complicated opinion and not related the topic
2	Analyze of Issue 30%	Excellent 91-100	Giving more than 3 arguments, all of them logically
		Good 76-90	Giving 3 arguments, all of them logically
		Enough 61-75	Giving less than 3 arguments, all of them logically
		Poor < 60	Giving less than 3 arguments illogically
3	Conclusion 20%	Excellent 91-100	Giving simple conclusion and related to their argument
		Good 76-90	Giving simple conclusion but repeat their argument
		Enough 61-75	Giving simple conclusion but not related to their argument
		Poor < 60	Giving complicated conclusion and not related to their argument
4	Word Choices 15%	Excellent 91-100	Excellent in chosen vocabulary appropriate with topic
		Good 76-90	Relative good in chosen vocabulary appropriate with topic and occasionally use Bahasa
		Enough 61-75	Less in chosen vocabulary, but appropriate with topic and mostly use Bahasa

		Poor < 60	Less in chosen vocabulary, inappropriate with topic and full use Bahasa
5	Confident 20%	Excellent 91-100	Answer the questions directly, loudly and speak fluently
		Good 76-90	Answer the questions directly and speak fluently but some words unclear
		Enough 61-75	Answer the questions directly and occasionally speak fluently but many words unclear
		Poor < 60	Answer the questions indirectly and doesn't speak fluently

Table 3.2 Scoring Rubric

There are four level of critical thinking, those are excellent, developer and the last is beginner.

Score	Level
91-100	Advance
66-90	Intermediate
< 65	Beginner

Table 3.3 Level of Critical Thinking

3.3.1.2 Test

In this study, the researcher used test as the instrument of collecting the data. The researcher gave pre-test and post-test to get the data. The purpose of giving the tests is to check the students' achievement as a progress indicator direction educational objectives set for the students. In completing this research, the researcher gave test based on an achievement test which as the

result of the data. Test conducted two test, pre-test and post-test based on the Standard of competence in the syllabus of eleventh grade (School Based Curriculum at eleventh grade of senior high school). The syllabus and lattice can you see in the appendix.

a. Pre-test

   Pre-test is done by experimental and control group. It is conducted for knowing the previous students' ability on critical thinking skill. Pre-test will be given before the implementation of inquiry based learning in teaching English. Because in this test to find out the reaction and response of the students. This test through oral test because the test orally. Every student will come to the teacher face to face alternately. Both of control and experimental class got this test.

b. Post-test

   In this test like pre-test, post-test was also done by experimental and control group. The procedure of post-test has the same procedure with the pre-test, but in this post-test was conducted after giving all the treatment only in the experimental group. It measured the result of this treatment success or not. The item and topic of post-test are same with the items and topic given to the experimental and control group in post-test.

The speaking test contained 4 items. The selection test was adopted with a syllabus of Senior High School 11^{th} grade in second semester were Analytic Exposition Text.

Sub Basic Competence	Focus item	Questions Number	
		Pre-test	Post-test
3.10 Analyzing the structure of the text analytical exposition about the hot topic discussed generally, according to the user context	Thesis	1 item	1 item
	Argumentation	2 item	2 item
	Conclusion	1 item	1 item

Table 3.4 Test

Treatment will be conducted for six meetings in which meeting will be last for 2x45 minutes. First meeting was held a pre-test. Second meeting until fifth meeting was applied inquiry based learning in teaching learning process. Second meeting, with the news on the weekend. Third meeting, with the diseases topic. Fourth meeting, with the topic in newspaper. Fifth meeting, with the education topic. The last meeting will be a post-test activity.

3.3.1.3 Validity

Validity is how far the instrument measure the test item for the students. Before conducting of the test as an instrument of the research, the test should be tried out in terms of its validity. There are three types of validity, they are content, predictive, and construct. Ary (1990) stated that content validity it can be used test's items based on objective in curriculum, syllabus, and course book. To test the content validity, the researcher compared the content of the

instrument the subject based on English curriculum and syllabus. After comparing the all items, the researcher can conduct the test for pre-test and post-test.

Basic Competence	Sub Basic Competence	Focus item	Questions Number	
			Pre-test	Post-test
3.10 Analyzing social function, the structure of the text, and linguistic elements of text analytical exposition about the hot topic discussed generally, according to the user context	3.10 Analyzing the structure of the text analytical exposition about the hot topic discussed generally, according to the user context	Thesis	1. What do you know about issue of beggar in our country?	1. What do you know about the choices of students after graduating?
		Argumentation	2. Do you agree with prohibition giving money to beggar?	2. Do you agree if continue study in university is better than work after graduating?
			3. What is your reason agree or disagree about that statement?	3. What is your reason agree or disagree about that statement?

		Conclusion	4. What is your conclusion about that issue?	4. What is your conclusion about that issue?

Table 3.5 Content Validity

3.3.1.4 Reliability

Heaton (1988) states that reliability is a necessary characteristic of any good test, for it is valid at all, a test must first be reliable as a measuring instrument. In this study, the researcher adopted rubric from different expert to use scoring rubric. So, this reliability was measuring the rubric was valid or not in this research. The researcher did try out in the XI Science 4 and XI Science 5. Based on the result of trying out for pre-test and post-test, researcher found that both of pre-test and post-test were reliable. It was shown from the result of test items' reliability in scoring rubric after try out. The all aspects in scoring rubric had covered criteria of students' critical thinking in the test.

3.3.2 The Procedure of Collecting Data

The first is prepare instruments, the researcher identify the topic from curriculum and syllabus to make items for test. The second is the researcher tried out the test to find out the validity and reliability of those items. The third is giving pre-test both of the classes before implementing inquiry based learning and getting the score of the test. The fourth is the researcher giving treatment to experimental class to implementation inquiry based learning. The fifth is giving post-test both experimental and control group. The last is if the all data have

ready done the researcher calculate the all data to know the effectiveness of inquiry based learning toward students' critical thinking.

Schedule:

No	Time	Activity
1	May, 10th, 2016	Giving pre-test in control group
2	May, 11th, 2016	Giving first treatment in control group Giving pre-test in experimental group
3	May, 12th, 2016	Giving first treatment in experimental group
4	May, 14th, 2016	Giving second treatment in experimental group Giving second treatment in control group
5	May, 17th, 2016	Giving third treatment in control group
6	May, 18th, 2016	Giving fourth treatment in control group Giving third treatment in experimental group
7	May, 19th, 2016	Giving fourth treatment in experimental group
8	May, 21th, 2016	Giving post-test in experimental group Giving post-test in control group

Table 3.6 Schedule

3.4 Technique of Analyzing Data

The purpose of analyzing data was to answer the research problem with getting through pre-test and post-test. In this study, the researcher analyzed the data by using independent t-Test in SPSS 15,0. The researcher used independent sample t-Test because the sample was small and the groups were independent. It was carried out to decide whether there was significant different between the

experimental group and control group after one month treatment. Assumption for the independent t-test: a) Independence: Observations within each sample must be independent 9they do not influence each other), b) amount of subject in every group are same or neared and, c) Normal distribution: The score in each population must be normally distributed and, d) Homogeneity of Variance: Two populations must have equal variances (the degree to which the distributions are spread out is approximately equal). In this research did not use normality distribution because our data is parametric. There are two kinds of parametric data, they are ratio and interval. The data in this study is include ratio. The result data in ratio is definite homogeny and normal distribution.

3.4.1 Homogeneity Test of Variance

For homogeneity test, the researcher used one Levene'e test of homogeneity test in SPSS 15.0 version. The purpose of this test was to analysis the variances of the observation in Control Group and Experimental Group were equal. Because the researcher could not random the students so, homogeneity test was necessary to make sure the students in both of the class had the same ability in critical thinking or not and the researcher could conduct the treatment. The test of Levene's test (P) was defined as follows:

$$P = \frac{(N-k)\sum_{i=1}^{k} N_i\,(Z_i - Z..)^2}{(k-1\sum_{i}^{k}\sum_{j=1}^{Ni}(Z_{ij} - Z_i)^2}$$

Where:

- P is the result of the test,
- *k* is the number of different groups to which the samples belong,

- N is the total number of samples,
- N_i is the number of sample in the *i*th group,
- Y_{ij} is the value of the jth case from the *i*th group,
- $Z_{ij} = \begin{cases} \text{I } Y_{ij} - \grave{Y}\iota \text{ I}, & \grave{Y}\iota \text{ is a mean of } i - \text{th group} \\ \text{I } Y_{ij} - \grave{Y}\iota \text{ I}, & Yi \text{ is a median of } i - \text{th group} \end{cases}$

The significance of P was tested against F (α,k - 1, N - k) where F was a quintile of the F-test distribution, with k-1 and N – k its degrees of freedom, and α was the chosen level of significance (0.05 or 0.01).

The procedures in analyzing the homogeneity by using SPSS VERSION 15.0 were as follows: after the pre-test data of both experimental and control groups were input, then clicked Analyze → Compare Means → Independent Sample t-Test, in Independent Sample t-Test menu, input the score variable into Test Variable column and the group variables, then defined groups, put code 2 for the experimental group in group 1 and code 5 for the control group in group 2 Continue then click OK.

3.4.2 Hypothesis Testing using an Independent Sample t-Test

The used of independent t-test is to find out the significant differences of inquiry based learning strategy for increasing students' critical thinking ability between the experimental group and control group. The steps of t-Test calculation was:

1. Test the hypothesis of the research and setting the α (alpha) level at 0.05 (two tailed test). The hypothesis could be formulated as follows:

H_0 : there was no significant effect on the use of inquiry based learning between experimental group and control group.

H_1 : there was a significant effect on the use of inquiry based learning between experimental group and control group.

2. Finding t-value using Independent t-Test and comparing the probability with the level of significance the hypothesis. After the scores were computed in SPSS 15.0 version, then saw the output of Independent t-Test and interpreted the output that if gig (2 tailed) > α (0.05), the researcher should accept the H_0 but if sig (2 tailed) < (0.05) so the researcher can reject H_0 it means H_1 is accepted.

T-test was calculated in order to find out the comparison of two means between Control Group and Experimental Group pre-test and post-test. In analyzing the data the researcher used independent t-Test formula. In calculating t-Test, the formula was as follow:

$$t = \frac{(x_{1-}x_2) - (\mu_{1-}\mu_2)}{Sx_{1-}x_2}$$

Where:

t : is t value

x_1 : is average group 1

x_2 : is average group 2

S : is standard error of the two groups

μ_1-μ_2 : is always defaults to 0

Where:

$$^{S}x_1 - x_2 = \sqrt{\frac{S^2 pooled}{n_1} + \frac{S^2 pooled}{n_2}}$$

$^{S}x_1$-x_2 : is standard error of two groups

S^2pooled : is variants of two groups

n_1 : is number of sample group 1

n_2 : is number of sample group 2

Pooled variance: the average of the two sample variances, allowing the larger sample to weight more heavily.

Formula:

$$S^2_{pooled} = \frac{(df_1)s^2 1+(df_2)s^2 2}{df_1+df_2} \quad \text{or} \quad S^2_{pooled} = \frac{SS_1+SS_2}{df_1+df_2}$$

$df_1 = df$ for 1st sample, $n_1 + 1$

$df_2 = df$ for 2nd sample, $n_2 + 1$

Estimated standard error of the difference:

$$^{S}x_{1-}x_2 = \sqrt{\left(\frac{SS_1+SS_2}{n_1+ n_2-2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

Clearly, the result of the tests was subjected for the following statistical procedures. In calculating t-Test, the researcher uses SPSS 15.0 version. The steps in analyzing the data of post-test of both experimental and control group were as follows: First, input the data of post-test in SPSS program between experimental and control groups, then click Analyze → Compare Means → Independent Sample t-Test. In Independent t-Test, input the score variable into Test Variable column, and group variable into Grouping Variable column, then click Define Group, choose group 1 (for experimental) and 2 (for control) then click OK.