III. METHODS

This chapter, discusses about the research methods that was used in this study, such as research design, population and sample, data collecting technique, research instruments, criteria of the test, validity of the instruments, reliability of the instruments, scoring system, research procedure, data analysis, and hypothesis testing.

3.1. Research Design

This research quantitative research because it was focused on the product (result of the test) not the process of teaching learning and the objectives was to find out the correlation between students' critical thinking and their reading comprehension ability. In this research, the researcher used co-relation study, which was one of the kinds of *ex-post facto design*. Correlation study here means the researcher used one group and took the data in one time without giving treatment. The data collected by seeing the correlation between cause and effect that might happen (after the fact). (Setiyadi, 2006: 133). The design of this research could be described as follows:

TI ⟶ T2

TI : Critical Thinking

T2 : Reading Comprehension

(Setiyadi, 2006: 133)

Whereby, in collecting the data, the researcher gave a reading test (T_2) to see the students' reading achievement. Before that, the researcher distributed a critical thinking test (T_1) in order to know the critical thinking skill employed by the learners in comprehending reading text. Then, the data from critical thinking test (T_1) was affected with the data from reading test (T_2).

3.2.Variables

In this research there were two variables, i.e. dependent and independent variables. The dependent variable was students' critical thinking and independent variable was reading comprehension ability. The score showed the data of critical thinking test and reading test which were used to identify the correlation between students' critical thinking and their reading comprehension ability.

3.3. Population and Sample

The population of this research was the third grade of SMPN 3 Natar Lampung Selatan in 2014/2015 academic year. There were three classes of the third grade in that school. The number of the students of each class about 35 students. The researcher determined the sample by using random sampling where every individual in population had probability to be chosen one class IX C as a sample

in order to find the validity, reliability, difficulty level, and discrimination power of the test item. After getting a good test items, by the random sampling technique, the researcher used IX C at the SMPN 3 Natar Lampung Selatan as the subject to collect the data.

3.4. Data Collecting Technique

1. Critical Thinking Test: Critical thinking test was multiple choice to be answered by students to measure students' use of critical thinking skill, one true answer. Critical thinking test consisted of 40 items, with four options each (A, B, C, and D).

2. Reading test: Reading test was one of objective test to measure students' reading comprehension, one true answer. Reading comprehension test consisted of 40 items, with four options each (A, B, C, and D).

3.5. Research Instruments

3.5.1. Critical Thinking Test

As it mentiond previously the critical thinking skill was measured through critical thinking test adapted from Watson-Glaser Critical Thinking Appraisal (WGCTA) measures CT using broad, nonspecific terms in five aspects:

1. Inference: discriminating among degrees of truth or falsity of inferences drawn from given data.

2. Recognition of assumptions: recognizing unstated assumptions or presuppositions in given statements or assertions.

3. Deduction: determining whether certain conclusions necessarily follow from information in given statements or premises.

4. Interpretation: weighing evidence and deciding if generalizations or conclusions based on the given data are warranted.

5. Evaluation of arguments: distinguishing between arguments that are strong and relevant and those that are weak or irrelevant to a particular question at issue (Warrell & Profetto-McGrath, 2007).

The critical thinking test consisted of 40 items, with four options each (A, B, C, and D).

3.5.2. Reading Test

It was a set of question and problems in form of objective test to measure students' reading comprehension. Reading test was given in order to know students' reading achivement in comprehending the text. Before I gave them try out reading test to prepare as good as possible researchers' equipment.

3.6. Criteria of Good Test

In this research, to prove wheter the test had good quality, it might be tried out first. The test could be qualified as 'good' test if it had sufficient validity and reliability, level of difficulty and discrimination power.

3.7 Validity of the Instrument

3.7.1. The Validity of the Critical Thinking Test

The validity of critical thinking test was also measured to find if the components were proportionally suitable and related to the relevant theories of critical thinking skill. According to Hatch and Farhady (1978) there were least two validity should be fulfilled; content and construct validity. In relation to the content validity, it is intended to see whether or not the tests are a good representation of the materials to be tested. The ways to find out this kind of validity are formulating the questions based on the aim of the critical thinking test was adapted from Watson-Glaser Critical Thinking Appraisal (WGCTA), it was considered standardized therefore the researcher investigated the content and construct validity. The instrument of critical thinking are *inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments*. (Warrell & Profetto-McGrath, 2007).

Table of Aspect of Critical Thinking

No	Aspect of Critical Thinking	Item Number	Percentage
1	Inference	1,2,3,4,5,6,7,8,9,10,	25%
2	Recognition of assumptions	11,12,13,14,15,16,17,18,19,20	25%
3	Deduction	21,22,23,24,25,26,27,28,29,30	25%
4	Interpretation	31,32,33,34,35	12.5%

5	Evaluation of arguments	36,37,38,39,40	12.5%
	Total	40	100%

3.7.2. The Validity of the Reading Test

" A test can be said valid if the test measures the object to be measured and suitable with criteria" (Hatch & Farhady, 1982). They also stated that there were basic types of validity. They were face validity, content validity, construct validity, and criterion-related validity.

1. Face validity, concerns with the lay out of the test.
2. Content validity, depends on a careful analysis of the language being stated;
3. Construct validity, measures certain specific characteristic in accordance with a theory of language learning;
4. Criterion-related validity, concerns with measuring the success in the future as in replacement test.

According to the types of validity above, the researcher used content and construct validity. The validity of reading test reffered to the content and construct validity in which the question represents five sort of reading skill that we knew that quite the same the reading skill, i.e. *determining main idea, finding the detail information, reference, inference, and vocabularies.* The were parallel to the skill required by the language curriculum. Then, Construct validity is concerned whether the test is actually in line with the theory of what reading comprehension means (Hatch and Farhady, 1982). To make sure the test reflects the theory in

reading comprehension, the researcher examined whether the test questions actually reflect the means of reading comprehension or not.

Table of Specification of Reading Test

No	Reading Specification	Item Number	Percentage
1	Determaining main ideas	1,3,16	7.5%
2	Inferences	7,11,36	7.5%
3	References	12,25,28,31,34,39	15%
4	Finding detail information	2,5,6,8,10,13,15,17,18,19,21,23,24,26,27,29,32,35, 37,40	50%
5	Vocabularies	4,9,14,20,22,30,33,38	20%
	Total	40	100%

3.8. The Reliability of the Instruments

3.8.1. The Reliability of the Critical Thinking Test and Reading Test

Reliability was simple consistency of a test. In other words, how far it could measure the subject at separated time, but it showed the same result relatively (Setiyadi, 2006: 113). Reliability could be defined as the extent to which a test produce consistent results when administered under similar condition (Hatch & Farhady, 1982). Reliability of the test was estimeted by using split-half technique.

To measure the coefficient of reliability between odd and even group, this research used the person product moment formula as follows:

$$r_{xy=} \frac{N\,(\sum XY) - (\sum X)(\sum Y)}{\sqrt{\{N\sum X^2) - (\sum X)2\}\{N\sum Y^2) - (\sum Y)2\}}}$$

Where:

r_{xy} : Coeficient of reliability between X variable and Y variable.

(Product Moment Correlation Formula)

n : numbers of the students

x : total score of odd number

y : total score of even number

x^2 : square of X

y^2 : square of Y

(Arikunto, 2006)

Before get the final data, the researcher gave the try out of critical thinking and reading comprehension test. Then, the researcher used the formula to calculate the reliability of critical thinking and reading comprehension test in order to know the items in the test show the consistency in its score. The test items are reliable when the value closes to 1.

To know the coefficient correlation of whole items, the researcher used "Spearmen Brown"s Prophecy Formula" (Hatch & Farhady, 1982: 246) to know the coefficient correlation of whole items.

$$rk = \frac{2rl}{1 + rl}$$

Where:

rk: the reliability of the test

r l: the reliability of half test

(Hatch & Farhady, 1982:246)

The criterian of reliability are:

0.80- 1.00 : very high

0.60- 0.79 : high

0.32- 0.59 : average

0.20- 0.39 : low

0.0- 0.19 : very low

The researcher found that the reliability of critical thinking and reading comprehension try out test were high reliability 0,60 (on critical thinking) and 0,70 (on reading comprehension ability) (See appendices 7, 8, and 10, 11).

1. Level of Difficulty

Level of difficulty was used to classify the test items into difficult items and easy ones. The items should not to be easy for the students. To see the difficulty of the test items, this research used this following formula:

$$LD = \frac{R}{N}$$

Where:

LD : level of difficulty

R : the number of students who answer correctly

N : the total number of students following the test

The criteria are:

< 0.30 : difficult

0.30- 0.70 : average

<0.70 : easy

(Shohamy, 1985; 79)

The researcher has found that there were, 31 items (17,27%) were average, 1 item (0,31%) was difficult and 8 items (6,02.%) were easy in reading comprehension test 39 items (77,85%) were average and 1 item (0,71%) was easy in critical thinking. However, the researcher omitted all the easy items to get good items test. (See appendices 9 and 12).

2. Discrimination Power

The discrimination power (DP) referred to the extentto which the item differentiates between high and low level students on the test. A good item

according to this criterion was one which good students do well on and bad students fail.

To know the discrimination power of the test, the researcher used the following formula:

$$DP = \frac{U - L}{\frac{1}{2} N}$$

Where:

DP = discrimination power

U = the proportion of upper group students

L = the proportion of lower group students

N = total number of students

The criteria are:

DP	: 0.00 - 0.20	= poor
DP	: 0.21 - 0.32	= Satisfied
DP	: 0.41 - 0.70	= Good
DP	: 0.71 - 1.00	= Excelent
DP	: − (Negative)	= Bad items (should be omitted)

The criteria are:

1. If the value is positive discrimination – a large number or more knowledgeable students than poor students get the item correct. If the value is zero, it means that there is no discrimination.

2. If the value is negative, it means that more low students then high level students get the item correct.
3. In general, the higher, the discrimination index, the better. In classroom situation most items should be higher than 0.20 indexes.

(Heaton, 1975: 182)

Based on the criteria of the try out test analyzed by the researcher (See Appendices 9 and 12), the researcher concluded that 10 items (0,81%) were poor and 30 items (29,28%) were good or positive discrimination power in reading comprehension test, 10 items (0,28%) were poor and 30 items (6,21%) were good or positive discrimination power in critical thinking test.

After counting the level of difficulty and discrimination power of each items, the researcher found that 10 items out of 40 items of reading comprehension test were poor and 10 items of 40 items out of critical thinking test were should be dropped.

3.9. Scoring System

In scoring the students result of the test, the researcher used Arikunto's formula (1997: 212). The ideal scores of test were calculated by using the following formula:

$$S = \frac{R}{N} \text{ X } 100\%$$

Where:

S : the score of the test

R : the total of the right answer

N : the total items

(Arikunto, 1997: 212)

3.10. Research Procedures

In doing the research, the researcher used procedure as follows:

1. Determining the sample of try out of the reading test

   The population of the research was the third grade students of SMPN 3 Natar Lampung Selatan. The researcher used sample random sampling, it means that one class was taken as the sample of research. Try out of reading test was given, before analyze validity, reliability, and difficulty level of reading test.

2. Determining test

   Reading test was used to get data of learners' reading ability.

3. Determining the sample of try out of Critical Thinking test

   Critical thinking test was used to analyze students' critical thinking. The employed by the learners and to measure students' used their critical thinking. The population of the research was the third grade students' of SMPN 3 Natar Lampung Selatan. The researcher used sample random sampling, it means that one class was taken as the sample of research. Try out of critical thinking test

was given, before analyze validity, reliability, and difficulty level of critical thinking test.

4. Collecting data

After administrating the tests, the data collected.

5. Analyzing the data

After the data is gathering, the researcher was analyzed the result of critical thinking and reading comprehension was used *simple linear regression analysis*. The researcher seen whether there is significant correlation between students' critical thinking and theirreading comprehesion or not.

6. Drawing findings and conclusion from the data.

3.11. Data Analysis

The researcher collected the data by looking at the result of test of critical thinking test and reading comprehension to find out the result of students' critical thinking test and their reading comprehension ability. The result of the test was in form of the score. After getting the result, the researcher analyzed the correlation between students' critical thinking and their reading comprehension ablity. The researcher analyzed the data by using the formula as follows:

$$r_{xy} = \frac{N\sum XY - \sum X \sum Y}{\sqrt{N\sum X^2 - (\sum X)^2}\sqrt{N\sum Y - (\sum Y)^2}}$$

rxy: correlation value

N: number of students

X: independent variable (reading comprehension)

Y: dependent variable (critical thinking)

In order to find out the correlation between students' critical thinking and their reading comprehension ability, the formula is $Y' = a + b_x \ldots bn$

In which,

Y' : dependent variable

X : independent variables

a: constant (Y' value if $X_{1, \ldots\ldots} X_n = 0$)

b: regression coefficient

but, the researcher pratically used pearson product moment in SPSS 17.0 (Statistical Program for Social Science).

3.12. Hypothesis Testing

After collecting the data, the researcher analyzed them in order to find the correlation of students' critical thinking and their reading comprehension ability. To determine whether the first hypothesis is accepted or rejected, the following criteria for acceptance:

$H_0 = r_{value} < r_{table}$

$H_1 = r_{value} > r_{table}$

The hypothesis would be as follow:

H_0: "There is no correlation between students' critical thinking and their reading comprehension ability".

H_1 : "There is correlation between students' critical thinking and their reading comprehension ability".