

CHAPTER III RESEARCH METHODOLOGY

3.1 Research Method

The purpose of this research was to describe the recent situation of students' concept mastery and student's perception in learning global warming topic. Based on the purpose of the research, descriptive method was used to achieve the purpose of this research. This method is concerning more in explaining something can happen, often use observation and survey tools to gain the data (Nassaji, 2015). According to (de Fontenay, 2008) descriptive method means investigating and describing the characteristic of the object without applying any treatment, and without manipulate the variables involved. Hence, there was no treatment given to the students while gaining the data.

3.2 Research Subject

This research was held in an Islamic-based school (*Madrasah Tsanawiyah*) that is located in Cimahi. The school uses *kurikulum* 2013 as their curriculum, and uses Bahasa Indonesia as their instructional language during the teaching learning process. The population of this research was 13 classes from grade 7th to 9th grade.

The number of students that involved in this research was 241 students. All of the students came from 11 classes spread from 7th grade to 9th grade. Both of genders of the students were involved in this research. Table 3.1 shows the recapitulation of the sample.

Table 3.1

Subject of the Research

Grade	Number of class	Number of student	Gender	Percentage (%)	Total (%)
7 th grade	2 classes	45	Female 21	46.67%	100 %
			Male 24	53.33%	
8 th grade	4 classes	89	Female 37	41.57%	100 %
			Male 52	58.43%	
9 th grade	5 classes	107	Female 37	34.57%	100 %
			Male 70	65.43%	

3.3 Operational Definition

In order to keep the misconception and misunderstanding away from this research, the operational definitions of this research were clarified as below:

1) Students' concept mastery

In this research, students concept mastery will be identified by using 30 number of objective test items. This objective test item was worked as the research instrument. The research instrument then distributed to all of the research subjects. The objective test item was consisted of all level of cognitive domain based on Bloom's taxonomy revised version. There were six level of cognitive: C1 (remembering), C2 (understanding), C3 (evaluating), C4 (Applying), C5 (Analysing) and also C6 (Creating).

2) Students' perception

The students' perception was grasped from students' response in answering an open-ended question asked what they know about global warming. The words used by the students to define global warming then executed by using semantic network analysis method.

3) Semantic network analysis

Semantic network analysis is one of the methods that can be used to collect students' perception. In this research, semantic network analysis was performed by using a software application named NetMiner 4.0.

3.4 Research Instrument

In this research, research instrument is very important to be used for gaining data. There were two types of instrument that were used in this research. Both of the instruments are explained below:

3.4.1 Objective Test

The objective test was used in this research to measure students' concept mastery. The objective test used was 30 number of multiple choice tests consisted of C1 (remembering), C2 (understanding), C3 (evaluating),

C4 (Applying), C5 (Analysing) and C6 (Creating) and the topic chosen was global warming. All of the test items have been judged by several experts who is related to the field, and also tested to students before used as the research instrument. After passed through the process of judgment, the result were accepted, revised, or either deleted. Table 3.2 shows the blue print of the test item.

Table 3.2
Blueprint of Global Warming Topic

Subtopic	C1	C2	C3	C4	C5	C6	Total
Greenhouse effect	12, 18, 20, 25	9		17, 28			7
The cause of global warming	13	1, 7, 19	6			30	6
The effect of global warming	5, 14	2	4, 8, 11	15, 16, 27		29	10
Human effort to reduce global warming	21	10	3	26	22, 23, 24		7
Total test item	8	6	5	6	3	2	30
Percentage (%)	26.7%	20%	16.7%	20%	10%	66%	100%

1) Validity

According to (Fraenkel, Wallen, 2012) validity is correctness, usefulness, appropriateness and meaningfulness of the particular conclusion that is gathered. Validity was used in this research to test whether the instrument was capable of measuring students' concept mastery or not. In order to determine the validity value, researcher used a software application called ANATES. Table 3.3 shows the interpretation of validity value. This formula was used to measure the validity value:

$$r_{xy} = \frac{n \sum xt - \{(\sum x)(\sum y)\}}{\sqrt{\{n \sum x^2 - (\sum x)^2\}\{n \sum y - (\sum y)^2\}}}$$

Information:

r_{xy} = items correlation coefficient

x = total score in test items

y = total score of each student

n = number of students

$\sum x$ = sum of total score of all students for each question's item

$\sum y$ = sum of total score of all students for whole test

(Fraenkel & Wallen, 2012)

Table 3.3

The Interpretation of Validity Value

The amount of r value	Interpretation
$0,80 < r \leq 1,00$	Very High
$0,60 < r \leq 0,80$	High
$0,40 < r \leq 0,60$	Enough
$0,20 < r \leq 0,40$	Low
$0,00 < r \leq 0,20$	Very Low

(Kaplan & Saccuzzo, 2009)

2) Reliability

Reliability can be defined as consistency of one score or one answer from one instrument, and from one set of items to another (Ayodele, 2012).

Table 3.4 shows the interpretation of reliability value. In this research, the researcher used this formula below to calculate the reliability value:

$$a = \frac{K}{K - 1} \left(1 - \frac{\sum_{i=1}^K \sigma_{Yi}^2}{\sigma_x^2} \right)$$

Information:

K = number of items

σ_x^2 = the variance (square of standard deviation)

σ_{Yi}^2 = observed variance from item

Table 3.4

Interpretation Value of Reliability

Gained r value	Interpretation
0,80 - 1,00	Very High
0,60 - 0,79	High
0,40 - 0,59	Prosperous
0,20 - 0,39	Low
0,00 - 0,19	Very Low

(Tilastoseura, Finnish, & Society, 2000)

3) Difficulty level

Difficulty level referred as the degree of difficulty which students' have in answering a question. The difficulty level can be determined by dividing the number of students who are able to answer the question correctly with the total number of students participated in the test (Chauhan & Bhoomika, 2013). Table 3.5 shows the interpretation value of difficulty level. The formula of difficulty level is stated as below

$$P = \frac{N}{A}$$

Information:

P = Difficulty level

A = Number of students who answered the item correctly

N = Total number of students who participated in the test

Table 3.5

Interpretation Value of Reliability

Value of Difficulty Index	Interpretation
0,00 – 0,30	Difficult
0,30 – 0,70	Moderate
0,70 – 1,00	Easy

(Cohen & Manion, 2007)

4) Discriminating power

Discriminating power was used in a test item to distinguish between strong or high-scoring and weak or low-scoring group of students. The high-scoring students were more likely to answer the question correctly, while the low-scoring students had low possibility in answering the test item

correctly (Backhoff, Larrazolo & Rosas, 2015). Table 3.6 shows the interpretation value of discriminating power. The formula of discriminating power is described below:

$$D = \frac{BA}{JA} - \frac{BB}{JB}$$

Information:

D = Discriminating power

BA = Number of high-scoring group that have right answer

BB = Number of low-scoring group that have right answer

JA = Total students of high-scoring participated

JB = Total students low-scoring participated

Table 3.1

Interpretation of Discriminating Power

Value of Difficulty Index	Interpretation
$0,00 < D \leq 0,20$	Poor
$0,20 < D \leq 0,40$	Satisfactory
$0,40 < D \leq 0,70$	Good
$0,70 < D \leq 1,00$	Excellent
D = Negative	Question is deleted

(Exhcoba & Reyna, 2015)

5) Distractor

Distractor is part of multiple choices test item which offer incorrect alternatives, and students have to choose the right alternatives (Cohen et al., 2007). To find out how many distractors there are in every question, measure the number of students who select the wrong answer.

3.4.2 Essay Test

The essay test is used to analyse students' perception toward the topic chosen which was global warming. The essay test was consisted only one open-ended question saying what the students know about global warming. The question is translated to Bahasa because the school used Bahasa Indonesia as their main language.

3.5 Instrument Validation Result

The objective test that was used in this research was multiple choices and need to be validated before used as the research instrument. The objective test needs to be tested to determine its validity, reliability, difficulty level and discriminating power. Before the process of judgment and validation to the students, there were 50 number of test items consisting C1 until C6 level of cognitive domain. The objective test was tested to 42 students who have learned about global warming topic. The result then analysed by ANATES software. Based on the analysis of ANATES, there were 30 number of test items used as the research instrument to measure students' concept mastery. According to the result of ANATES analysis, the reliability of the objective test was 0.93 which considered as very high. Table 3.7 shows the number of test items that were accepted as the research instrument to measure students' concept mastery. The table of recapitulation based on ANATES can be seen in the Appendix A.3.

Table 3.2

The Accepted Number of Test Items

Number of test item	Status of test item	New Number of test item
1	Revised	-
2	Revised	-
3	Revised	-
4	Rejected	-
5	Accepted	1
6	Rejected	-
7	Rejected	-
8	Rejected	-
9	Accepted	2
10	Revised	-
11	Accepted	3
12	Revised	-
13	Accepted	4
14	Accepted	5
15	Accepted	6
16	Accepted	7
17	Accepted	8
18	Rejected	-
19	Accepted	9
20	Accepted	10
21	Accepted	11

Number of test item	Status of test item	New Number of test item
22	Accepted	12
23	Accepted	-
24	Accepted	13
25	Revised	
26	Accepted	14
27	Accepted	15
28	Accepted	16
29	Accepted	17
30	Accepted	18
31	Accepted	19
32	Revised	-
33	Accepted	-
34	Accepted	20
35	Accepted	21
36	Accepted	22
37	Accepted	23
38	Accepted	24
39	Accepted	25
40	Accepted	26
41	Rejected	-
42	Revised	-
43	Accepted	
44	Accepted	27
45	Accepted	-
46	Accepted	28
47	Accepted	-
48	Revised	29
49	Revised	30
50	Accepted	-

3.6 Data Analysis Technique

The data collected in this research were gathered through both of quantitative and qualitative technique. Quantitative method was used to determine students' concept mastery in learning global warming. Meanwhile qualitative method used in investigating students' perception of global warming. Detailed information about data analysis was explained as below:

3.6.1 Students' Concept Mastery Data Analysis

Students' concept mastery was obtained from 30 numbers of multiple choice tests. The analysis was performed by using SPSS software and also

Microsoft excels to calculate the percentage of the students who can answer the question correctly. The normality and homogeneity of the test items were examined using the software. The data collected were evaluated based on two characteristic: firstly, the level of cognitive domain which consisted of 6 levels C1 (Remembering), C2 (Understanding), C3 (Applying), C4 (Analysing), C5 (Evaluating), and C6 (Creating). Secondly, according to the subtopic of global warming topic which consisted with 4 concepts; the greenhouse effect, the cause of global warming, the effect of global warming, and human effort in reducing global warming. The percentages of the correct answers from students were evaluated to define the profile of the concept mastery of the students.

3.6.2 Students' Perception Data Analysis

In this research, students' perception was examined by using semantic network analysis method. Semantic network analysis is a method that can be used to capture students' perception from a written statement and also to view the network between the statements (Lee et al., 2015). An open-ended question asked what students know about global warming was used as the research instrument. After the response from the students were collected, then the data were first translated into English by using google translate function that available in excel since the software only able to examine the response in English or Korean. The semantic network analysis was executed by using software named NetMiner 4.0. Not all of the words came from students' responses were included to the software, some meaningless words such as "I do not know", and "I am forgot" were eliminated. The words "global" and "warming" were also removed because those words were appeared in the question and might influence the result of the analysis. To make the result more adequate, only those words which popped up more than 3 times (frequency) and have more than 3 connections (weight) to other words were selected for the data analysis.

3.7 Research Procedure

In order to make this research well arranged in term of systematic, the research procedure is dividing into three main stages. The three main stages are preparation stage, implementation stage, and completion stage that will be elaborated as follows:

3.7.1 Preparation Stage

In this stage, the author has to analyse the entire variable of this research before conducting the research. The preparation stage of this research is explained as follow:

1. Identifying the problem of the research
2. Conducting literature study about students' concept mastery, students' perception, semantic network analysis and global warming topic from several reliable sources such as journals, e-book as well as articles.
3. Designing research instruments: objective test items and essay test
4. Validating the research instruments to experts
5. Conducting validation of the research instruments to students who have learned about the chosen topic of this research which is global warming
6. Revising the research instruments based on experts' judgment and students' validation result.

3.7.2 Implementation Stage

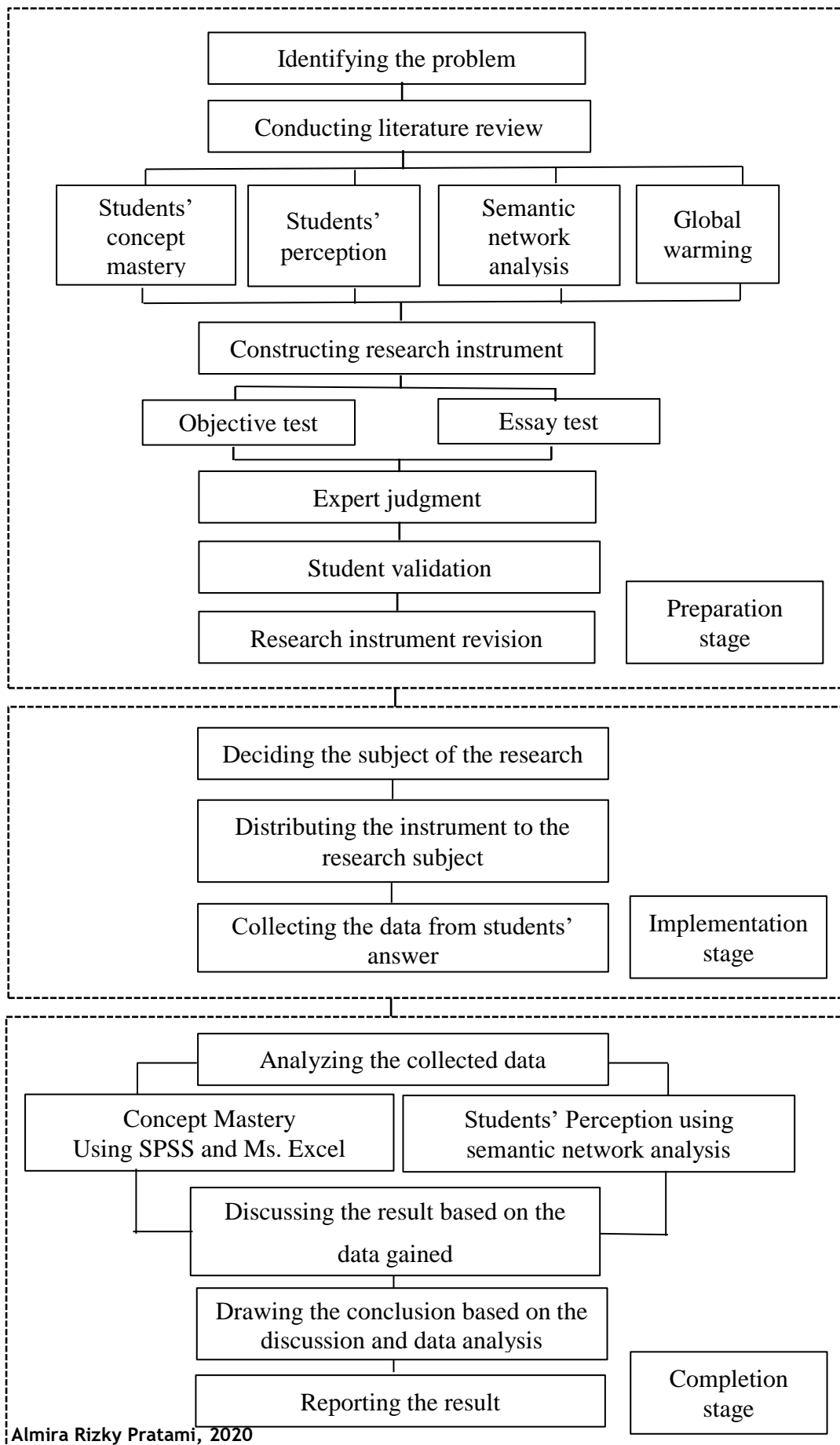
In this stage, the author started to conduct the research to gain the data. The implementation stage of this research is explained as follow:

1. Deciding the research subject
2. Spreading the research instruments to the students
3. Gaining the data from the research instruments

3.7.3 Completion Stage

In completion stage, the collected data from the implementation stage was analysed. The completion stage of this research is explained as follow:

1. Analysing the data gained using SPSS Software and also Microsoft Excel for assessing students' concept mastery and NetMiner software to determining students'
2. Discussing the result based on the data gained
3. Drawing the conclusion based on the discussion and data analysis
4. Reporting the result



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THE PROFILE OF STUDENTS' CONCEPT MASTERY AND STUDENTS' PERCEPTION TAKING

Figure 3.1 Research Procedures