

## **CHAPTER III**

### **RESEARCH METHODOLOGY**

#### **A. Research Method**

This present study used descriptive method. This kind of research concern in the current or past status of something which in line with the focus of this study. This study described or captured junior high school students' critical thinking profile in general, to examine the difference toward the independent variable and find out the correlation between students' critical thinking and other variables. Therefore, this research utilize the data collection and analysis techniques that results is concerned on measuring tendency, variation, comparison, and correlation.

Descriptive research simply describe achievement, attitudes, behaviors, or other characteristics of the subjects. This study focus to ask about something which described in natural setting. Descriptive research do not involve manipulation of independent variables and pay close attention on the nature of subjects and instruments (McMillan & Schummacher, 2001). Descriptive research also involves gathering data that describe events as organizes, tabulates, illustrate, and describe data collection.

#### **B. Population and Sample**

The location of this research was conducted on three public junior high school in Kuningan. The population of this research were the critical thinking of 9<sup>th</sup> grade students from three Public Junior High School in Kuningan, which are school A, School B, and School C. Those school was chosen because they use 2013 curriculum and have good multimedia facilities.

The sample was drawn from one class from each school. According to McMillan and Schummacer (2001), purposive sampling will select the particular elements from the population that will be representative or informative about the

topic of interest, such as population have learned the topic, good ability in using computer, and the has the same status which is students in public school.

### **C. Operational Definition**

In order to avoid misconception about this research. So some operational definitions are explained in this research. Those research variables are explained as follow:

1. Critical thinking is measured by science virtual test on living things and sustainability theme. The science virtual test consist of 26 test items which constructed by eight elements of critical thinking which are generates purpose, raises question at issue, embodies point of view, makes assumption, uses information, utilizes concepts, makes interpretation and inference, and generates implication and consequences. The test item represented 2 or 3 indicators that has been validated with moderate validity and reliability.
2. Gender has several factors that make boys and girls differ in some views. Boys and girls is differentiated by the strength in spatial-mechanical and verbal-emotive. Students' gender will become point of view or independent variable. It use to see the profile of students' critical thinking. The gender data is collected through the respondent identity on the worksheet.
3. Students' learning style become independent variable or point of view to investigate critical thinking profile difference. Learning styles is the style or way students prefer to learn. The learning style data is obtained through VARK learning style questionnaire.
4. Students' motivation become independent variable or point of view to investigate critical thinking profile difference. Students' motivation is the motivation to learn science. Students' motivation to learn science is determined through science motivation questionnaire (SMQ). The science motivation questionnaire is in the form of likert scale, from 0 to 4.

#### D. Research Instrument

The data gathering is using Science Virtual Test, VARK Learning Style Questionnaire, and Science Motivation Questionnaire.

##### 1. Science Virtual Test

Science virtual test is a standardized virtual critical thinking test that have been developed by Rusyati and Firman (2017). It has been validated and ready to be used with moderate reliability (Cronbach alpha 0.71) and moderate difficulty level with range  $0.1 \leq \text{difficulty index} \leq 0.91$ . This instrument is necessary to be used for gaining students' critical thinking skill data. It contains 26 multiple choice question that covered eight elements of Inch critical thinking skill (2006): generates purposes, raises question at issue, makes assumption, embodies point of view, uses information, utilizes concepts, makes interpretation and inferences, and generates implication and consequences. In addition, the test items was also made based on the living things and sustainability theme which limited by core competence 3 as mentioned in curriculum 2013. For further details, Table 3.1 will show the distribution of science virtual test item.

**Table 3.1 Distribution of Science Virtual Test Item**

No	Critical Thinking Elements	Topic			Total Test Item
		Biotechnology	Electricity	Magnetism	
1.	Purpose				4
	a. Clearly stated the purpose.	1			
	b. Distinguishing primary purpose with related purpose.	2			
	c. Stated purpose on target.	3			
2.	d. Stating a significant and realistic purposes	4			4
	Question at issue				
	a. Stating problem question clearly and precisely.	5			
	b. Asking the question in several ways to explain the meaning and scope of the problem.	6			

No	Critical Thinking Elements	Topic			Total Test Item
		Biotechnology	Electricity	Magnetism	
	c. Stating sub question. d. Identifying the problem of question.	7 8			
3.	Assumption a. Identifying assumption and determine the assumption is justifiable. b. Considering that the assumption can form the point of view.	9 10			2
4.	Points of view a. Identify point of view. b. Identifying the strength and the weakness of point of view. c. Strive to be fair-minded in evaluating all point of view.	11 12 13			3
5.	Information a. Expressed support based on data. b. Search for information that oppose and support argument. c. Using the information that is clear, accurate, and relevant with the question at issue. d. Gather information.	14 15 16 17			4
6.	Concepts a. Identify key concepts and states clearly. b. Stating alternative concepts or alternative definition of concepts. c. Using the concept carefully and precisely.	18 19 20			3
7.	Interpretation and inference a. Infer based on evidence. b. Checking the consistency of inferences. c. Identifying assumption can lead to inferences.	21 22 23			3

No	Critical Thinking Elements	Topic			Total Test Item
		Biotechnology	Electricity	Magnetism	
8.	Implication and consequences a. Finding the implications and consequences that followed from reasoning. b. Stating positive and negative implications c. Considering the possible consequences.		25	24	3

The 26 test items is divided into three main topic which are biotechnology, electricity, and magnetism. Because the theme is a unity which limited to living things and environmental sustainability theme so the most topic which covered by the test item is biotechnology with only one or two test item that represent electricity and magnetism topic.

## 2. VARK Questionnaire for Learning Styles

The students learning style is described through VARK questionnaire. This questionnaire has varied of types which differ regarding to the age level of the test taker. So on this research the VARK questionnaire that will be used is appropriate for junior high school students. It consist of 16 items with 4 multiple option which each option represent the one sensory modality, visual, aural, read/write, and kinesthetic learning style. VARK questions can be viewed as test-lets because respondents can select multiple items within a question. The correlations between items within test-lets are a type of method effect. Four multitrait-multimethod confirmatory factor analysis models were compared to evaluate the dimensionality of the VARK. The reliability estimates for the scores of the VARK subscales were .85, .82, .84, and .77 for the visual, aural, read/write, and kinesthetic subscales, respectively, which are considered adequate (Leite et al., 2010). The questionnaire is attached in appendix A.2.

### **3. Science Motivation Questionnaire**

Science Motivation has five dimension which can be determined through science motivation questionnaire. They are intrinsic motivation, self-efficacy, self-determination, grade motivation, and career motivation. Science Motivation Questionnaire is to provide science education researchers and science instructors with a reliable, valid, and convenient tool for assessing students' motivation to learn science and evaluating the effectiveness of instructional strategies and material designed to increase students' motivation. The science motivation questionnaire is developed by Glynn (2006). The reliabilities (internal consistencies) of the scales, assessed by Cronbach's alphas, were: career motivation (0.92), intrinsic motivation (0.89), self-determination (0.88), self-efficacy (0.83), and grade motivation (0.81). The Cronbach's alpha of all 25 items was 0.92 (Glynn, 2011). The questionnaire is attached on appendix A.3

### **E. Data Analysis**

Data analysis conducted based on the research question:

#### **1. Scoring Procedure and Data Analysis for Students respond in Critical Thinking Test**

The science virtual critical thinking test has unequal allocation of test item for each element of critical thinking. Thus, the raw score of each element need to be converted into proper scale. The average score is obtained by divided the total number with the total question of the elements (Arikunto, 2013).

In order to build critical thinking profile, the main data analysis which used is descriptive analysis, which focus on mean value. In this case, the means and standard deviations were computed for overall and eight elements critical thinking score to provide critical thinking skill profile.

Based mean and standard deviation of each element and overall critical thinking score, the critical thinking skill attainments can be categorized into low, moderate, and high as follow as:

**Table 3.2 Interpretation of Students' Attainments**

Interval	Category
$X \geq \bar{x} + SD$	High
$\bar{x} - SD \leq X \leq \bar{x} + SD$	Moderate
$X \geq \bar{x} - SD$	Low

Where,

X = Students' Score

$\bar{x}$  = Mean of Score

SD = Standard Deviation

(Arikunto, 2013)

Based on interpretation category above, the students' critical thinking attainments can be categorized on three following levels, low (score < 43.33), moderate ( $43.33 \leq \text{score} < 69.75$ ), and high (score  $\geq 69.75$ ).

## 2. Examine The Critical Thinking Difference on Defined Variable

In this present study the difference on defined variables is analyzed by using IBM SPSS version 23. For examining the difference between two variables, Mann Whitney or t-test can be applied. For examining the difference for more than two variables Kruskal Wallis or One way ANOVA might be used.

This study examine the critical difference within gender (male and female group), learning style (visual, aural, read/write, and kinesthetic group), and students' motivation to learn science (low, moderate, and high motivation group). Before the type of test is determined, the normality in critical thinking score on defined independent variables is checked by divided the skewness by its standard error. It considered to be approximately normal if the result is less than 2.5. The simpler way is by checking the skewness value. If the skewness is less than plus or minus one ( $< +/- 1.0$ ), the variable is at least approximately normal (Leech, Barrett, & Morgan, 2005; Susetyo, 2010). All critical thinking score appear to be approximately normal on the independent variable. Hence, the significant differences is tested by using t-test and one way ANOVA.

## 3. Examine The Correlation between Two Variables

Correlations are inferential statistics that are used to assess the association or relation between two variables. On this study, the correlation is applied to find out



the relationship between critical thinking skill level (high, moderate, and low) and students' motivation level (high, moderate, and low). Since the data is in ordinal so the Kendall Tau-b correlation test is applied.

The degree of relationship determined how closely the variable are related. This is usually are expressed as a number between -1 and 1 and known as correlation coefficient. A zero correlation indicates there is no relationship. As the correlation coefficient moves toward either -1 or +1, the relationship getting stronger until the perfect correlation on the end of the points (McMillan and Schumacher, 2001).

## **F. Research Procedure**

In general, the research procedure is consist of preparation stage, implementation stage, and completion stage.

### 1. Preparation Stage

- a. Defining variables of research
- b. Literature review about computer based test, critical thinking, gender difference, VARK learning styles, and science motivation to learn science
- c. Determining research instrument: SVT, adopting VARK Questionnaire, adopting Science Motivation Questionnaire (SMQ)
- d. Determining sample and population
- e. Conducting and revising research proposal
- f. Conducting research administration and determining the schedule

### 2. Implementation Stage

This stage is in school, the collecting data will be as follows:

- a. Profiling critical thinking skill of students from three school
- b. Gathering students' learning styles from three school
- c. Gathering students' motivation from three school

### 3. Completion Stage

- a. Processing data collection
- b. Analysis the data
- c. Discussing the finding

d. Constructing conclusion

To have clearer plot of this research the distinct procedure is illustrated in Figure 3.1.

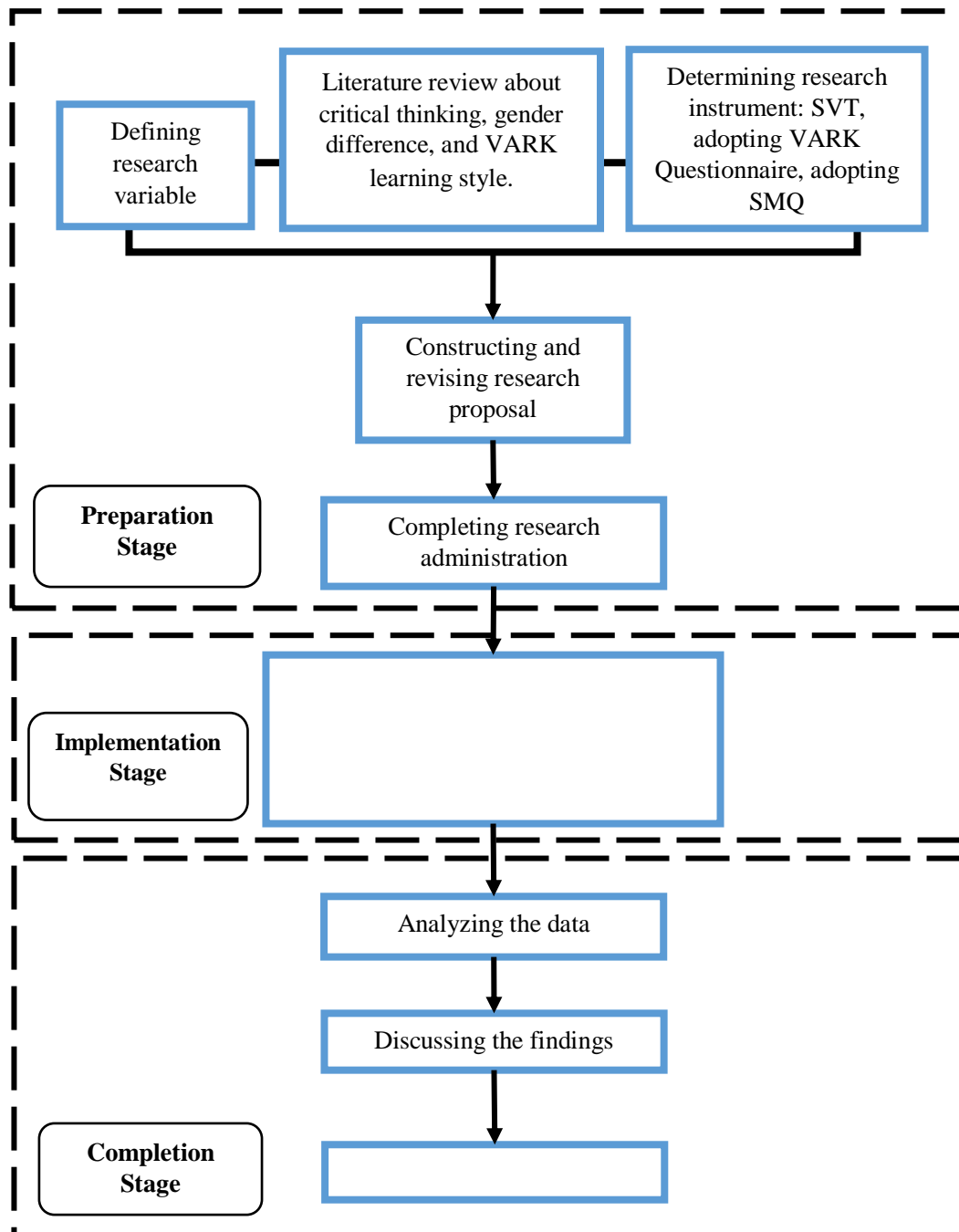


Figure 3.1 Plot of the research