

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Method

The method that is used in this study is descriptive. The descriptive method is explained as the general procedure which purposes to describe a phenomenon (Johnson, 1953). The objective of this study is to analyse the science process skills indicators and describe their occurrence on the worksheets of junior high school textbooks. Therefore, using the descriptive method in this research is correct.

3.2 Research Subject

The research subject that is used in this study is worksheets in grades 7, 8, and 9 in science textbooks for Junior High School. There is no subjectification in choosing a specific worksheet. The purpose of choosing the books in all grades is to make the data inclusive as well as to gather more information to make the result more diverse and comprehensive. Another reason for selecting all books is to see whether or not the pattern of the indicator of Science Process Skills will stay the same. The digital version of these books can be accessed online and downloaded legally for free through the website as follow by logging in with *google* account, *belajar.id* account, or *rumah belajar* account <https://bse.belajar.kemdikbud.go.id/#!/Home/Welcome>.

3.3 Operational Definition

Science process skills indicators in this study are justified by using science worksheet analysis. There are five indicators of basic science process skills namely observation, classification, testing and using the number, constructing space-time relationship, and prediction (Karamustafaoglu, 2011). The detail of science process skills is written as follow.

- 1) Observation is the process of gathering information by using five senses. This process is necessary to ease the students in thinking and responding to information in more complex and various ways (Safaah et al., 2017).
- 2) Classification is the activity of grouping objects based on the similarity of the properties or characteristics (Delen & Kesercioğlu, 2012).
- 3) Making use of the students' mathematical ability is the key to testing and using number skills (Delen & Kesercioğlu, 2012).

- 4) Being able to connect the correlation between physical space and time is the definition of constructing a space-time relationship (Delen & Kesercioğlu, 2012).
- 5) The last indicator, prediction, relies on the students' ability to guess the future occurrence based on the previous pattern of proof (Delen & Kesercioğlu, 2012).

Along with the basic science process skills, the integrated science process skills are also followed by five indicators. They are experimenting, hypothesizing, identify and controlling variables, interpreting data, and obtaining results (Karamustafaoğlu, 2011).

- 1) In experimenting, the students are expected to design and choosing the tools as well as the materials they need in their investigation (Delen & Kesercioğlu, 2012).
- 2) To be called able in hypothesizing, the students have to be able to construct a prior question toward the output of the investigation they are going to conduct (Delen & Kesercioğlu, 2012).
- 3) Identifying and controlling variables mean that the students have to be able to differentiate between two variables: dependent and independent variable. The dependent variable is described as the “effect” where the independent variable is the “cause” of the effect (Delen & Kesercioğlu, 2012).
- 4) In interpreting data, the students deliver the data of their investigation by using a table, graph, or any other visual representations. This means that the students have to show their ability in presenting patterns or relationships between ideas into those visual representations (Joyce et al., 2008).
- 5) In obtaining the result, the students are asked to gather all data or information they get from the previous activity (Delen & Kesercioğlu, 2012).

3.4 Research Instrument

The researcher of this study used a science worksheet analysis table for validating the data. The analysis table consists of the information of the grade, semester, title of the chapter, code (independently made), page, and title of the worksheet, followed by the indicators of the Science Process Skills from basic science process skills and integrated science process skills. A score of 1 (one) is

given if an indicator of Science Process Skills is present in the worksheet. All of the worksheets in 6 (six) books show more than 1 (one) Science Process Skills indicator. The table as seen as following is the template of how the basic science process skills occurrence in the worksheet were sorted.

Table 3.1
Template of Science Worksheet Analysis Table of Basic Science Process Skills Indicators Occurrence on Worksheet

Specification of Science Worksheet based on Indonesian National Book (Curriculum 2013)						Identification of Science Worksheet based on Science Process Skills Category				
Grade	Semester	Chapter	Chapter Title	Code	Page	Worksheet Title	Basic Science Process Skills			
							Observation	Classification	Testing and Using Number	Constructing Space and Number Relationship
7	I									
7	II									
8	I									
8	II									
9	I									
9	II									

(Karamustafaoğlu, 2011)

Similar to the previous table, an analysis table is also used with differences in the indicators which now is consisted of integrated science process skills indicators. As seen as following is the template of the analysis table of integrated science process skills appearance in student worksheets.

Table 3.2
Template of Science Worksheet Analysis Table of Basic Science Process Skills Indicators Occurrence on Worksheet

Specification of Science Worksheet based on Indonesian National Book (Curriculum 2013)						Identification of Science Worksheet based on Science Process Skills Category					
Grade	Semester	Chapter	Chapter Title	Code	Page	Worksheet Title	Integrated Science Process Skills				
							To Make Experiment	To Hypothesize	To Identify and Control Variable	To Interpret Data	To Obtain Result
7	I										
7	II										
8	I										
8	II										
9	I										
9	II										

(Karamustafaoğlu, 2011)

3.5 Data Analysis

The worksheets are sorted from semesters I and II based on the grade level. Specific code is used to ease the researcher in identifying the number of worksheets as well as the indicators present in each semester. The occurrence of each science process skills indicator in the worksheet is represented by “1” (one) in the table. If the indicator is absent, a “0” (zero) point is given. Each indicator occurrence in six

semesters is summed. After that, the percentage of one indicator's occurrence is summed and divided by the total occurrence of all indicators (649 occurrences).

Lawshe's CVR (Content Validity Ratio) is used to validate and test the reliability of the instrument. Lawshe's Content Validity Ratio is a method that is used to measure the agreement among raters toward a specific item. The value of CVR ranged from -1 (negative one) to 1 (one). The more valid and reliable the instrument, the bigger the value of CVR. The research instrument is indicated as essential if more than half of the raters agreed. It means that the value of CVR needs to be more than 0 (zero), while the value 0 (zero) of CVR represent that half of the raters agreed, lastly if less than half of the raters agreed then the value of CVR will be lower than 0 (zero) (Lawshe, 1975). The formula of CVR is shown as follow.

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

(Lawshe, 1975)

CVR : The Content Validity Ratio value

n_e : The number of raters who agree toward a specific item

N : Total raters involved

The inter-rater agreement is used to test the validity of the data analysis result in this research. The agreement is needed from experts to reduce the subjectivity of the data, as well as to prove that the researched data is objective. Three raters that are involved in this study are junior high school, science teachers. The judgment result is analysed with CVR (Content Validity Ratio) and presented in Table 3.3.

Table 3.3
CVR (Content Validity Ratio) value of science process skills indicators

No.	Science Process Skills	Indicators	CVR (Content Validity Ratio)	
			Value	Interpretation
1.	Basic	Observation	0.982	Essential
2.	Basic	Classification	0.989	Essential
3.	Basic	Testing and Using Number	0.971	Essential
4.	Basic	Constructing Space-Time Relationship	0.996	Essential

No.	Science Process Skills	Indicators	CVR (Content Validity Ratio)	
			Value	Interpretation
5.	Basic	Predicting	0.982	Essential
6.	Integrated	To Make Experiment	0.993	Essential
7.	Integrated	To hypothesize	0.978	Essential
8.	Integrated	To Identify and Control Variables	0.986	Essential
9.	Integrated	To Interpret Data	0.946	Essential
10.	Integrated	To Obtain Result	0.993	Essential

As seen from the table, the result of the data analysis showed that each indicator in science process skills obtained more than 0.9 of CVR value which concluded that this data research is valid.

SWOT analysis is applied in this study where the researcher profiles the science worksheets' strength, weakness, opportunity, as well as the threat after validating the data. The researcher analyses the worksheet by identifying the occurrence of particular science process skills indicators in each grade and breaking down its effect on the students' skills in processing science.

3.6 Research Procedure

To make a good sequence systematically of the research, the research procedure is arranged in three main stages. Those three stages are the preparation stage, implementation stage, and completion stage.

- 1) Preparation Stage
 - a) Preparing problems to be investigated.
 - b) Reviewing the literature of science process skills.
 - c) Gathering research instrument.
 - d) Validating research instrument.
 - e) Revising the instrument based on experts' feedback.
- 2) Implementation Stage
 - a) Checking the indicators' occurrence in the worksheet.
 - b) Writing down the appearance of the indicator as "1" (one), and "0" (zero) for the absence of the indicator.
 - c) Calculating the percentage of each indicator occurrence in the worksheets.

- d) Testing the data based on the interrater agreement by using CVR (Content Validity Ratio).
 - e) Conducting SWOT analysis based on the result of the indicators' occurrence.
- 3) Completion Stage
- a) Analysing the final result of science worksheet analysis.
 - b) Obtaining results and discussion.
 - c) Drawing conclusion based on the data analysis.
 - d) Finalizing research report.

A flowchart procedure is made to describe how the flow of the study is conducted. The flowchart can be seen as follow.

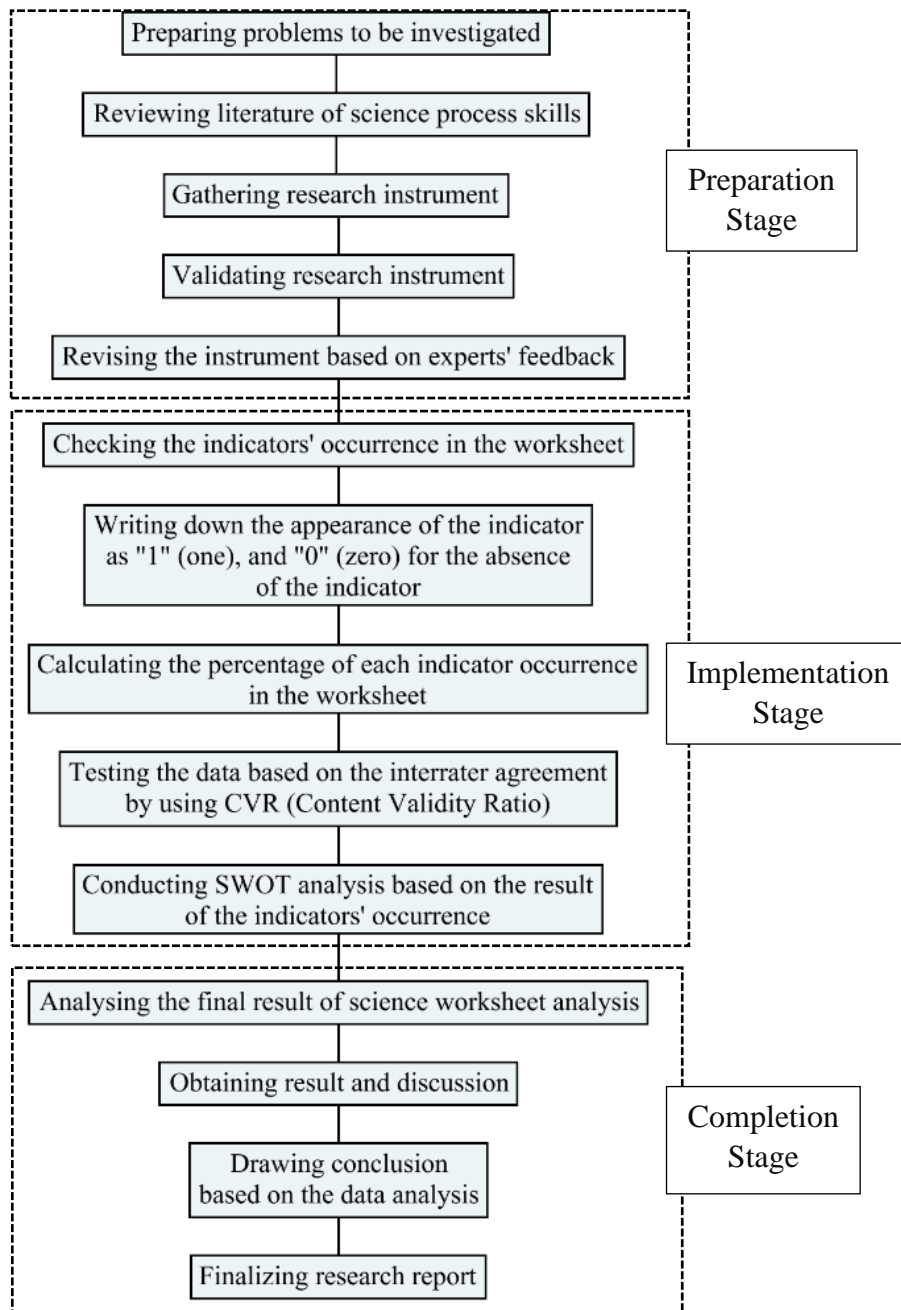


Figure 3.1 Flowchart of Research Procedure