CHAPTER III
RESEARCH METHODOLOGY

3.1 Research Design

In this research, the research type was qualitative-descriptive research. Based on Lambert, V. A., and Lambert, C. E. (2012) the purpose of qualitative descriptive research is to provide a complete summary of specific events experienced by individuals or groups of individuals.

The term qualitative description (QD) refers to descriptive studies in qualitative research. QD has been highlighted as vital and relevant for research questions aimed at determining who, what, and where events or experiences occurred, as well as gathering information from informants about a poorly understood phenomenon (Kim, Sefcik, and Bradway, 2016).

While to gain the data, the research methodology that was used to process the data was by content analysis which was to describe data objectively, systematically, and communicatively through a set of procedures to find conclusion of a problem from the data sources. Content analysis is to summarize and categorize the data into simpler context from the analyzed data (Cohen, Manion, and Morrison, 2007).

3.2 Research Object

The object of this research was Junior High School science textbook (BSE) for 8th grade students 1st semester based on Curriculum 2013 (*Buku Ilmu Pengetahuan Alam*/IPA) which was published by Kemendikbud from the government on 2017. Topics on this book consisted of 6 topics which are movements, simple machine, plant structure and function, digestive system, additive and addictive substance, and circulatory system.

This textbook was chosen because this book is the main textbook that is used by the most schools in teaching and learning process. According to the aim of curriculum 2013 and the purpose of this book to accomplish the better quality of science teaching and learning compared to other countries by following the standard of assessment like Program for International Student Assessment (PISA) which consist of several scientific literacy competencies.

The textbook is taking a big role in learning process to fulfill the main goals. So research and evaluation toward the textbook is needed to improve the contents for a better quality and standard based on scientific literacy competencies.

3.3 Data Sources

The data sources used in this study were divided into two types, which were primary data sources and secondary data sources:

3.3.1 Primary Data

The primary data source for this research was from junior high school science textbook (*Buku Ilmu Pengetahuan Alam*/IPA) 2017 published by Kemendikbud from the government according to curriculum 2013. The textbook which consisted of 6 main topics based on core competence 3 and basic competencies 3.1 – 3.7 that are attached in *Peraturan Menteri Pendidikan Nasional* No.37 (2018) for 8th grade students in junior high school.

3.3.2 Secondary Data

The secondary data sources were for supporting data that was taken from outside the primary data such as journals, documents, and/or another book related to science textbook and scientific literacy analysis.

3.4 Data Collection Technique

The data collection techniques used in this study was documentary study. Documentary study is one of the qualitative research techniques by observing or analyzing documents written directly by the research author or by another researcher. Documentary analysis can be appealing for a variety of reasons. It can also help researchers reach out to inaccessible people or subjects, such as in historical study.

Furthermore, unlike non-participant or indirect observation, the writer has little or no response, especially if the document was not created with the aim of being used as research data. Longitudinal analysis can benefit from documentary research since it can reveal how situations have changed over

time. Understanding its context is important to be able to interpret the multi-level of the documents (Cohen, Manion, & Morrison, 2007).

3.5 Operational Definition

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

a. Scientific Literacy

Scientific literacy according to PISA 2018 is defined by 3 competencies which are the ability of scientifically explaining phenomena, evaluating and designing scientific enquiry, and scientifically interpreting data and evidence (OECD, 2019).

b. National Science Textbook (BSE) for 8th Grade Students

National science textbook (BSE) that has been published by the government is to support students to reach the goal of Curriculum 2013. Also to know the quality of science teaching-learning compared to other countries based on The Trends in International Mathematics and Science Study (TIMSS) and Program for International Student Assessment (PISA) (Kemendikbud, 2017).

3.6 Reseacrh Instrument

In this research, instrument is necessary to be used for gaining data. There are rubrics as instruments that used to analyze the representation of scientific literacy in science school textbook. Those instruments are described below:

3.6.1 Contexts for the PISA Science Assessment

Table 3.1 Contexts for the PISA Science Assessment

Contexts for the PISA Science Assessment			
	Personal	Local/National	Global
1. Health	Maintenance of health, accidents, nutrition	Control of disease, social transmission, food choices, community health	Epidemics, spread of infectious diseases

Contexts for the PISA Science Assessment			
	Personal	**Local/National**	**Global**
2. Natural resources	Personal consumption of materials and energy	Maintenance of human populations, quality of life, security, production and distribution of food, energy supply	Renewable and non-renewable, natural systems, population growth, sustainable use of species
3. Environment	Environmentally friendly behavior, use and disposal of materials	Population distribution, disposal of waste, environmental impact, local weather	Biodiversity, ecological sustainability, control of pollution, production and loss of soil
4. Hazard	Natural and human-induced, decisions about housing	Rapid changes (earthquakes, severe weather), slow and progressive changes (coastal erosion, sedimentation), risk assessment	Climate change, impact of modern warfare
5. Frontiers of science and technology	Interest in science's explanations of natural phenomena, science based hobbies, sport and leisure, music and personal technology	New materials, devices and processes, genetic modification, weapons technology, transport	Extinction of species, exploration of space, origin and structure of the universe

Scientific Literacy Context (OECD, 2019)

3.6.2 PISA Scientific Competencies

Table 3.2 PISA 2018 Scientific Competencies

| PISA 2018 Scientific Competencies		
1. Explaining phenomena scientifically	A.	Recalling and applying appropriate scientific knowledge;
	B.	Identifying, using and generating explanatory

PISA 2018 Scientific Competencies		
		models and representations;
	C.	Making and justifying appropriate predictions;
	D.	Offering explanatory hypotheses;
	E.	Explaining the potential implications of scientific knowledge for society
2. Evaluating and designing scientific enquiry	A.	Identifying the question explored in a given scientific study;
	B.	Distinguishing questions that are possible to investigate scientifically;
	C.	Proposing a way of exploring a given question scientifically;
	D.	Evaluating ways of exploring a given question scientifically;
	E.	Describing and evaluating a range of ways that scientists use to ensure the reliability of data and the objectivity and generalizability of explanations.
3. Using scientific evidence	A.	Transforming data from one representation to another;
	B.	Analyzing and interpreting data and drawing appropriate conclusions;
	C.	Identifying the assumptions, evidence and reasoning in science-related texts;
	D.	Distinguishing between arguments that are based on scientific evidence and theory and those based on other considerations;
	E.	Evaluating scientific arguments and evidence from different sources (e.g. newspaper, Internet, journals)

Scientific Literacy Competencies (OECD, 2019)

3.7 Data Analysis Technique

Unlike other qualitative approaches, data analysis in qualitative descriptive research does not rely on a pre-existing set of rules derived from the philosophical or epistemological stance of the discipline that created the specific qualitative research approach. Rather, qualitative descriptive research is completely data-derived in the sense that codes are produced from the data throughout the course of the investigation. Qualitative descriptive studies, like other qualitative research techniques, are distinguished by simultaneous data gathering and analysis (Lambert, V. A., and Lambert, C. E., 2012).

Data analysis in this study is using Miles and Hubermen's interactive analysis techniques. The data analysis cycle according to Miles, Huberman, & Saldaña (2013) is described as follows.
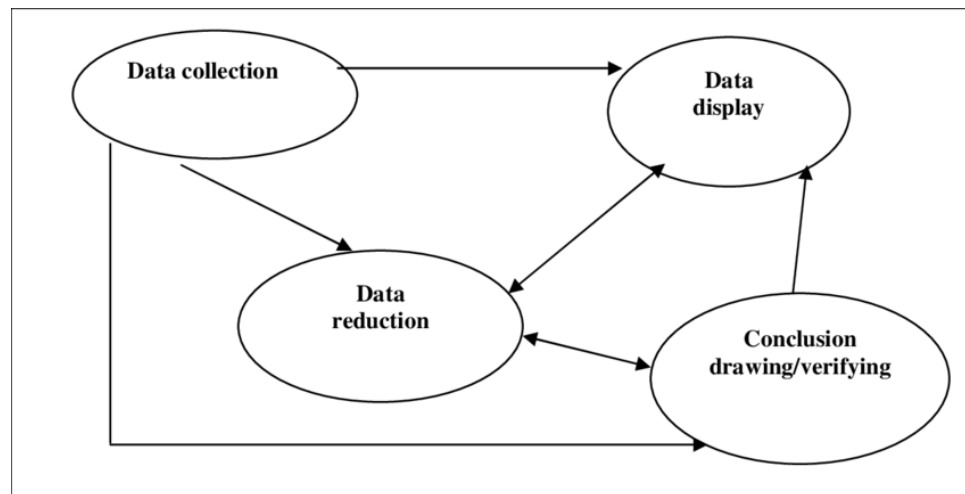
(Miles, Huberman, & Saldaña, 2013)

Figure 3.1 Interactive Model of Data Analysis Techniques

3.7.1. Data Reduction

Data reduction is carried out by summarizing, selecting the main points, and focusing on the things that are important. Selecting the appropriate data, and separating the data that is not needed to facilitate further data collection.

3.7.2. Data Display

The data that has been reduced is then presented in narrative form and is equipped with tables to clarify the analysis and describe the research results in the form of findings from the overall results of the analysis of the science textbook for 8th grade student 1st semester.

3.7.3. Conclusion Drawing/Verifying

Conclusions are drawn after the data is analyzed which was presented by narrative form and tables in the previous section. The conclusion is in form of a narrative text with the statement according to the final result discussed.

The analysis scientific literacy context was through analyzing its materials or theories from each chapter while to analyze the scientific literacy

competencies was through analyzing the test unit related to materials or experiments.

Here is the equation to calculate the representation of scientific literacy competencies in the analyzed textbook:

$$\text{Scientific literacy\%} = \frac{\sum indicator\ score}{\sum total\ indicator\ score} \times 100\%$$

3.8 Research Procedure

3.8.1 Preparation Stage

a. Identify problem and objectives.

b. Analysis literature review of scientific literacy, PISA, and 8th grade student national textbook based on 2013 curriculum.

c. Constructing research instruments.

d. Research instrument validation by expert.

e. Research instrument revision.

f. Planning research timeline.

3.8.2 Implementation Stage

a. Observing contents of the textbook.

b. Analyze the scientific literacy context.

c. Report and discussion with supervisors.

d. Analyze the scientific literacy competencies.

e. Report and discussion with supervisors.

f. Data revision

3.8.3 Completion Stage

a. Analyze the data of the whole research.

b. Discussion and result.
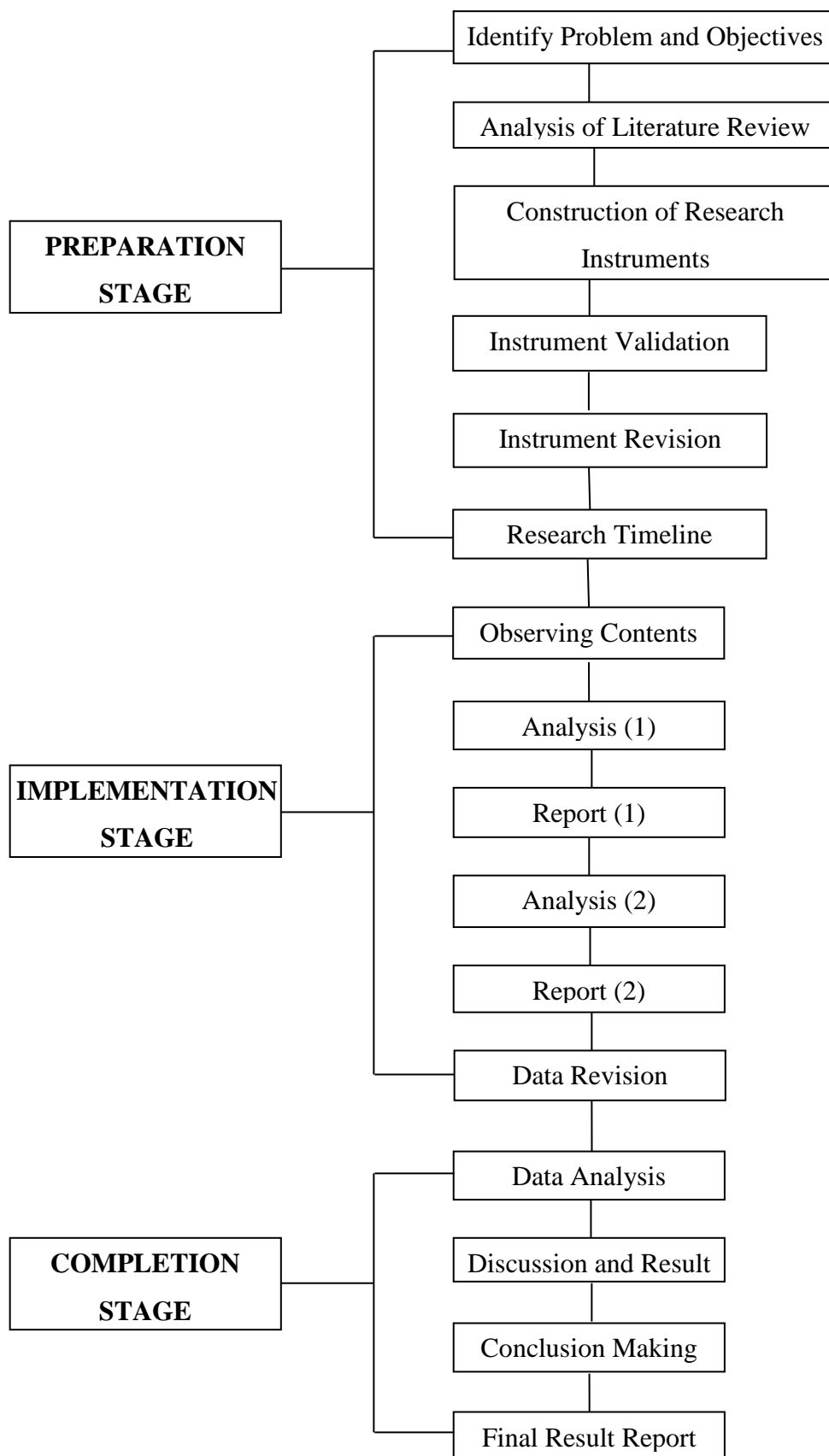
c. Make a conclusion from the data analysis result.

d. Make the result report.

Figure 3.2 Research Procedure Plot