CHAPTER III

RESEARCH METHODOLOGY

This chapter describes the research methods and components related to the research methods used. The components in question consist of location, research subjects, research methods, research instruments, instrument validation, data collection techniques, and data analysis techniques as well as agreement on the results of the data obtained.

3.1 Research Method

The descriptive method was used in this study. The purpose of descriptive studies is to describe and interpret, and the current status of individuals, settings, conditions, or events (Mertler, 2014). The descriptive research was used this time is because to test the research subject directly to describe the individual status of my current subject.

3.2 Research Design

This research was used survey research. Survey research designs are procedures in quantitative research in which investigators administer a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviours, or characteristics of the population (Creswell, 2012). Scientific articles are tools that were used in this research, using scientific articles obtained from valid sources that will cover learning material for the human respiratory system. This article was distributed to students as the subject of this research. The articles are used to be distributed to students and used as tools to retrieve data by instructing students to make questions about the material in the articles that are distributed. From there, each student was given time to read the article, then asked to make 5 questions related to human breathing material. From here I get the data, namely the results of the questions made by students. The collection of survey results, namely the questions that the students make, examined using QCSS as a rubric or standard in determining the results of the survey and process them as final data for profiling the students' questions skill in the field of science.

3.3 Population and Sample

The population that I used in this study I made all 8th-grade students in a private school in Bandung and one of the public schools in Subang. Because in this study I

measured the ability to ask students about the topic of the human respiratory system where this topic was studied by class students. 8 junior high schools in the 2013 curriculum.

Stratified random sampling is a process in which certain subgroups, or strata, are selected for the sample in the same proportion as they exist in the population (Jack R. Fraenkel, Norman E. Wallen, 2012). In this case, the stratified sampling technique is the most appropriate because it is determined by determining the group in stages. By determining the school, then determining the population of this study is the 8th-grade, and determining the students who study a topic, namely the topic of in humans' respiratory system intending to take its representation.

The questions that were analysed were those posed by students each asking questions in each of their articles. The number of questions contained in each analysed article is the same. This can be seen in Table 3.1

Table 3.1
Summary of Students Question on Article 1 and Article 2

Article	Questions	Male	Percentage	Female	Percentage
Respiratory System	281	105	37.37%	176	62.63%
Pneumonia	291	116	39.86%	175	60.14%

In table 3.1 it can be seen the number of questions can be seen by students in article 1 visiting 281 questions and article 2 "pneumonia" 291 questions. With each question grouped by gender. In article 1 there is 37.37% submitted by a male and 62.63% were submitted by a female. In Article 2 there are 39.86% of questions at the base by male and 60.14% by a female.

3.4 Operational Definition

The terminology used in this research is defined as the following: The ability to ask students will be one of the skills needs of the 21st century, critical thinking will be shown from the students' questioning skills. The great curiosity that students must be ready to live the inner era of their lives in the future. Because of that, students' questioning skills should be known to prepare the peacock in facing the skills needs of the 21st century. QCSS can be a measuring tool for analyzing student questioning skills by classifying the types of questions students make. Bloom Blosser's Taxonomy (1973) introduced the Question

Category Structure for Science (QCSS) tool for researchers to identify the types of open and closed questions posed by students.

The topic of learning human respiratory systems is a topic that is being discussed by all parties. On the other hand, Pneumonia is very busy talking and has become a major topic in the world of health today. A new type of virus was discovered in 2019, namely COVID-19, which is one indication of pneumonia. By raising this student will ask more questions or feel more curious to find out more. So, using sources for learning, scientific literacy is needed that comes from good sources, such as scientific articles. By presenting facts that are relevant to student learning material, it will bring students to life issues that are currently the main topic in socializing.

3.5 Research Instrument

3.5.1 Scientific Article

Teaching materials are in the form of scientific articles that are used as instruments to be distributed to students of class VIII SMP. Scientific articles are used as a learning resource which is a reliable source whose research results are in the form of facts and can be accounted for, becoming the main basis for scientific articles to be used as learning resources for students. Scientific articles by presenting facts that are relevant to student learning materials will bring students to life problems that are currently the main topic in socializing. Not only understanding the learning material but students will be invited to see facts and facts that occur in their environment. This will stimulate students' curiosity to ask questions.

The distribution of articles to all student subjects is intended so that students read and learn the content of the articles presented. After reading the article, students will be asked to make 3 questions about the topic in the scientific article they are reading. The article presented in it discusses respiratory disorders in humans such as pneumonia-related to Covid-19, where this outbreak is still very busy being discussed and is the main topic of research in the field of science. The students will learn and get information through articles.

However, previously, the two articles used had been tested by expert judgment and also tested for translation, and finally readability by science subject teachers and 8th-grade students who had studied the material. 3 expert judges approve the use of the article. By checking. With the results of the three judgments, judgments have been approved for the

use of the article, although some comments require the translation of the article from English to Indonesian. Therefore, a translation assessment was carried out. With the indicators in Table 3.2.

Table 3.2
Translation rating scale of scale

Indicator	Value	Category
Almost Perfect	86–90	There is no distortion of meaning; fair delivery; almost not like a translation; no spelling mistakes; there are no grammatical errors/deviations; there is no mistake use of terms.
Very Good	76–85	There is no distortion of meaning; no online dictionary translation rigid; there is no misuse of the term; there are one or two grammar/spelling errors.
Good	61–75	There is no distortion of meaning; there is a rigid dictionary translation, but relatively no more than 15% of the entire text, so that doesn't feel like a translation; idiom and grammar mistakes not more than 15% of the entire text; there are one or two uses terms that are not common/standard; There are one or two spelling mistakes.
Good Enough	46–60	Feels like a translation; there are several dictionary translations stiff, but relatively not more than 25% of the entire text; there are one or two terms of usage that are not common /standard and/or less clear.
Poor	20–45	Feels like a translation; too many translations are stiff literal (relatively more than 25% of the entire text); distortion of meaning and misuse of the term more than 25% of the entire text.

(Alawi, 2019)

The suitability of the translation results in this study was tested using the level of conformity model used by Alawi on the scale in Table 3.2. From the scale above, an expert rating was obtained before being revised with the results in Table 3.3.

Table 3.3
Validation of Translation Experts on Articles

Scientific Article	Indicator	Value
Article 1	Good	65
Article 2	Good enough	60

The results in Table 3.3 show a scale of value of 65 which means good, and in article 2 with a scale of value of 60 which means quite good. After that, a revision was made to improve it, and a readability test was carried out by 5 science teachers and 5 8th grade junior high school students.

The readability of an article is improved by making it readable in each paragraph. In this case, the rubric in Appendix A.4 Readability of Scientific Articles is used as the readability standard for article 1 and article 2 in each paragraph in it. Article 1 has 10 paragraphs and article 2 which has 15 paragraphs. The readability test was carried out by five assessors, two of whom were grade 8 students and three were teachers who teach in junior high schools. With the results shown in Table 3.4 Article 1 with an average number of agreed assessments of all aspects in the whole paragraph of 85% and article 2 of 88%. With details are attached in the appendix.

Table 3.4
Result of Readability of Scientific Articles

Articles	Percentage	
	Yes	No
1	85%	15%
2	88%	12%

The readability of an instrument or scientific article can use Validation using CVR or Validation of Readability According to Law she, if more than half of the panellists indicate that an item is important/essential, then the item has content validity. The CVR value for each item is determined using the following formula:

$$CVR = \frac{\left(ne - \frac{N}{2}\right)}{\left(\frac{N}{2}\right)}$$

Information:

CVR = Content Validity Ratio

no = The number of panellists who answered "YES"

N = The number of panellists

This formula produces values that range from +1 to -1, a positive value indicates that at least half of the panellists rated the item as important or appropriate. The greater the CVR value of 0, the more "important" and the higher the validity of the content (Almanasreh, Moles, & Chen, 2019).

Table 3.5
The results of the Validation of Readability in Article 1

No Of Paragraph	Number of Responses Judgment		Index CVR	Criteria
	Yes	No		
1,2,3,4,9,8,10	√		1	Essential
5,6,7		√	0.6	Not Essential

Table 3.5 shows the results of legibility validation carried out by five people, consisting of two students and three science teachers who teach in junior high schools. Article 1 consists of ten paragraphs on the topic of the human respiratory system where three paragraphs of which are paragraphs that are considered less essential. And eliminated in this study. Meanwhile, Table 3.6 is a table of results from legibility validation carried out by five people, consisting of two students and three science teachers who teach in junior high schools with different articles, namely articles about pneumonia. This second article consists of 15 paragraphs. The sixth, twelfth, fourteenth, and fifteenth paragraphs are considered not essential, with a CVR index of 0.6.

Table 3.6
The results of the Validation of Readability in Article 2

No Of Paragraph	Number of Responses Judgment		Index CVR	Criteria
	Yes	No		
1,2,3,4,5,7,8,9,10,11,13	√		1	Essential
6,12,14,15		√	0.6	Not Essential

Furthermore, referring to Wilson 2012 The results of the next calculation are compared with the CVR from the 5% significance level table ($\alpha = 0.05$). While the CVR value for the five validators is 0.73. Based on the results of the readability test, revisions were made to the paragraphs that were not appropriate, before being distributed to the students of the research subjects. Paragraphs which according to the judge are deemed ineligible, are removed from the article. As in the first article, there are ten paragraphs, after the readability test of the CVR, the paragraph which is considered essential contains only seven paragraphs, and in article du which contains fifteen paragraphs, there are considered essential only eleven paragraphs.

3.5.2 Students' question skills based on Question Category System (QCSS)

Measuring student's questioning skills used the instrument, namely by classifying the questions made by students. Building on the Taxonomy of Bloom Blosser (1973) introduced the QCSS tool for researchers to identify the types of open and closed questions posed by students. Closed questions are limited to acceptable answers, "correct responses," and open-ended questions suggest a collection of acceptable answers that refer to the specific experiences of students (Crittenden, 2014).

QCSS consists of three classification levels as discovered by Blosser. In the first level, the questions are divided into open questions and closed questions. In the second

level, the questions are divided into four ways of thinking, namely cognitive memory and convergent thinking for closed questions, divergent thinking, and evaluative thinking for open questions. The third level on QCSS is dealing with the way of thinking that question demands.

Tabel 3.7
Question Category System for Science

FIRST LEVEL	SECOND LEVEL	THIRD LEVEL
1. Closed Question	1. Cognitive-Memory Operations	1. Remembering includes repeating and imitating, memorizing definitions. 2. Identification, nominate (Labelling), observe.
	2. Convergent Thinking Operations	1. Associating, discriminating, classifying. 2. Redefine 3. Apply the information that has been obtained in advance for solving new problems or other problems. 4. Synthesize. 5. Forecasting (closely) the limitations are determined by the conditions or the existing evidence. 6. Make critical decisions using standards commonly recognized by the class.
2. Open Question	1. Divergent Thinking Operations	1. Express an opinion. 2. Openly predicting data but not sufficient to limit answers. 3. Summing up.
	2. Evaluative Thinking Operations	1. Proving the truth: behaviour, planning activities, taking positions. 2. Designing a new method, formulating hypotheses, conclusions. 3. Making a decision A: value issues are associated with affective behaviour. 4. Taking decision B is associated with cognitive behaviour.

(Blosser, 1979; Putri, 2017)

Use the assessment step using a classification system called the QCSS in which questions are classified as one of four main types; Managerial, Rhetorical, Closed Questions, or Open Questions (Crittenden, 2014). in this case, the use of QCSS was to identify the various types of questions asked by students. From these results, it will be known the skills students have in asking questions in the field of science. questions arising from scientific articles that are given to students, students are asked to make 3 until 5

questions, from one side of the students making questions, they will be classified, it will be seen how many students can make questions with the classification of open questions or closed questions.

And the format for analysing questions posed by students is by classifying them as in table 3.9. This analysis table has been validated by three experts who assessed it. With good feedback for use. As for the comments in it, it has been revised to be used as an indicator to analyse student questions.

Table 3.4
Student Question Analysis Table

Question	**Classification of questions based on QCSS**														
	Closed Question								**Open Question**						
	Cognitive-Memory Operations		Convergent Thinking Operations						Divergent Thinking Operations			Evaluative Thinking Operations			
	1	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**1**	**2**	**3**	**4**
1. Remembering	√														
2. Repeating															
3. Imitating															
1. Identifying		√													
2. Labelling															
3. Observing															
1. Associating			√												
2. Discriminating															
3. Classifying															
1. Formulating				√											
1. Applying information					√										
1. Synthesize						√									
1. Predicting (closed)							√								
1. Making critical decisions.								√							
1. Expressing opinions									√						
1. Forecasting openly.										√					

Question	Classification of questions based on QCSS														
	Closed Question								Open Question						
	Cognitive-Memory Operations		Convergent Thinking Operations						Divergent Thinking Operations			Evaluative Thinking Operations			
	1	2	1	2	3	4	5	6	1	2	3	1	2	3	4
1. Concluding (Summing up)											√				
1. Proving the truth												√			
1. Creating a new method design													√		
2. Formulating															
Hypothesis															
3. Making conclusions															
1. Taking a decision A.														√	
1. Taking a decision B.															√

Each question asked by students will be analysed using rubric in the appendix – A research instrument (Appendix A.1 access) with one by one from each level. First, students' questions are grouped into two parts, namely at the first level, open questions and closed questions, and the percentage is calculated. The next stage is to regroup each student's questions using level 2 of QCSS, namely by classifying them into four parts, namely, Cognitive-Memory Operations, Convergent Thinking Operations, and Divergent Thinking Operations. And finally, classifying questions by grouping them into the third level of QCSS.

3.6 Data Analysis

In this study, quantitative techniques were used to collect data. Quantitative data is obtained when the variable being studied is measured along a scale that indicates how much of the variable is present (Jack R. Fraenkel, Norman E. Wallen, 2012). This technique is used to analyse students' questioning abilities by identifying them using QCSS. The information is shown below in detail as follows:

3.6.1 Students Questions Skill

In this case, QCSS is used to identify different types of questions posed by students. From these results, it will be known the skills possessed by students in asking questions in the field of science. questions that arise from scientific articles given to students, students are asked to make 3 to 5 questions, from one side students make questions, will be classified, it will be seen how many students can make questions with three-level grouping classification using QCSS. The first level is grouping them from closed and open questions, then at the second level grouping them by dividing them into Cognitive Memory Operations, Convergent Thinking Operations, Divergent Thinking Operations, and Evaluative Thinking Operations. then grouped again in more detail at the third level of QCSS which has been explained in the instrument rubric. After that, a presentation was made for each group of questions. And finally, look at the gender of each question asked by students. And this aims to analyse how high the ability to ask students if it is measured by QCSS.

3.7 Research Procedure

The research was carried out systematically. This research consists of three stages, namely the preparation stage, the implementation stage, and the data processing or completion stage.

3.7.1 Preparations Stage

The First Stage, namely the preparation stage, this stage begins by determining the focus and research problems. This stage is followed by a literature review on measuring students' abilities using QCSS, with a focus on the topic of human breathing systems for junior high school level, especially grade 8. Then compile research along with a blueprint of research instruments. This research will be revised to make it complete. The instruments that will be used will also be assessed by several experts. The trial phase needs to be done because this research develops the instrument. Many things need to be revised to finally get good instrument validation. After the instrument is validated, the instrument is ready to be given to research participants.

3.7.2 Implementations Stages

Implementation stage, the implementation stage includes administration of research instruments to participants and collecting all data to be processed. Because this research

uses qualitative methods, the completion stage or data processing is calculating the data to be analysed.

3.7.2.1 Coefficient of Agreement

The coefficient of agreement is used for the validity of the final data in this study, which aims to eliminate the subjective assessment by the author. Through triangulation techniques involving 3 people in the field of science education. In this case, to determine the tolerance for differences in observations, the technique of testing the reliability of observations is used. The formula most used by H.J.X. Fernandez has been proposed by Arikunto 2013 (Putri, 2017). Namely: Observation reliability is determined by the Coefficient of Agreement between observers.

$$\mathrm{KK} = \frac{2s}{\mathrm{N}_1 + \mathrm{N}_2}$$

With information:

KK = coefficient of agreement

S = number, the same number of codes for the same object.

N1 = number of codes generated by observer I.

N2 = number of codes generated by observer II.

The coefficient of agreement obtained, then recapitulated based on categories to determine the agreement between observers classified as very bad, good, or very good. The kappa categories in question are:< 0.40 = very bad,0.40 – 0.75= good ,> 0.75= very good by Mousumi Banerjee & Beyond Kapp, 1999 (Syahida & Irwandi, 2015).

Table 3.5
Results of Coefficient of Agreement

Article 1	Article 2	Criteria
0.90	0.92	very good

Table 3.10 shows the results of the agreement coefficients carried out by three observers to assess the data analysis. The results obtained are in article 1 as much as 0.897 which means very good and article 2 as much as 0.913 which means very good. After this agreement was carried out, the data was revised according to the agreement with the researcher and the three observers.

3.7.3 Completion Stages

Then will discuss the analysis of the results. Furthermore, conclusions are drawn after completing the analysis and discussion. The results of the research will be reported in the written form of the research report.

3.7.4 Research Flowchart

The overall detailed main steps of each stage are summarized as shown in Figure below:

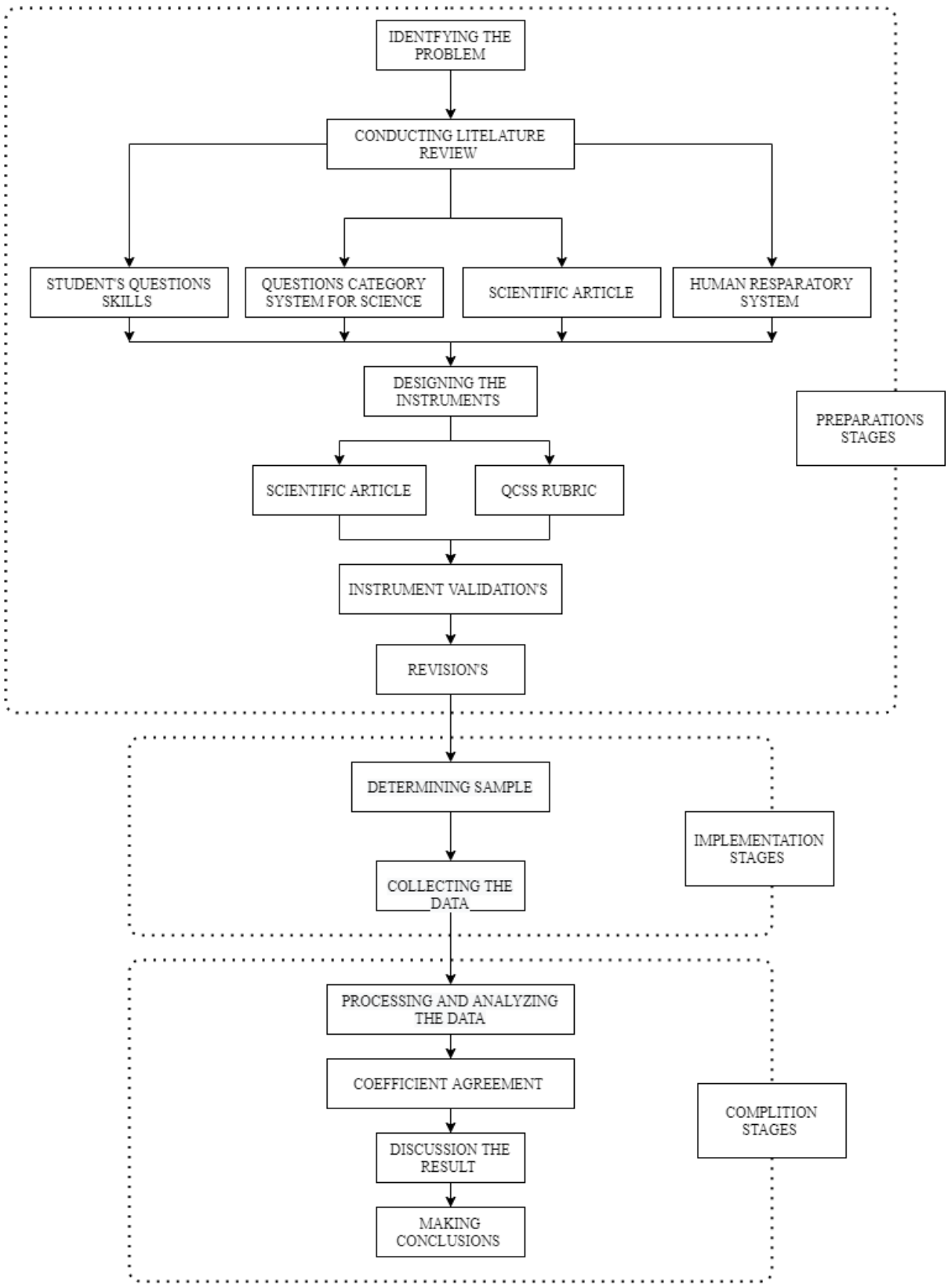

Figure 3.1 Research Flowchart