CHAPTER III
RESEARCH METHODOLOGY

3.1 Research Method and Research Design

The quantitative research approach and descriptive method were used to answer the research questions stated in the first chapter. As stated in chapter 1, this research's main objective was to analyze the correlation between students' self-efficacy and their achievement in learning science both in private and public schools. The correlational research design was used in this research to determine the correlation between two variables (self-efficacy and learning achievement).

In the correlational research design, there is no treatment given by the research to the phenomenon to manipulate individuals, settings, or events in the study (Fraenkel et al., 2012). The correlational research design is a type of descriptive research method (Kuluchumila, 2018). The relationship (correlation) of two or more variables is analyzed statistically by the researcher as part of correlational research procedures (Ingleby, 2012). The descriptive method itself is used to describe the analysis result of the data calculation.

3.2 Population and Sample

The population in this study were 8th grade students from both public and private schools around Bandung City. While the sample of this research was 8th grade junior high school students from three different public schools and three private schools.

There were 170 students from three different public schools and 107 students from three different private schools as a sample in this research. The total 170 public school students were 32 female and 29 male students from public school A, 39 female and 19 male from public school B, and the last 51 students from public school C were 25 female and 26 male. The other 107 private school students were 12 female and 20 male students from private school A, 25 female and 27 male students from private school B, and the last 11 female and 12 male students were from private school C. The sampling technique used is convenience sampling, because only including people who easily to reach to participate in the study (Fraenkel et al., 2012).

3.3 Operational Definition

a) Students' self-efficacy

Students' self-efficacy in this research is focused on science self-efficacy (SSE). Students' belief on their confidence to success in learning science course.

b) Students' achievement

In this research students' achievement is final score of a whole assessment in learning science for the 1st semester of academic year of 2019/2020. Students' achievement assessed through written test, practical work, and creating a product.

c) School systems

School systems referred to different characteristics in every school that can influence school outcomes, such as students' motivation, engagement, and achievement. School systems could also be called environmental factors of students' success.

3.4 Research Instrument

In this study, there were two types of research instruments. The first one is the Linkert-scale questionnaire to measure students' science self-efficacy, and the second one is the rubric to observe the teaching-learning process on science lessons.

3.4.1 Students' Science Self-Efficacy Questionnaire

Some statements regarding students' self-efficacy will be reflected in the questionnaire based on the statement indicators, as shown in table 3.1 below. Students can choose the answer in the range of 1 to 4. Which are 1 for strongly disagree (SD), 2 for disagree (D), 3 for agree (A), and 4 for strongly agree (SA).

Table 3.1
Indicators of Statements in Students' Self-Efficacy Questionnaire

No	Indicators	Statement
1.	**CU (Conceptual Understanding)**: Measuring students' confidence in their ability to use cognitive skills in understanding the definitions of science concepts, laws, and theories.	1,2,3,4
2.	**HCS (Higher-order Cognitive Skills)**: Assessing students' confidence in their ability to employ a scientific approach such as scientific inquiry	5,6,7,8,9,10

No	Indicators	Statement
	skills, problem solving, critical thinking, and other HCS.	
3.	**PW (Practical Work)**: Evaluating students' confidence in their ability to accomplish laboratory activities including skills in both the cognitive and psychomotor domain.	11,12,13,14
4.	**EA (Everyday Application)**: Addressing students' confidence in their ability to apply science concepts and skills to everyday events.	15,16,17,18, 19,20,21,22
5.	**SC (Science Communication)** : evaluating students' confidence in their ability to communicate or discus with others such as peers.	23,24,25,26, 27,28

3.4.1.1 Students' Self-Efficacy Questionnaire Development and Analysis

Students' self-efficacy questionnaires developed according to the instrument developing procedure, as shown in figure 3.1 below. After judged by three experts, and then the researcher doing instrument pilot-test to 32 8th grade students.

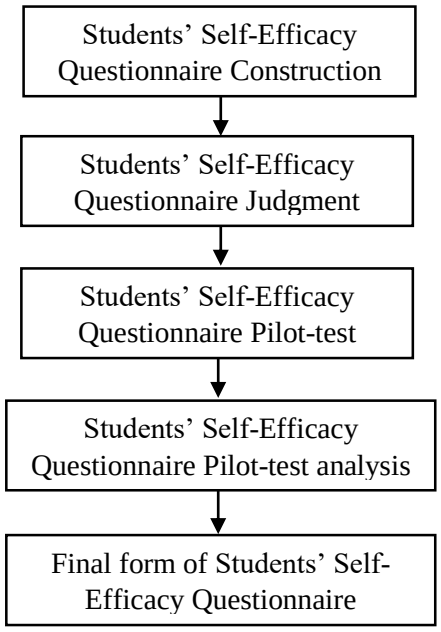

Figure 3.0-1. The Process of Developing Students' self-efficacy Questionnaire

The instrument pilot-test result analyzed by SPSS 25.0 to check the validity and reliability of the instrument. When preparing or selecting an instrument for use, validity is an essential process (Fraenkel et al., 2012). The valid instrument is if it can measure what intended to be measure accurately. The formula of validity test itself is as follows

$$rx = \frac{\sum xy}{\sqrt{(\{\sum x^2\})(\{\sum y^2\})}}$$

$rx =$ correlation coefficient of a sample

$x = (x_i - \bar{x})$ score item

$y = (y_i - \bar{x})$ total score

The formula was used to correlate between variables x and y. The data were calculated based on the formula above using SPSS 25.0. The data from questionnaires were calculated to find the *r*-value. The *r*-value was obtained from comparing the r-result with r-table. The item was valid if the *r*-value > *r*-table at a 95% confidence level. When the *r*-value < *r*-table, the item considered invalid. If the item was considered as invalid item, it needs to be revised or deleted. To calculate the r-table, it was also necessary to find the degree of freedom. The degree of freedom calculation formulated as (df= n –2). Since the sample (n) of the pilot test was 32, so 32 -2 = 30. After that, the value of the r-result and r-table can be seen in the table below.

Table 3.2
The Result of Validity Test on Students' Self-Efficacy Questionnaire

Question	r-result	r-table	Description
1	0.783	0.361	Valid
2	0.601	0.361	Valid
3	0.484	0.361	Valid
4	0.391	0.361	Valid
5	0.582	0.361	Valid
6	0.400	0.361	Valid
7	0.720	0.361	Valid
8	0.665	0.361	Valid
9	0.537	0.361	Valid
10	0.744	0.361	Valid
11	0.546	0.361	Valid
12	0.523	0.361	Valid
13	0.606	0.361	Valid
14	0.576	0.361	Valid
15	0.746	0.361	Valid
16	0.642	0.361	Valid
17	0.463	0.361	Valid
18	0.614	0.361	Valid
19	0.660	0.361	Valid
20	0.581	0.361	Valid
21	0.582	0.361	Valid
22	0.666	0.361	Valid
23	0.417	0.361	Valid
24	0.452	0.361	Valid

Question	r-result	r-table	Description
25	0.542	0.361	Valid
26	0.424	0.361	Valid
27	0.393	0.361	Valid
28	0.367	0.361	Valid

Based on the table above and the statistical calculation (appendix C.1), we can conclude that all the items in the students' self-efficacy questionnaire in learning science were valid and can be used to measure students' self-efficacy in learning science.

Reliability defines as the consistency of the items in the instrument as measurement tools (Fraenkel et al., 2012). If the items are reliable, the students who get a high score at the first test are expected to get a high score the next time they take the test. The score may not be the same, but it should be close. However, a reliable item isn't always a valid item.

Table 3.3
The Result of Reliability Test on Students' Self-Efficacy Questionnaire

Variable	*R*	Criteria
Students' self-efficacy in learning science	0.917	High Reliable

3.4.2 Observation-Question Guideline

The observation-question guideline used in the interview to observes the science lesson activities will be consist of several questions based on some factors according to MoEc regulation, as shown in table 3.4 below.

Table 3.4
Indicators of Questions in Science Lesson Observation Question

No	Indicators	Questions
1.	The Source (Book, Website, ect)	1,2,3,
2.	Teaching Preparation	5,6,7,
3.	Science Class in a Week	8,9,10,
4.	Learning Model	11,12,13,14,15
5.	Learning Approach	16,17,18,19,20,
6.	Learning Method	21,22,23,24,25,
7.	Learning Method Students' Like Most	26,27,28,
8.	Lab Activity in one Semester	29,30,31,32,33,34,
9.	Students' Number in a Group of Lab Activity	35,36,
10.	Type of Worksheet Used in Lab Activity	37,38,39,40,
11.	Field Trip in one Semester	41,42,43,44,
12.	Quiz in one Semester	45,46,47,48,
13.	Assessment and Evaluation	49,50,51,52

The statements in the rubric judged first by three experts before use in the research. The processes of developing the rubric are shown in figure 2. The pilot-test to the interview questions was done to a junior high school science teacher. There are some revisions of the question after the pilot-test has done.

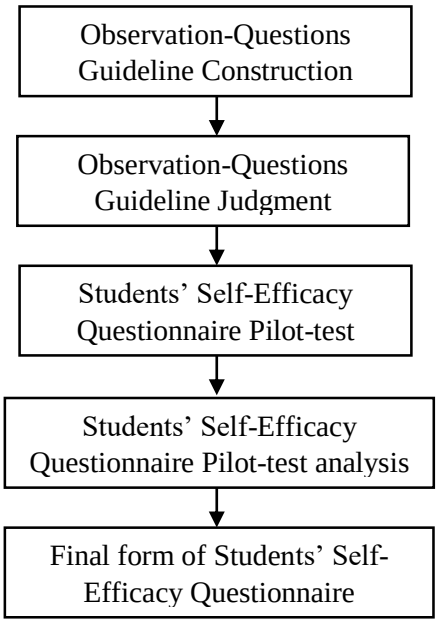

Figure 3.0-2. The Process of Developing Science Lesson Observation Question Guideline

3.5 Data Analysis

3.5.1 Students' Science Self-Efficacy

To answer the first research question which was "How are students' self-efficacy in learning science in public and private schools?" research questions, a science self-efficacy questionnaire adapted from Lin et al. (2013) was used. The result of students' answers to the questionnaire was analyzed using SPSS 25.0 to interpret the data. The use of SPPS in data analysis was to provide accurate data analysis since SPSS was the tool which more practical and efficient. The ordinal classification was used to determine the range of students' self-efficacy both in public and private schools.

3.5.2 Correlation between Students' Self-Efficacy and Their Achievement in Learning Science

The second research questions deal with the correlation between students' self-efficacy and their achievement in learning science in public and private

schools. Students' achievement or students' scores in learning science in this study used the available scores in every public school, or the other word students' achievement was used secondary data (Appendix C6 & Appendix C7). SPSS 25.0 used to analyze and compute the correlation score and significant relation of gathered data. Before that, the normality test was conducted to determine the type of correlation analysis. The following section describes how the normality test is done.

a) Normality of Distribution

The function of the normality test was to determine whether the students' scores in learning science and their self-efficacy scores were normally to distribute. Firstly, the normality tests were done in general data from private and public schools, as shown in the following table 3.5. The normality test is done to the data from each public and private schools since further analysis will also depend on the school. Therefore, Kolmogorov-Smirnov chosen to calculate the data due to the number of data from each school was more than 50. The data is normally distributed if the Sig. of the data was greater than 0.050. However, if the Sig. was less than 0.050 the data did not normally distribute.

Table 3.5
Normality Test of Public and Private School's General Data

School		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
Public School	Self-Efficacy	.096	170	.001	.967	170	.000
	Science Achievement	.183	170	.000	.854	170	.000
Private School	Self-Efficacy	.121	107	.001	.968	107	.101
	Science Achievement	.097	107	.016	.967	107	.010

According to table 3.5, the Sig. value of Kolmogorov-Smirnov test for both public and private school were less than 0.05. It can conclude that the general data of self-efficacy and science achievement in public and private schools were not normally distributed. Moreover, Sig. value of science achievement in public school was 0.00, smaller than the private school which has .016 of Sig. value.

All of the data from three different public schools did not normally distribute. As shown in the following table 3.6, the Sig. of public school A was .007 for self-efficacy and .008 for science achievement, .047 and 001 for self-efficacy and science achievement in public school B, and in public school C the Sig. of self-efficacy was .039, while science achievement was .000.

Table 3.6
Normality Test of Public School's Data

Public School		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
A	Self-Efficacy	.136	61	.007	.964	61	.067
	Science Achievement	.134	61	.008	.916	61	.000
B	Self-Efficacy	.117	58	.047	.948	58	.015
	Science Achievement	.155	58	.001	.959	58	.046
C	Self-Efficacy	.127	51	.039	.960	51	0.81
	Science Achievement	.287	51	.000	.797	51	.000

Private school A and C have the normally distributed data, as shown in table 3.7 bellow Sig. of self-efficacy data in private school A was .881 and .678 for Sig. of science achievement. In private school C, both self-efficacy and science achievement data are normally distributed, as shown in the Shapiro-Wilk analysis result. However, because of the data from private school B, more than 50 Kolmogorov-Smirnov used to determine the normality of the data. As shown in table 3.7, the private school's B data of science achievement was not normally distributed. Sig. of science achievement was .002, while Sig. of self-efficacy was .053, which indicated the normality of the data..

Table 3.7
Normality Test of Private School's Data

Private School		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
A	Self-Efficacy	.128	32	.195	.983	32	.881
	Science Achievement	.074	32	.200	.976	32	.678
B	Self-Efficacy	.122	52	.053	.966	52	.141

Private School		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
C	Science Achievement	.161	52	.002	.940	52	.012
	Self-Efficacy	.152	23	.179	.943	23	.206
	Science Achievement	.144	23	.200	.936	23	.146

The data from private schools A and C both in self-efficacy scores and science achievement were normally distributed. Thus, Person Correlation analysis was chosen to statistically determine the correlation between students' self-efficacy and their science achievement. Meanwhile, since the data of science achievement in public school B was not normally distributed, the correlation analysis in private school B done with Spearman-Rank analysis. Although the data of self-efficacy in private school B shown as normally distributed data, it did not fulfill the requirements of person correlation analysis..

3.6 Research Procedure

The procedures of this research include three stages, which were the preparation stages, implementation stages, and completion stages. Further steps in each stage as follows:

a) Preparation Stage

Preparation stage conducting before the researcher doing the research, there is some stage which are:

1) Construct research instruments according to variable in the research
2) Conducting judgment instrument with the expert
3) Revise research instrument that has been a judge
4) Conduct research instrument pilot-test
5) Analyze pilot-test result

b) Implementation Stage

Implementation stage consisting of:

1) Giving a questionnaire to the sample determined to gathering the data of students' self-efficacy profile through online survey
2) Observing the science lesson activities by interviewing science teacher through voice call and fill the question-form

c) Completion Stage

1) Analyzed the result of the instrument used in the research based on the data analysis
2) Conclude the data analysis result

d) The scheme of research stage described before is shown in figure 3.3:

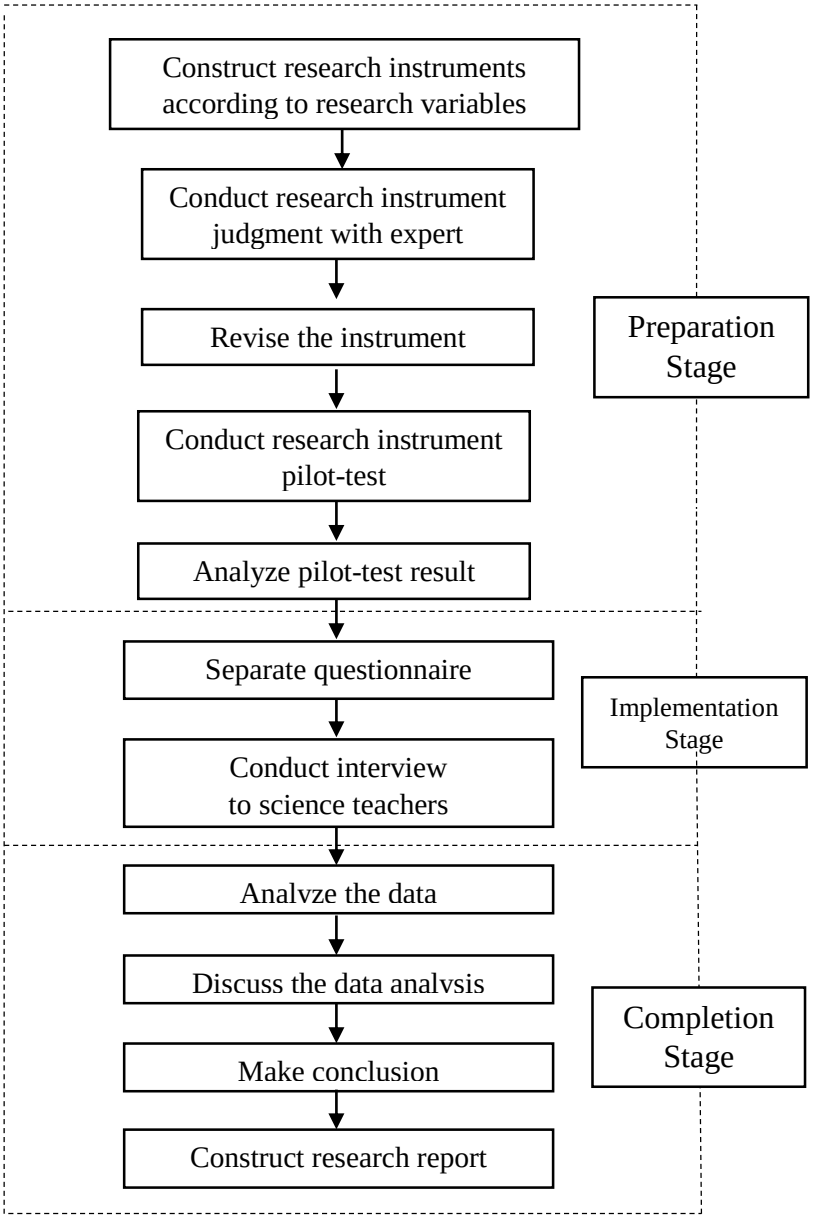

Figure 3.3. Research Stage Scheme