CHAPTER III
METHOD

3.1 Research Method and Research Design

The research requires certain method and design in order to achieve the desired outcome which enrich the information and the science learning process conducted. The research method and the research design that used in the implementation of the study is explained below.

3.1.1 Research Method

The research method of this study is pre-experimental in measure the students' scientific literacy and students' motivation in light and optic topic. The pre-experimental is used because during the experiment, the researcher observe a single group and gives a treatment to the group (Creswell, 2014). Therefore, the use of this method is in accordance with the aim of the study which analyze the effect of the inquiry-based learning supported by Instagram in one group of the students.

3.1.2 Research Design

In measuring the students' scientific literacy, one group pretest and posttest design is used. One group pretest and posttest is used because pretest and posttest is measured followed by treatment for a single group with the O represent as measurement or observation and X represent exposure to the group (Creswell, 2014). The diagram shown in the Table 3.1 below.

Table 3.1
The Diagram of One Group Pretest and Posttest and Design

O_1	X	O_2
Pretest	Implementation of Inquiry-based learning	Posttest

From the table 3.1, as stated before, the O_1 and O_2 represent as the measurement and the X represent the treatment given to the students. To measure the students' motivation, the one shot case study is used. One shot case study is used because the treatment is given to the group then observe or measure the group (Creswell, 2014). The diagram of the design shown in The Table 3.2 below.

Table 3.2
The Diagram of One Shot Case Study Design

X	O
Implementation of inquiry-based learning	Posttest

Based on table 3.2, the X represent as the treatment given to the student. The O represent as measurement or observed done to the students. In the posttest, the questionnaire is given to the students.

3.2 Research Subject

The subject of this research is 8th grade students with the total 17 students from Kuala Lumpur with 10 students, Bandung with 2 students, and Yogyakarta with 5 students from three different Junior High School that used 2013 National Curriculum which not learn light and optic. The age of samples vary from 13-14 years old. The students chosen from different city because the difficulties in finding the samples due to distance learning not all of the students participate actively, so the other sample need to be added. The sampling method that used in this research is convenience sampling. Convenient sampling is chosen because the sample chosen because the sample is available (Fraenkel et al., 2012). The detail of sample based on the gender is shown in the Table 3.3 below.

Table 3.3
The Detail of the Sample Based on Gender

Gender	Frequency	Percentage
Male	12	70.59%
Female	5	29.41%

Gender	Frequency	Percentage
Total	17	100%

3.3 Operational Definition

1) According to PISA, scientific literacy is the ability to engage with scientific-related topics and able to apply the knowledge to daily life (OECD, 2018). In this research measures the students' scientific literacy competency and knowledge domain by using objective test. The objective test used consist of 15 questions of multiple choice in light and optic topic which given before experiment (pretest) and after experiment (posttest).
2) Students motivation consist of six domain which is self-efficacy, active learning strategies, science learning values, performance goal, achievement goal, and learning environment stimulation (Tuan et al., 2005). The students' motivation is measured by using Students Motivation Towards Science Learning (SMTSL) questionnaire. The questionnaire consist of 35 questions with the scoring rate starts from 1 as very disagree, 2 as disagree, 3 as neutral, 4 as agree, and 5 as very agree.

3.4 Hypothesis

1) H_0: There is no enhancement in students' scientific literacy by using inquiry-based learning supported by Instagram in light and optic topic.
   H_1: There is enhancement in students' scientific literacy by using inquiry-based learning supported by Instagram in light and optic topic.
2) H_0: There is no motivation in students' motivation by using inquiry-based learning supported by Instagram in light and optic topic.
   H_1: There is motivation in students' motivation by using inquiry-based learning supported by Instagram in light and optic topic.

3.5 Research Instrument

In this research, there are several instruments that used to measure the students scientific literacy and students motivation. The instruments that used shown below.

1) Scientific literacy

The objective test is used to measure the students' scientific literacy. The objective test is given to the students before and after the implementation in the form of pretest and posttest. The topic that chosen in objective test is light and optic topic and includes three sub topic, there are properties of light, mirror, and lens which in accordance with the 2013 National Curriculum. The objective test consist of competency and knowledge aspect. The competency consist of explain the phenomena scientifically, design and evaluate scientific enquiry, and interpret data and evidence. The knowledge aspect consist of content knowledge, procedural knowledge, and epistemic knowledge. The unrevised blueprint of scientific literacy objective test is shown in the Table 3.4 below.

Table 3.4
Blueprint of Scientific Literacy Objective Test Before Revision

Sub topic	Explain phenomena scientifically			Design and evaluate scientific enquiry			Interpret data and evidence		
	C	P	E	C	P	E	C	P	E
Properties of light	1,2, 3,5			4					
Mirror	6,9, 13			10, 14	8,11	12	15		7
Lens	19	18					17, 20	16	

The objective test then judged by the expert and validated by testing the objective test to 23 students that already learned light and optic topic. The validation of objective test is done online due to distance learning. The result of the validation then analyzed by using ANATES to find out the

validity, discriminating power (DP), difficulty level (DL), correlation, and acceptance. The recapitulation of test item is shown in the Table 3.5 below.

Table 3.5
The Summary of Objective Test Analysis

Question Number	DP	DL	Correlation	Acceptance
1	50.00%	Medium	0.363	Accepted
2	33.33%	Medium	0.290	Accepted
3	33.33%	Medium	0.380	Accepted
4	-33.33%	Difficult	-0.342	Rejected
5	33.33%	Medium	0.213	Accepted
6	66.67%	Easy	0.617	Accepted
7	66.67%	Medium	0.574	Accepted
8	16.67%	Medium	0.234	Accepted
9	66.67%	Medium	0.603	Accepted
10	16.67%	Medium	0.108	Rejected
11	66.67%	Difficult	0.658	Accepted
12	0.00%	Very easy	0.072	Rejected
13	50.00%	Medium	0.279	Accepted
14	0.00%	Medium	0.060	Rejected
15	50.00%	Medium	0.376	Accepted
16	33.33%	Medium	0.196	Rejected
17	33.33%	Very difficult	0.484	Accepted
18	83.33%	Medium	0.529	Accepted
19	66.67%	Medium	0.592	Accepted
20	66.67%	Medium	0.415	Accepted

From the Table 3.5, there are questions of objective test is rejected. The final of objective test blue print is 15 questions and shown in the Table 3.6 below.

Table 3.6
Blueprint of Scientific Literacy Objective Test After Revision

Sub topic	Explain phenomena scientifically			Design and evaluate scientific enquiry			Interpret data and evidence		
	C	P	E	C	P	E	C	P	E
Properties of light	1,2, 3,4								
Mirror	5,8,				7,9		11		6

Lens	10 14	13		12, 15

2) Students' motivation

The questionnaire is used to assess the students' motivation. The questionnaire that used is adapted from Students Motivation Towards Science Learning (SMTSL) questionnaire from Tuan. The motivation domain that assessed is consist of six domain, there are self-efficacy, active learning strategies, science leaning values, performance goal, achievement goal, and learning environment stimulation. The questionnaire assessment using Likert-scale. The questionnaire blueprint is shown in the Table 3.7 below.

Table 3.7
The Blueprint of Students Motivation Questionnaire

No	Domain	Likert Scale				
		1	2	3	4	5
1	Self-efficacy					
2	Active learning strategies					
3	Science learning values					
4	Performance goal					
5	Achievement goal					
6	Learning environment stimulation					

(Source: Tuan et al., 2005)

In the Table 3.7 shown the blueprint of students' motivation questionnaire, the further questionnaire shown in the appendix. The questionnaire consist of 35 questions, with the self-efficacy consist of 8 questions, active learning strategies consist of 8 questions, science learning value consist of 5 questions, performance goal consist of 4 questions, achievement goal consist of 5 questions, and learning environment stimulation consist of 5 questions. The Likert scale in the questionnaire stated in 1 to 5, with the 1 is very disagree, 2 is disagree, 3 is neutral, 4 is agree, 5 is very agree. Likert scale here is used to measure the students'

perception in answering the statements. Each of the scale represent the point gained form the questionnaire answer.

In order to prepare the questionnaire given to the students, the expert judgment was done. The expert judgment that already done consist of add information, change the sentence, and statement which less appropriate in the questionnaire the sentence. Not only that, the expert judgment also done in the introduction information before the students answer the questionnaire. The summary result shown in the Table 3.8 below.

Table 3.8
The Summary of Questionnaire Revision

Revision	Statement Number
Information added	15, 16
Change the sentence	1, 2, 17
Statement which less appropriate	34

From the Table 3.8, it shown several revision from the judgment. The expert were asked to revise by adding information to the sentence in order to deliver the content clearly. The expert also asked to change the sentence to be more appropriate which able to cover the word so the meaning of the sentence so the students able to understand the statement. And the last is the expert asked to move the statement into different domain because the statement is more appropriate in other domain.

3.6 Data Collection

1) Students' scientific literacy

The collecting data of scientific literacy competency and knowledge domain process will using online forms due to distance learning. The students' scientific literacy test item is in multiple choice objective test. The picture of scientific literacy objective test in google forms shown in Figure 3.1.

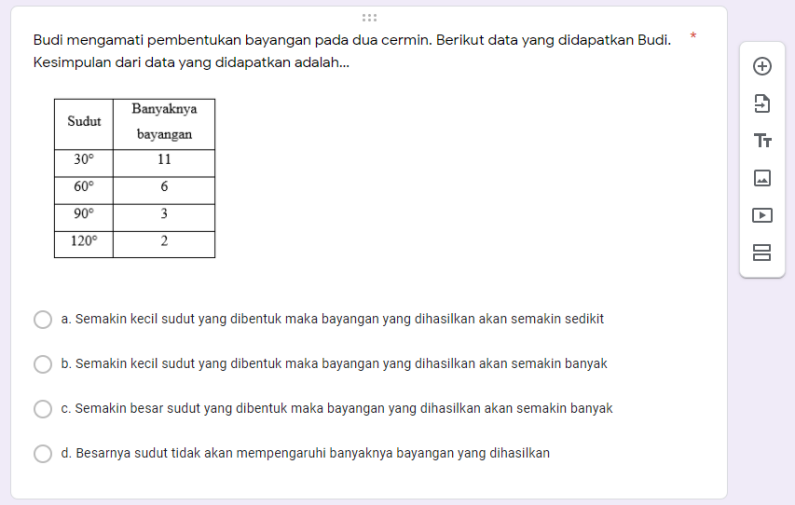

Figure 3.1 The Students Scientific Literacy Objective Test

From the Figure 3.1, the objective test that used to measure the students scientific literacy is using Bahasa Indonesia. Bahasa Indonesia is chosen because the students mostly use Bahasa Indonesia in teaching and learning process. Besides, most of the students have better understanding rather than using English.

2) Students motivation

The collecting data of students' motivation towards science learning will be using google from due to distance learning, same with students' scientific literacy measurement. The students motivation will be in Likert scale with the students choose the scale which represent the students. The questionnaire of students motivation shown in the Figure 3.2 below.

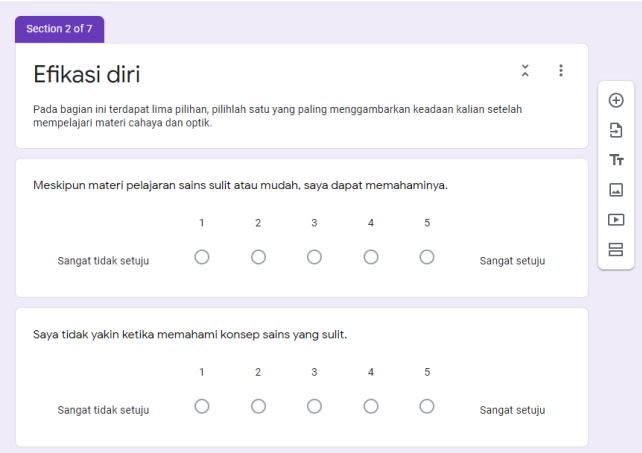

Figure 3.2 The Students Motivation Questionnaire

From the Figure 3.2, the questionnaire to measure the students' motivation towards science learning is using Bahasa Indonesia. Bahasa Indonesia is chosen because the students mostly use Bahasa Indonesia in teaching and learning process. Besides, most of the students have better understanding rather than using English.

3.7 Data Analysis

1) Students scientific literacy

To measure the students' scientific literacy, the result gained is calculated by ms. Excel for calculation and measure statistically by using SPSS. To test the hypothesis, the normality, homogeneity, and paired t-test is used. Pair t-test is used because the pretest and posttest of one group is compared. Then, the score result is also calculated to find the n-gain score. To calculate the n-gain, the formula below is used.

$$g = \frac{\text{Posttest Score} - \text{Pretest Score}}{\text{Mazimum score} - \text{Pretest Score}} \quad (1)$$

g = n-gain score

(Meltzer, 2002)

The n-gain score gained then interpreted based on the n-gain interpretation table. The n-gain score interpretation is shown in table below.

Table 3.9
The N-gain Interpretation Table

N-gain Score	Interpretation
$g < 0.3$	Low
$0.3 \leq g \leq 0.7$	Moderate
$g > 0.7$	High

(Meltzer, 2002)

Based from the Table 3.9, the result score then interpreted based on the table. The analysis and conclusion then drawn based on the interpretation gained.

2) Students motivation

The students' motivation result then calculated based on the Likert scale. The result then calculated statistically and find its mean. Then, the result of the mean that gained from the questionnaire is calculated in the percentage form. To calculate the percentage, the formula below can be used.

$$P = \frac{f}{N} \times 100\% \quad (2)$$

P = percentage

f = the score gained

N = maximum score

(Riduwan from Rockyane & Sukartinigsih, 2018)

The percentage gained based on the calculation with the formula then interpreted based on the percentage interpretation table. The interpretation of the percentage is shown in the Table 3.10 below.

Table 3.10
The Interpretation of Percentage

Percentage	Interpretation
0%-20%	Very Not Good
21%-40%	Not Good
41%-60%	Moderate
61%-80%	Good
81%-100%	Very Good

(Source: Riduwan from Rockyane & Sukartinigsih, 2018)

From the Table 3.10, the interpretation percentage divided into five description. It starts from very not good to very good percentage. Then, the analysis and conclusion is drawn based on the interpretation gained.

3.8 Research Procedure

The procedure of this research consist of three stages, there are preparation stage, implementation stage, and completion stage. The stages of research procedure discussed below.

3.8.1 Preparation Stage

The preparation stage consist of compile relevant research from different sources that related into inquiry-based learning, scientific literacy, students motivation, and social media or online platform that appropriate to be used in distance learning as well as promote the visual based media for students. The instrument that used is objective test and questionnaire which judged by experts and validated before the instruments given to the students.

3.8.2 Implementation Stage

The implementation stage was carried out in order to acquire data from students' achievement. The learning process were done in Google Classroom to give the instruction for the students, as well as Whatsapp. Then, Google Meeting is used to implement the inquiry-based learning to the students. The Instagram is also used to support the final phase in inquiry-based learning. The complete implementation of each meeting shown in the table 3.11 below.

Table 3.21
The Implementation Stage of the Study

Meetings	Activities
1st meeting	1. The students asked to answer the scientific literacy objective pretest before the class start. 2. The students given the material by using inquiry-based learning through explanation and Instagram post in sub topic properties of light.

Meetings	Activities
2nd meeting	1. The students given the material by using inquiry-based learning through explanation and Instagram post in sub topic mirror.
3rd meeting	1. The students given the material by using inquiry-based learning through explanation and Instagram post in lens sub topic. 2. The students asked to answer the scientific literacy objective posttest after the class end. 3. The students asked to answer the students' motivation questionnaire after the class end.

3.8.3 Completion Stage

In this stage, the data that gained then analyzed and discussed in the research. The data gained are analyzed statistically and the research paper is completed. The summary of the research process is shown in the flowchart in Figure 3.3.

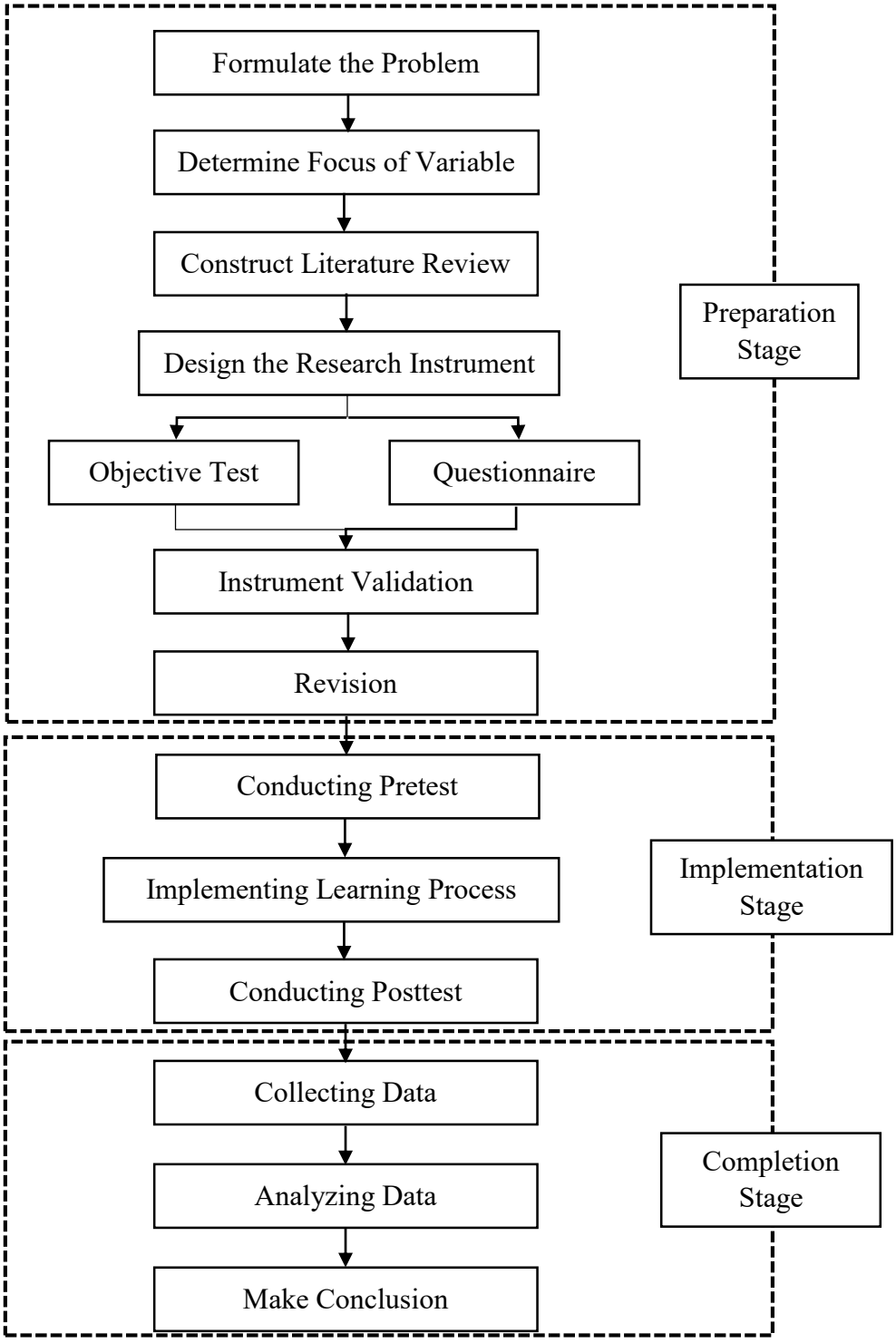

Figure 3.1 The Summary of Research Stages