CHAPTER 3
RESEARCH METHODOLOGY

3.1 Research Design

This particular research will be using Quantitative Research Method, which, according to Leedy & Omrod (2001) and Williams (2011), includes the collection of data which information can be measured and subjected to statistical treatment with the intention of support or refute alternative knowledge claims. According to Fraenkel, Wallen, & Hyun (2013), quantitative research strive for possible relationship between variables and explain the cause of the relationship.

This research method is chosen because in this research, an issue or phenomenon is explained through gathering data in numerical form and investigated with the assistance of mathematical methods; specifically statistics, in accordance with Aliaga, and Gunderson (2002) definition of quantitative research. Thus, a quantitative research method concerns with calculating and investigating variables in order to gain results. This method involves the application and analysis of numerical data using particular statistical methods to answer questions like who, how much, what, where, when, how many, and how (Apuke, 2017).

Quantitative research method is suitable and appropriate with the objectives of this research, which is to investigate junior high school students' attitudes toward science before and during COVID 19 pandemic.

This research will be using scientific sampling method with a designed questionnaire to measure a specified population's characteristics over the application of statistical methods. Survey Research Design is in line with the purpose of this research stated before and chosen as the design. Sukamolson (2007) described survey as a form of quantitative research, which concerned with sampling questionnaire, questionnaire design, and questionnaire administration with the purpose of gathering information from the group/population involved, and further analyzed for better understanding of their behavior/characteristics.

3.2 Participant

1) Research Location and Period

This research was conducted online and available for all junior high school students in Indonesia. Public, Private, and International schools are welcomed to participate. The questionnaire was distributed and accessible for six days. The percentage of participants' school provinces is presented in Figure 3.1.

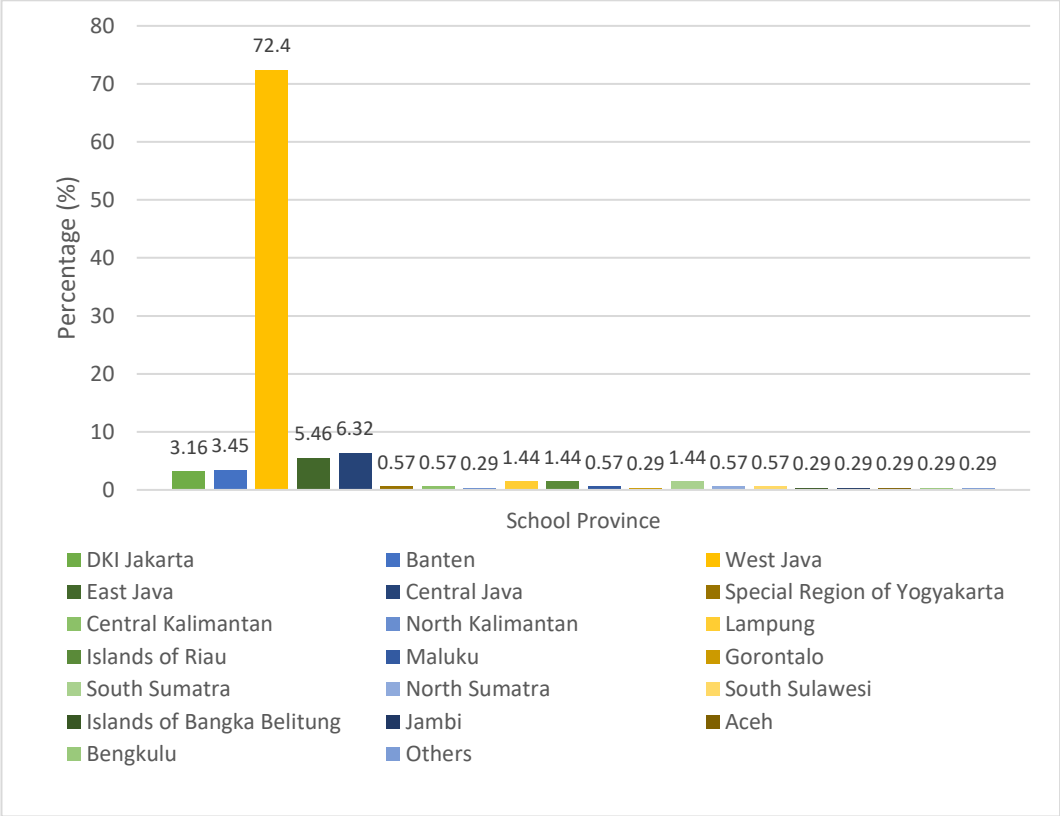

Figure 0.1 Percentage of Participants' School Provinces

Indonesia has 34 provinces, but from Figure 3.1, only students from twenty provinces participated. The provinces that participants came from are DKI Jakarta, Banten, West Java, East Java, Central Java, Special Region of Yogyakarta, Central Kalimantan, North Kalimantan, Lampung, Islands of Riau, Maluku, Gorontalo, South Sumatra, North Sumatra, South Sulawesi, Islands of Bangka Belitung, Jambi, Aceh, Bengkulu, and others (not stated). The highest percentage came from West Java with 72.4%. Then from Central Java with 6.32% and East Java with 5.46%. Followed up by Banten with 3.45% and DKI Jakarta with 3.16%. After that is Lampung, South Sumatra, and Islands of Riau with 1.44%. Next is Special Region of Yogyakarta, Central Kalimantan, Maluku, South Sulawesi, and North

Sumatra with 0.57%. Lastly, there is Gorontalo, Islands of Bangka Belitung, Jambi, Aceh, Bengkulu, North Kalimantan and others (not stated) with 0.29%. The amount of students from each province is specifically depicted in Table 3.1.

Table 0.1 Summary of Participants' School Provinces

Province	Amount of Student(s)
DKI Jakarta	11
Banten	12
West Java	252
East Java	19
Central Java	22
Special Region of Yogyakarta	2
Central Kalimantan	2
North Kalimantan	1
Lampung	5
Islands of Riau	5
Maluku	2
Gorontalo	1
South Sumatra	5
North Sumatra	2
South Sulawesi	2
Islands of Bangka Belitung	1
Jambi	1
Aceh	1
Bengkulu	1
Others	1

Based on Table 3.1, participants from West Java is the highest in number, which is 252 students. The second is from Central Java with 22 students Third is East Java with 19 students. Next, there is Banten with 12 students and followed up closely by DKI Jakarta with 11 students. Then there are Lampung, South Sumatra, and Islands of Riau with five students. After that, there are Special Region of Yogyakarta, Central Kalimantan,

Maluku, South Sulawesi, and North Sumatra with two students. At last, there are Gorontalo, Islands of Bangka Belitung, Jambi, Aceh, Bengkulu, North Kalimantan and others (not stated) with one student each.

2) Population and Sample

The population in this research will be all junior high school students in Indonesia who are studying science in their school. The sampling technique for this research will be simple random sampling. Fraenkel, Wallen, and Hyun (2011) stated that simple random sampling is a sampling method in which each member of the population has an equal and independent chance of being selected as the sample. Since the research will be conducted online, every junior high school student will have an equal chance to be selected. A total of 348 junior high school students from 107 junior high schools participated in this research. The 348 participants are made up of female and male junior high school students. Female and male students' percentage is shown in Figure 3.2.

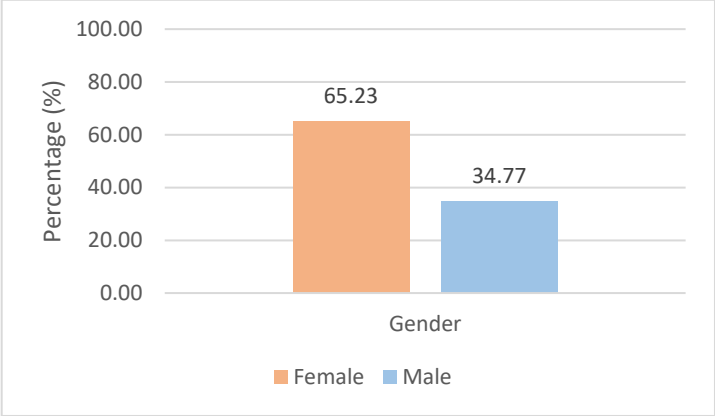

Figure 0.2 Percentage of Participants' Gender

Based on Figure 3.2, the female students' percentage in this questionnaire is 65.23%. On the other hand, the male students' percentage is 34.77%. Based on the percentage itself, female student participants are higher in number than male student participants. The amount of students for each gender is specifically depicted in Table 3.2.

Table 0.2 Summary of Participants' Gender

Gender	
Female	**Male**
227	121

Out of 348 participants, 65.23% of them are female students, which is a total of 227 participants and 34.77% of them are male students, which is a total of 121 students based on Table 3.22. The ratio of male and female students are 1.00:1.88. In addition to gender, participants are also varied in ages. Students from 11 years old to 16 years old participated in this research. The percentage for participants' ages is shown in Figure 3.3.

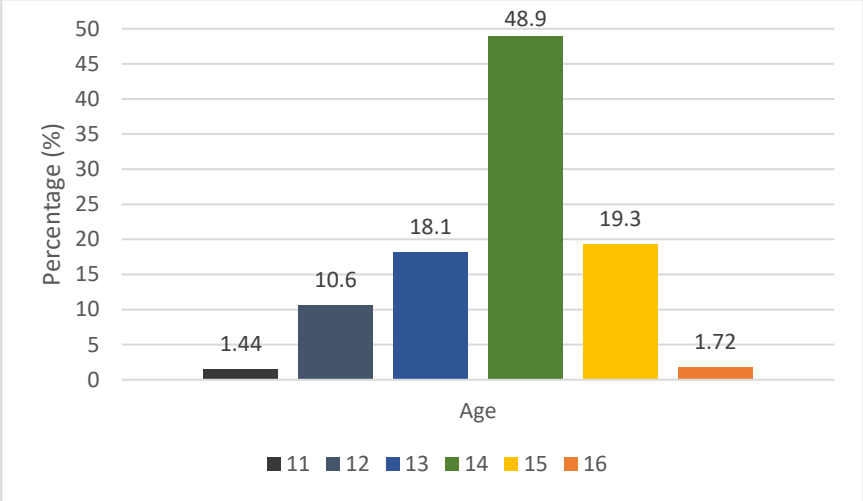

Figure 0.3 Percentage of Participants' Age

In Figure 3.3, 1.44% of the participants are 11 years old, 10.6% are 12 years old, 18.1% are 13 years old, 48.9% are 14 years old, 19.3% are 15 years old, and 1.72% are 16 years old. Based on the percentage, students within the age 14 dominated as the participants. On the contrary, students within the age 11 and 16 are rarely participating. The amount of students in each age range is specifically depicted in Table 3.3.

Table 0.3 Summary of Participants' Age

Age (years old)					
11	**12**	**13**	**14**	**15**	**16**
5	37	63	170	67	6

Out of 348 participants, 1.44% of them are 11 years old, which is five participants. 10.6% of them are 12 years old, which is 37 participants. 18.1% of them are 13 years old, which is 63 participants. 48.9% of them are 14 years old, which is 170 participants. 19.3% of them are 15 years old, which is 67 participants. Lastly, 1.72% of them are 16 years old, which is six participants. This result is based on Table 3.3. Since the questionnaire was distributed to junior high school students, the participants came from grade VII to IX. The percentage for participants' grade is shown in Figure 3.4.

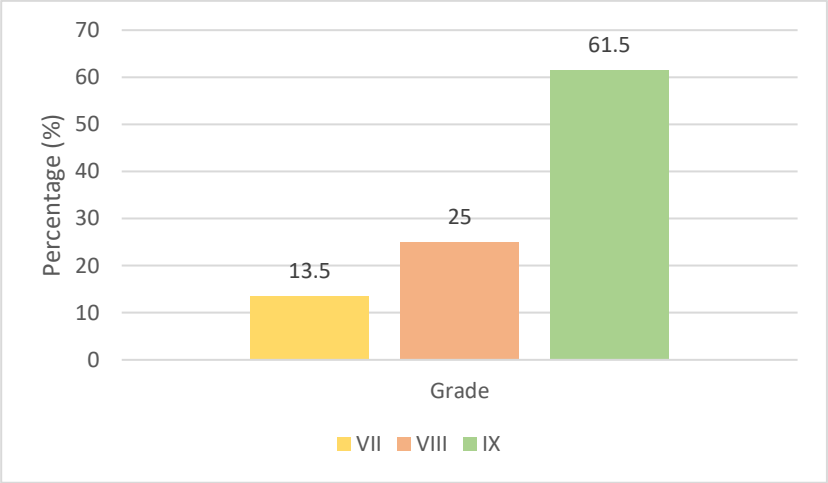

Figure 0.4 Percentage of Participants' Grade

Based on Figure 3.4, the highest percentage is Grade IX with 61.5%. Next is Grade VIII with 25%. The lowest percentage is Grade VII with 13.5%. From the percentage, students from Grade IX exceeded half of the participants' number. The amount of students from each grade is specifically depicted in Table 3.4.

Table 0.4 Summary of Participants' Grade

Class		
VII	**VIII**	**IX**
47	87	214

Out of 348 participants, 13.5% or 27 students are from Grade VII, 25% or 87 students are from Grade VIII, and 61.5% or 214 students are from Grade IX. There are more students from Grade IX than from Grade VII and VIII. This result can be found in Table 3.4.

3.3 Research Instrument

In this research, an instrument was constructed for collecting the data. The instrument is intend to understand the junior high school students' attitude towards science before and during the COVID 19 pandemic. The instrument described as follow:

3.3.1 Attitude towards Science Questionnaire

This questionnaire will be used to gather the data of junior high school students' attitudes toward science before and during COVID 19 pandemic. The questionnaire is adapted from Said, Abd-El-Khalick, Summers, Culbertson, & Friesen (2013).

1) Statement Construction

Said, Abd-El-Khalick, Summers, Culbertson, & Friesen (2013) constructed and developed ASSAS (Arabic-Speaking Students' Attitudes toward Science Survey) guided by the most recent revision of the theories of reasoned action and planned behavior (TRAPB) (Ajzen & Fishbein, 2005). This construction is adapted to be used as an instrument in this research. The summary of the final statements construction is presented in Appendix 1.

2) Likert Scale Construction

A Likert scale will measure the Attitudes toward Science Questionnaire employed in this research. According to Creswell (2012), Likert scale is a frequently used measurement scale in educational research. The scale was written in the degree of strongly disagree, disagree, not sure, agree, and strongly agree. These degrees will then be converted into numbers, started from 1 to 5 respectively. The summary of Likert scale construction is shown in Table 3.5.

Table 0.5 Likert Scale of Attitudes toward Science Questionnaire

Scale	Degree	Point
1	Strongly Disagree	1
2	Disagree	2

Scale	Degree	Point
3	Not Sure	3
4	Agree	4
5	Strongly Agree	5

3) Statement Judgment

To be able to determine whether the Attitude towards Science Questionnaire is suitable for Junior High School, there is a need for the questionnaire to be judged in different point of view from some experts. There are two experts joined in this judgement, both have background in education, specifically science education. The statements of Attitude towards Science Questionnaire addressed to both experts directly, along with the resolve and instruction of statement judgement. The result of experts' judgment is shown in Appendix 2.

4) Validity and Reliability

Since the instrument is adapted from Said, Abd-El-Khalick, Summers, Culbertson, & Friesen (2013), the Attitude towards Science Questionnaire has already been through validation and reliability test. The validity result of the adapted questionnaire is presented in Table 3.6, while the reliability result is presented in Table 3.7.

Table 0.6 National representative student sample for the ASSASS large-

scale validation (N = 1978)

		Grade				Students					
						Sex					
		Sections		Number		Male		Female		Not reported	
School	Level(s)	*n*	%[a]	*n*	%[a]	*n*	%[b]	*n*	%[b]	*n*	%[b]
School level											
Primary	3	12	12.5	224	11.3	104	46.4	109	48.7	11	4.9
	4	9	9.4	208	10.5	84	40.4	120	57.7	4	1.9
	5	9	9.4	180	9.1	54	30.0	119	66.1	7	3.9
	6	9	9.4	207	10.5	68	32.9	130	62.8	9	4.3
Total	–	39	40.6	819	41.4	310	37.9	478	58.4	31	3.8
Preparatory	7	13	13.5	261	13.2	92	35.2	165	63.2	4	1.5
	8	9	9.4	218	11.0	142	65.1	71	32.6	5	2.3
	9	9	9.4	177	8.9	100	56.5	76	42.9	1	0.6
Total	–	31	32.3	656	33.2	334	50.9	312	47.6	10	1.5
Secondary	10	9	9.4	171	8.6	77	45.0	83	48.5	11	6.4
	11	7	7.3	134	6.8	47	35.1	80	59.7	7	5.2
	12	10	10.4	198	10.0	58	29.3	138	69.7	2	1.0
Total	–	26	27.1	503	25.4	182	36.2	301	59.8	20	4.0
Grand total	–	96	100.0	1978	100.0	826	41.8	1091	55.2	61	3.1
School type											
Independent		34	35.4	678	34.3	277	40.9	389	57.4	12	1.8
Semi-independent		33	34.4	667	33.7	172	25.8	472	70.8	23	3.4
International		1	1.0	21	1.1	17	81.0	0	0.0	4	19.0
Community		11	11.5	259	13.1	102	39.4	152	58.7	5	1.9
Private Arabic		17	17.7	353	17.8	258	73.1	78	22.1	17	4.8
Grand total	–	96	100.0	1978	100.0	826	41.8	1091	55.2	61	3.1

[a] Percent of grand total.

[b] Percent of corresponding grade or school level.

(Adopted from Said, Abd-El-Khalick, Summers, Culbertson, & Friesen, 2013)

Table 0.7 CFA-based scale reliabilities for the final ASSASS model

Sub-scale	Reliability
Attitude	0.87
Negative outlook	0.75
Control beliefs	0.61
Behavioral beliefs	0.77
Intention	0.83

(Adopted from Said, Abd-El-Khalick, Summers, Culbertson, & Friesen, 2013)

5) Final Form of the Attitude towards Science Questionnaire

After the judgment done by experts, a final form of Attitudes toward Science Questionnaire is completed. The final form of the questionnaire has 64 statements and available in two versions, Bahasa and English. This questionnaire has five-scale Likert scale. The final form of Students' Attitudes toward Science Questionnaire can be seen in Appendix 3.

3.4 Research Procedure

The procedure for this research divided into three stages, which are preparation stage, implementation stage, and completion stage. Each stage has its own step will be conducted during the research.

1) **Preparation Stage**

For this stage, several steps are established as the starting point of the research. The steps are explained as follow:

a) Identify which issue is suitable for the research material.
b) Read and analyze previous researches in various sources (journal, book, etc.) to help determine the research problems and focus.
c) Choose the subject that will be the center of the research. In this research, attitude towards science is chosen.
d) Arrangement of research instrument.
    a. Instrument judgment by experts
    b. Test the validity and reliability

2) **Implementation Stage**

After the preparation was completed, the research will be conducted as follow:

a) Determine the population and sample.
b) Distribute research instrument.
c) Collect the research data.

3) **Completion Stage**

For the last and final stage of the research, these following steps will be conducted:

a) Analyze the data properly and accordingly.
b) Explain the result and create discussion from the analyzed data.
c) Draw conclusion from the research.

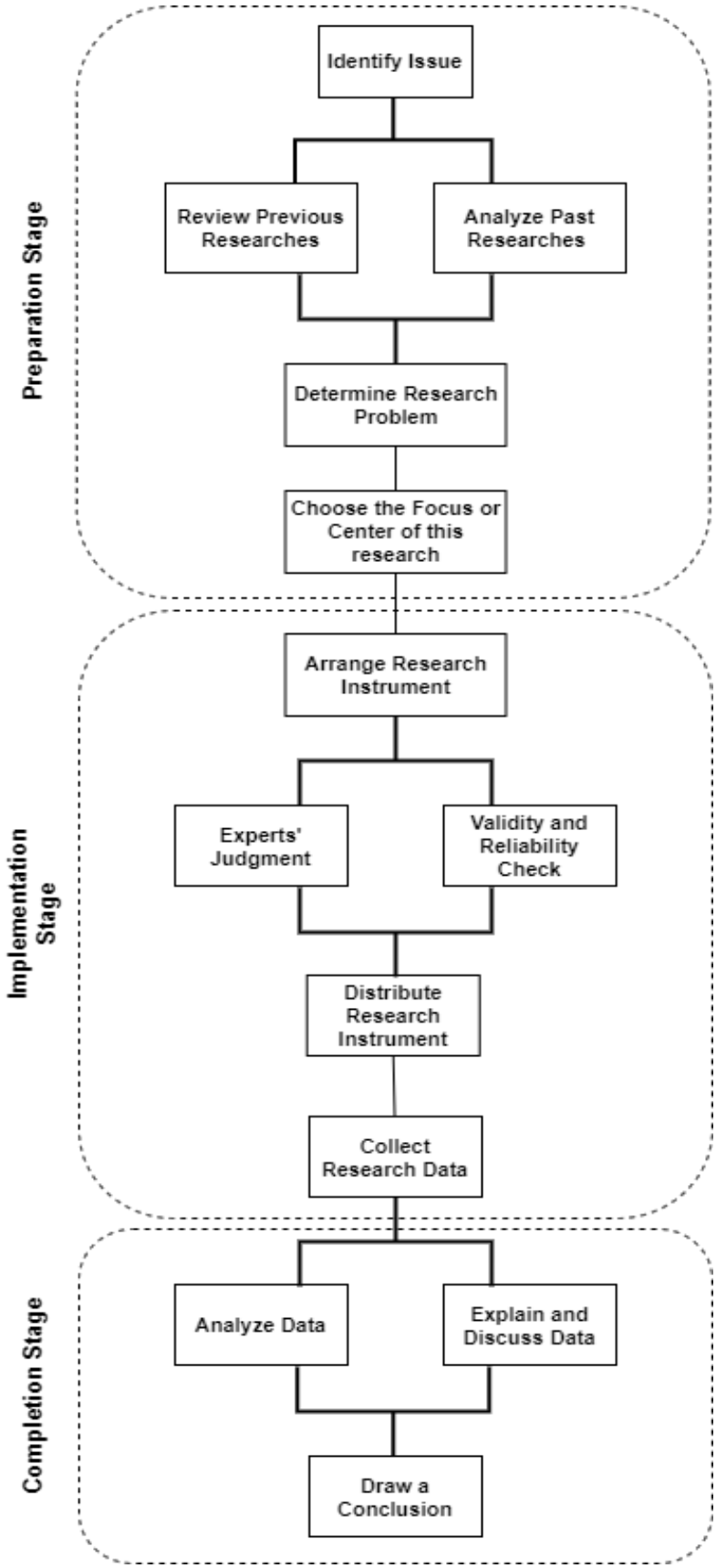

Figure 0.5 Research Diagram

3.5 Data Analysis

For this research, one questionnaire will be distributed to junior high school students all over Indonesia with the aid of a platform called Google Form. The questionnaire addressed the students' attitude toward science before and during COVID 19 Pandemic. Students were given a link of the questionnaire, which is http://bit.do/skripsinadel. The data gathered will then analyzed using statistical software SPSS (version 27) to acquire the frequencies of data collected. The processed data will also be present in the form of tables, diagrams, and texts. The provinces are DKI Jakarta, Banten, West Java, East Java, Central Java, Special Region of Yogyakarta, Central Kalimantan, North Kalimantan, Lampung, Islands of Riau, Maluku, Gorontalo, South Sumatra, North Sumatra, South Sulawesi, Islands of Bangka Belitung, Jambi, Aceh, and Bengkulu.

To acquire result from the students' attitudes toward science, accumulation of the point gained by the students was desired. Students who had answered all 64 statements in Attitudes toward Science Questionnaire will gained two separate scores for before and during COVID-19 pandemic. For each score, the students have a minimum point of 32 and the maximum point of 160. After calculating the average for both the score of students' attitudes toward science before and during COVID-19 pandemic, an average percentage will be calculated with the formula:

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

P = Percentage

f = Total Score

N = Maximum Score

(Adapted from Riduwan, 2015: 15)

The percentage gained will then interpreted in the criteria shown in Table 3.3.4.

Table 0.8 Range of Students' Attitudes toward Science Points and Levels

Range	Interpretation
0% - 20%	Very Bad

Range	Interpretation
21% - 40%	Bad
41% - 60%	Moderate
61% - 80%	Good
81% - 100%	Very Good

(Adapted from Riduwan, 2015: 15)

3.6 Assumption

The assumptions as the groundwork of this research are as follow.

1) Attitudes toward is a broad expression that has been used to comprise scientific attitudes and interests, along with attitudes toward scientists, scientific careers, science teaching methods, science curriculum, or science subject in the classroom.
2) The learning system in Indonesia's Junior High School changed into distance learning and some alterations in curriculum are applied as per March 2020 according to Indonesia ministry of Education and Culture.

3.7 Hypothesis

The hypothesis that is tested in this research are as follow.

H_0: The attitudes toward science of junior high school students before COVID-19 pandemic is better than during COVID-19 pandemic.

H_1: The attitudes toward science of junior high school students during COVID-19 pandemic is better than before COVID-19 pandemic.

H_0: There is no difference between attitudes toward science of junior high school students before and during COVID-19 pandemic.

H_1: There is a difference between attitudes toward science of junior high school students before and during COVID-19 pandemic.

3.8 Operational Definition

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

1) **Attitudes toward science** in this research are the feelings, beliefs and values held about an object that may be the enterprise of science, school science, and the impact of science on society or scientists themselves, as described by Osborne, Simon, and Collins (2003).

2) **Science learning during COVID 19 pandemic** is in this research refers to the new policy by Indonesia ministry of Education and Culture. It is stated that learning from home through online/distance learning is carried out to provide a meaningful learning experience for students, without being burdened with the demands of completing all curriculum achievements for grade promotion and graduation (Surat Edaran Mendikbud Nomor 4 Tahun 2020 pasal 2a).