CHAPTER III

RESEARCH METHODOLOGY

3.1   Research Method and Research Design
3.1.1   Research Method

The purpose of this research is to describe the current condition of students' concept mastery and students' environmental awareness in learning global warming topic Since the goal of this research is to capture or describe students' concept mastery and environmental awareness profile, the descriptive correlation method was used to fulfill the goal itself and the reason why something is occurred will be provided (Arikunto,2011). Descriptive method is one of the research methods that try to describe and interpolate an object based on the natural condition (Kusumawati, 2015). Meanwhile Sugiono (2014) stated that correlation method is a method trying to correlate one element with another element to create the new form which different with the previous form. Therefore, there is no treatment given to the object and set the natural condition without any manipulation. The give state of affairs will be described by the descriptive studies as carefully and fully as possible (Frankel, 2011).

3.1.2   Research Design

This research uses the non-experimental descriptive correlation. All of the students came from two classes from each grade level of secondary high school were given global warming topic test in order to capture their students' concept mastery in cognitive aspect from C1 to C6. Moreover, to identify their environmental awareness, the questionnaire, which adopted from Royan and Nebrida (2019) was given to them after finishing the test. When all the data were collected, the profile of students' concept mastery and environmental awareness could be identified.

3.2   Population and Sample

Population is a generalization area that consist of objects and subjects that have certain qualities and characteristics determined by the researcher t be counted and draw the conclusion (Sugiono, 2013)

The school for this research took place was one of Public Junior High School in Kabupaten Cirebon. The school uses the 2013 National Curriculum then

the teaching learning process activities is mainly conducted in Bahasa Indonesia. All of those students experienced discussion as one of the teaching learning process activities. The convenience sampling was used as the sampling technique for this research. Fraenkel (2011) stated that the convenience sample is a group of individuals who are available for study conveniently.

Table 3.1
Subject of The Research

No.	Grade	Number of Classes	Number of Students
1	7th grade	6 classes	104 students
2	8th grade	8 classes	187 students
3	9th grade	6 classes	137 students
	Total		428 students

3.3   Operational Definition

In order to get the expected goals and avoid misunderstandings in interpreting the existing term in this research. Fred Kerlinger (1966) in *Foundation of Behavioral Research* book stated that operational definition spells out what the researcher must do by defining and giving meaning of the variable in order to measure the variable itself. In this research, operational definition of terms is cleared as follows:

1. Students' Concept Mastery in this research refers to the revised Bloom's Taxonomy that focused on cognitive aspect such as Remembering (C1), Understanding (C2), Applying (C3), Analyzing (C4), Evaluating (C5) and Creating (C6). In this research, all of the cognitive aspect from C1 to C6 is measured by using an objective test consists of 30 multiple-choice question form. The entire question is based on the indicator of global warming topic, which consists of the definition of global warming, the cause, and effect and the solution for global warming.

2. Students' Environmental Awareness is the way for displaying national civilization and it is the most important indicator as well. It reflects many aspects of environmental status such as personal consideration and behaviour, public capacity and the local citizens' attitude towards sustainable society as a whole (Kaiser, 2003). To identify the students' environmental, the students were given a questionnaire that is adopted

from Royan and Nebrida (2019) which consist of part 1 (Awareness of Environmental Concept and State of Environmental), part 2 (Awareness of Practices on the Need to Solve Environmental Problems) and part 3 (Awareness of Practices on the Need to Possess a High Degree of Commitment).

3.4 Research Instrument

3.4.1 Cognitive aspect test

Cognitive aspect test is in form of 30 multiple choices questions in order to describe the cognitive ability of students in mastering the concept and based on the Bloom Taxonomy revised. The level of cognitive process dimension that is measured is from C1 to C6.

In order to modify or revise the test item that was not appropriate with the content, distratctor or question statement, the instrument had already consulted and judge by some lectures and experts from related field. The instrument was also tested to the group of students who had already given the global warming topic. Table 3.2 below shown the blue print of cognitive test item

Table 3.2
Blue print of Cognitive test item

Sub Topic	Cognitive Process Dimension And Number Of Test Item					
	C1	C2	C3	C4	C5	C6
Greenhouse effect	1,26	2	4,7	-	15	-
The cause of global warming	16	14,25,27	9	24	21	18,20
The effect of global warming	11,17	3,6	-	12,23	30	-
Human effort to reduce global warming	19,28	10	8,29	5,13,22	-	-

In order to make the research instrument is appropriate for the research itself; the instrument analysis of cognitive aspect test requires validity, reality, level of difficulty and discriminating power.

a. Validity

Validity is the most important characteristic of any test. Validity refers to the correctness, meaningfulness and usefulness of the specific conclusion that is collected (Fraenkel, Wallen & Hyun, 2011). Validation is the process to support the inference by collecting and analyzing evidence (Fraenkel, 2011). The software of ANATES was used in the process of validity of the instrument. The formula is described below:

$$r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (XY)^2]}}$$

Where,

   r   =   Correlation coefficient between x and y variable

   N   =   Amount of students

   X   =   Total score in test item

   Y   =   Total score of student

(Fraenkel, 2011)

The formula above can be used to determine the validity of the sampe item. The Table 3.3 below can be used toi define the criteria of each item.

Table 3.3
Validity Interpretation

Correlation Coefficient	Validity Criteria
$0,80 < r \leq 1.00$	Very High
$0,60 < r \leq 0,80$	High
$0,40 < r \leq 0,60$	Enough
$0,20 < r \leq 0,40$	Low
$0,00 < r \leq 0,20$	Very Low

(Source: Minium et al., 1993)

b. Reabiltity

Reliability is described as the consistency of the scores or answer from one administration of an instrument to another and from one set of items to another (Fraenkel, 2011). It will be called as reliable when a test rely and fit on several aspects in conducting the test item. Therefore, the formula to calculate the realibity is described as follows:

$$KR_{20} = r = \frac{N}{N-1}\left(\frac{S^2 \sum pq}{S^2}\right)$$

Where,

KR_{20} =   The realibility estimate (r)

N =   The number of items on the test

S^2 =   The variance of the total test score

P =   The propotion of the people getting each item correct (this is found separately for each item)

Q =   The propotion of people getting each item incorrect
For each item, q equals 1 - p

$\sum pq$ =   The sum of the products of p time for each time

(Source : Kaplan,2009)

The realibilty of test item could be calculated by using ANATES. Table 3.4 shown the interpretation of the result.

Table 3.4
Reability Interpretation

Correlation coeffecient	Realiability Intrepetation
$0.80 < r \leq 1.00$	Very High
$0.60 < r \leq 0.80$	High
$0.40 < r \leq 0.60$	Enough
$0.20 < r \leq 0.40$	Low
$0.00 < r \leq 0.20$	Very Low

(Source: Minium et al., 1993)

c. **Difficulty level**

Difficulty is the mean score of test item corespond to the propotion of who answer the item correctly. Arikunto S(2012:222) stated that the question which is not too easy or not too diffcult to be answered could be defined as good question. Students will not be stimulated to try harder to answer

when the question is too easy, otherwise the student will give up or lose heart when the question is too difficult (Arikunto,2012).

The formula that can be used to measure the difficulty level is shown as follows :

$$P = \frac{Number\ of\ student\ who\ answered\ the\ item\ correctly\ (A)}{Total\ number\ of\ students\ who\ attempted\ the\ item\ (N)} \times 100$$

(Source: Cohen, 2007)

The difficulty level can be calculated by using ANATES software. The value can be interpreted in Table 3.4.

Table 3.5
Difficulty Interpretation

Value	Criteria
0-0,29	Difficult
0.30-0.69	Middle
0.70-1.00	Easy

(Source: Arikunto, 2012)

d. **Discriminating power**

Discriminating power analysis means the questions' ability to distinguish between the high and low achieveer students (Arikunto S.,2012;226). Not good question is when the question can be asnwered by both low and high achiever students then the question which can not be answered by both low and high achiever students can also defined as not good question since the question has no discriminating power.

To measure the discrimanting power, the formula that can be used as follows :

$$D = \frac{B_A}{J_A} - \frac{B_B}{J_B}$$

(Source: Arikunto, 2013)

Where,

D　　　= Discriminating power

BA　　= Number of high achieving group that have correct aswer

BB　　= Number of low achieving group that have correct aswer

JA　　= Total Paticipant of high achieving test-takers

JB　　= Total Paticipant of bottom achieving test-takers

Table 3.6
Clssifiction of Discriminating Power

Discriminant Index Coefficient	Discriminant Index Criteria
$0.00 < D \le 0.20$	Poor
$0.20 < D \le 0.40$	Statisfactory
$0.40 < D \le 0.70$	Good
$0.70 < D \le 1.00$	Excellent
$D =$ Negative	Question is deleted

(Source: Arikunto, 2013)

e. **Disctractor**

Distractor is where the multiple-choces' item option offers the alternative answer then the student should choose the correct one. When the students choose it many times, it can be defined as effectively working, otherwise if rarely or never been choosen by the students, means that it doesn't work effectively (Cohen,2007).

3.4.2　Questionnaire

To capture the level of students' environtmental awareness, the instruments that is used is the questionnaire. The questionnaire is adopted from Royan and Nebrida (2019). The questionnaire is distributed to the students' after all the students finished taking the cognivitve aspect test. The questionnaire also already consulted and validated by some lectures and experts in order to revise it wchich was not appropiate with the researchs' need.

The questionnaire itself concist of three part, part 1 (Awareness of Environtmental Concept and State of Environtmental), part 2 (Awareness of Practices on the Need to Solve Environmental Problems) and part 3 (Awareness of Practices on the Need to Possess a High Degree of Commitment).

Table 3.7
Questionnaire of Environtmental Awareness
Part 1 (Awareness of Environtmental Concept and State of Environtmental)

Variable	No	Statments	Liker scale					
			Highly Aware	**Very Aware**	**Moderately Aware**	**Slightly Aware**	**Totally Unaware**	
Awareness of Environmental Concepts	1	Hutan hujan adalah ekosistem yang paling beragam di dunia						
	2	Pemanasan global terjadi akibat akumulasi/konsentrasi gas rumah kaca yang berlebih						
	3	Lapisan ozon melindungi kehidupan di Bumi dengan menyerap radiasi ultraviolet berbahaya dari Matahari						
	4	Pembangunan berkelanjutan berarti meningkatkan standar hidup tanpa merusak lingkungan						
	5	Aktivitas membuat gurun buatan adalah penurunan produktivitas biologis atau ekonomi tanah di daerah kering dan semi kering yang dihasilkan dari berbagai faktor termasuk aktivitas manusia						
	6	Hujan asam adalah suatu bentuk polusi udara di mana asam-asam yang terbawa udara yang dihasilkan oleh pembangkit listrik dan sumber-sumber lain jatuh ke Bumi						

Variable	No	Statments	Liker scale					
			Highly Aware	Very Aware	Moderately Aware	Slightly Aware	Totally Unaware	
	7	Masyarakat adat adalah mereka yang telah menghuni dan mencari nafkah langsung dari lingkungan yang sama selama ratusan atau ribuan tahun.						
	8	Hanya ada satu persen dari semua air di dunia yang layak						
	9	Agenda 21 adalah rencana Persatuan Bangsa Bangsa (PBB) di mana negara-negara berkembang berjanji untuk mengembangkan industrinya dengan tujuan melindungi lingkungan.						

Table 3.8
Questionnaire of Environtmental Awareness
Part 2 (Awareness of Practices on the Need to Solve Environmental Problems)

Variable	No	Statements	Liker scale				
			Always	Often	Sometime	Seldom	Never
Awareness of Practices on the Need to Solve Environmental Problems	1	Mematikan lampu dan menccabut peralatan saat tidak digunakan untuk menghemat listrik					

Variable	No	Statements	Always	Often	Liker scale Sometime	Seldom	Never
Awareness of Practices on the Need to Solve Environmental Problems	2	Memanfaatkan energi matahari, radiasi yang dihasilkan oleh reaksi fusi nuklir jauh di dalam inti Matahari.					
	3	Menanam pohon endemik di area kosong di masyarakat untuk mencegah erosi tanah dan mendapatkan lebih banyak oksigen untuk bernapas.					
	4	Menghindari penggunaan plastik dan styrofoam yang tidak hanya membahayakan lingkungan tetapi juga kesehatan manusia					
	5	Menghindari membuang sampah di mana saja dan pelajari ilmu pemilahan sampah					
	6	Menjaga etika makanan yang baik dengan menghindari membuat makanan sisa					
	7	Mengurangi penggunaan deterjen karena mereka cenderung membuat busa di selokan yang dapat menyebabkan polusi air dan tanah					

Variable	No	Statements	Liker scale				
			Always	Often	Sometime	Seldom	Never
Awareness of Practices on the Need to Solve Environmental Problems	8	Mempraktekan ilmu pengomposan yang menghasilkan bahan organik terurai sebagian yang digunakan dalam berkebun untuk memperbaiki tanah dan meningkatkan pertumbuhan tanaman.					
	9	Mendaur ulang dan gunakan kembali bahan-bahan yang tidak dapat terurai secara alami untuk mengurangi limbah padat.					
	10	Menggunakan botol air atau gelas yang dapat digunakan kembali daripada membeli air botolan di kantin atau toko.					

Table 3.9
Questionnaire of Environtmental Awareness
Part 3 (Awareness of Practices on the Need to Possess a High Degree of

Commitment)

Variable	No	Statements	Liker scale				
			Always	Often	Sometime	Seldom	Never
Awareness of Practices on the Need to Possess a High Degree of Commitment	1	Mendiskusikan dengan teman dan kerabat tentang masalah lingkungan dan masalah yang dihadapi masyarakat dan negara secara keseluruhan					

Variable	No	Statements	Liker scale				
			Always	Often	Sometime	Seldom	Never
	2	Melobi untuk undang-undang yang relevan tentang pelestarian lingkungan dengan dukungan dari pemerintah					
	3	Menulis artikel di surat kabar yang mendorong orang untuk ikut merespons berbagai masalah lingkungan..					
Awareness of Practices on the Need to Possess a High Degree of Commitment	4	Mengatur forum atau simposium lingkungan dengan teman-teman anda dan masyarakat.					
	5	Menulis surat permohonan kepada pemerintah mengenai masalah lingkungan di Anda.					
	6	Meminta dukungan media dalam mengungkap pelanggaran dan penyimpangan yang menyebabkan kerusakan lingkungan					

Variable	No	Statements	Liker scale				
			Always	Often	Sometime	Seldom	Never
	7	Menyampaikan orasi atau wacana tentang literasi lingkungan untuk meningkatkan kesadaran masyarakat.					
	8	Menjadi relawan untuk kelompok organisasi yang membantu pelestarian dan pelestarian lingkungan.					
Awareness of Practices on the Need to Possess a High Degree of Commitment	9	Mendorong semua orang untuk menjadi duta lingkungan di komunitasnya masing-masing,					

3.5   Instrument Validation Result

The reasercher decided to use 30 question and drop the rest 20 question s based on the quality of the questions from aonther questions. Table 3.6 describes the distribution of the objective test based on cognitive level dimmension after being analyzed by ANATES.

Table 3.10

The Recapitulation of Test Item based on Cogintive aspect

No	Cognitive Level	Total of Test Item	Number of Question
1	C1 (Remembering)	7	1,9.15,19,20,29.30
2	C2 (Understanding)	7	2,3,4,10,16,21,27
3	C3 (Applying)	5	6,11,12,13,22

4	C4 (Analyzing)	6	7,13,14.17,24,26
5	C5 (Evaluating)	3	5,8,25
6	C6 (Creating)	2	18,29
	Total	**30**	

3.6   Data Anaysis Technique

The quantitative technique was used to gather the data in this research. This technique was used to analyze tha students' concept mastery and students' environmental awareness. Information is shown below in detail as follow:

3.5.1   Students' concept mastery

There are 30 number of multiple choice test to obatine the students' concept mastery. SPSS Software was used to analyze the data of students' concept mastery and also to check the normality and homogenity of the test items was eximined by using SPSS software. There are 2 type of data was gained, firstly based on students level of cognitive domain C1 (Remembering), C2 (Understanding), C3 (Aplying), C4 (Anlaysing), C5 (Evaluating), and C6 (Creating). Secondly based on the sub topic of global warming topics which are the greenhouse effect, the cause of global warming, the effect of global warming and the human effort to reduce the global warming. All the data shown and presented as the form of precentage of the correct answer, this data aims to define the profile of students' concept mastery.

3.5.2   Students' environmental awareness

In this reserach, students' environmental awareness was exmined used the linkert scale analysis and also used the SPSS software in order to anlayze their normality and homogenity. The open-ended questionaire was distributed vritually through online platform to the students. The used questionaire was adopted from previous research. The questionaire consist of three part; part 1 Awareness of Environtmental Concept and State of Environtmental; part 2 Awareness of Practices on the Need to Solve Environmental Problems and part 3 Awareness of

Practices on the Need to Possess a High Degree of Commitment. The statements of representation of the questionaire are differents to each other, the part 1 and 2 used 1 (tottaly unaware) 2 (slightly aware) 3(moderately aware) 4 (very aware) 5 (highly aware) while part 3 used the statements 1(never) 2(seldom) 3(sometimes) 4(often) 5(always). All the data was exemined in order to shows the precentage of students' environmental awareness.

3.6 Research Procedure

To make the research well organized systematicly, there are three part of procedure stages. There are preparation stage, implementation stages and completion stage. Detailed information will be shown as follow :

3.6.1 Preparation stage

By having this stage it aims for the author to analyze the entire varibale in this research before conductiong the research itself. Detailed information is explained as follow :

1. Identifying the reearchs' problem
2. Literature study about students' concept mastery, students' environmental awareness, global warming topic was conducted by the author in order to enrich the knowledge. All the literatures come from the realible sources such as books, e-books,journals and the article as well.
3. The insturments for students' concept mastery and environmental awareness were designed
4. Validating the insturments to the experts
5. Validating the instruments to the students who have learned about related topic which in this reserach is global warming topic
6. Revising the instruments based on validation activities done previously, both from the expert or the students

3.6.2 Implementation statge

In this stage, the researcher start to conduct the reearch in order to gain data needed for the research itself. The detailed information is shown as follow:

1. Deciding the subject of the research

2. Spreading the instruments of the research to the students

3. Gaining the data from both reseacrh instruments

3.6.3 Completition stage

This is the last stage of this research which means that the data collected and exmined. The detailed information about this stage stated as follow:

1. The data is analyzed

2. The analyzed data is discussed
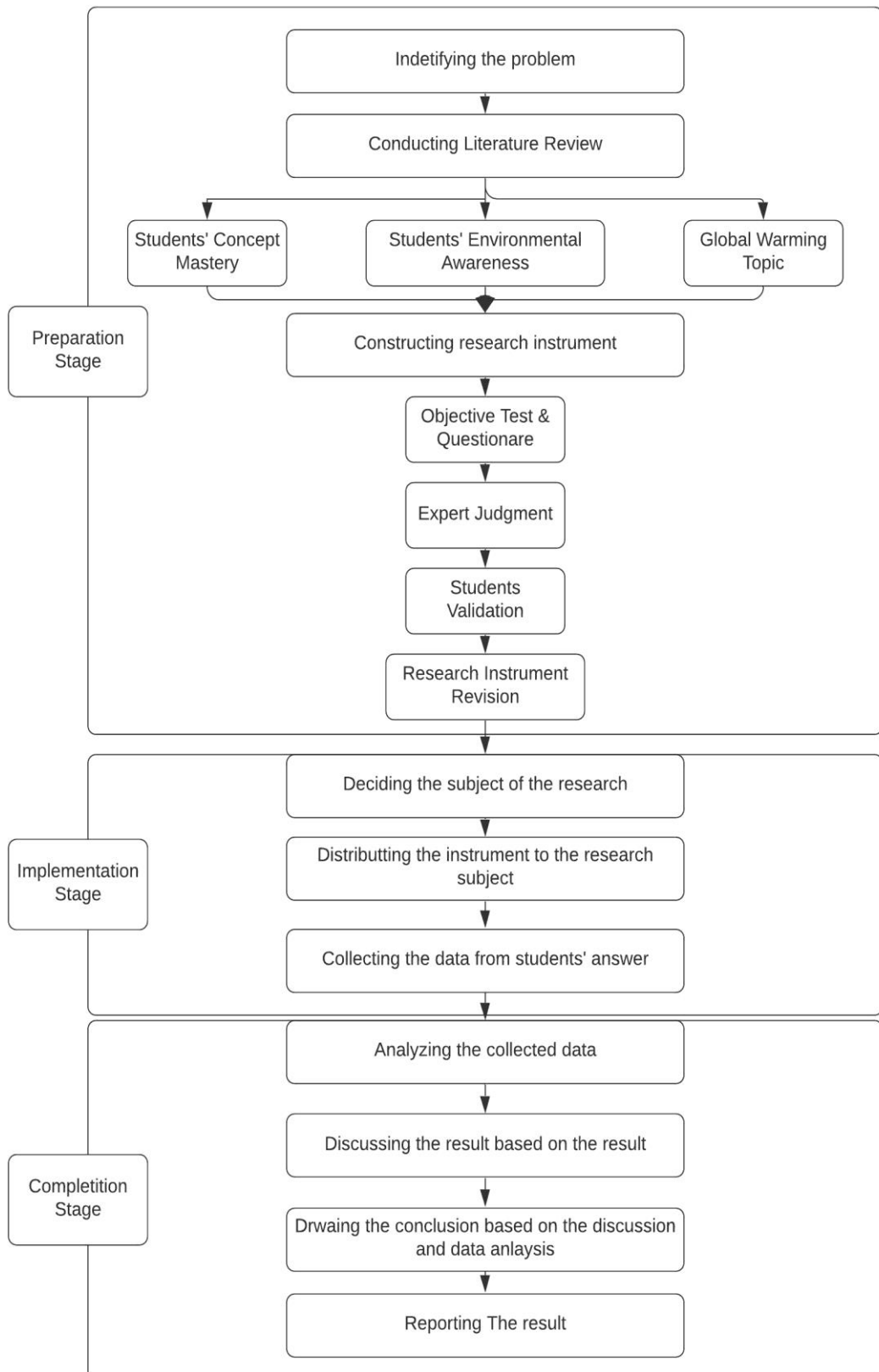
3. Making the conclusion based o the data discussion and analysis

4. Reporting the result

Figure 3.1 Research Flowchart