CHAPTER III
RESEARCH METHODOLOGY

1.1 Research Method

This research aims to identify students' ethical perceptions of the use of animals in science learning activities and the factors that influence them, including gender and ownership of pets. Based on this purpose, a descriptive method was used to accomplish the aim of research itself. Loeb (2017) define descriptive research as a way to identify trends and variation in populations, create new measures of key phenomena, or simply describe samples in studies aimed at identifying causal effects. Descriptive research is a part of almost every empirical paper and report.

The purpose of descriptive method is to describe and interpret the current status of individuals, settings, conditions, or event (Mertler, 2014). In descriptive research, survey methods of all kinds, including comparative and correlational methods, are commonly used (Kothari, 2017). The researcher is simply studying the phenomenon of interest as it exists naturally; no attempt is made to manipulate the individuals, conditions or events. As an outcome, no treatment was given to the students while gathering data. A descriptive method was used to accomplish the aim of evaluating the ethical perspectives of middle school students.

1.2 Research Design

The research design is a cross-sectional survey design. A cross-sectional survey collects information from a sample that has been drawn from a predetermined population and the information is collected at just one point in time a day to a few weeks more. The survey design can be appropriate because it recognizes all of the steps involved in conducting a survey on a phenomenon to be studied. A survey design provides a quantitative description of a population's trends, attitudes, or opinions by researching a sample of the population. The researcher generalizes or draws inferences to the population based on sample results. (Kothari, 2017 and Creswell, 2014)

Surveys are primarily used to describe the characteristics of a population. In essence, researchers are interested in determining how members of a population distribute themselves across one or more variables such as age, ethnicity, religious preference, attitudes toward school. (Fraenkel et al., 2012). The research used one instrument in the form of a questionnaire to profile students' ethics perception to the use of animal in science education. The data was collected through an online survey platform. The accessible link

of the questionnaire is http://gg.gg/animalinscienceedu.

1.3 Population and Sample

The research was conducted by administering the questionnaire to junior high schools located in Bandung. All schools implement the Indonesian National Curriculum. Because this research means to investigate the junior high school students, seventh to ninth-graders in the academic year 2020-2021 was chosen as the population. The population consists of all members of a human community, animal, event, or object who live together in one location and have chosen to become the conclusion target of the research's findings (Creswell, 2012).

As the purpose of this research to describe the ethical perception of students about to the use of animals in science education, this research needs many student participants. Sampling was carried out using convenience sampling technique. This sampling method obtaining the most accessible people or a collection of data from members of the population who are easily accessible and willing to provide that data. A convenience sample is a group of people who are readily available for research (Fraenkel et al., 2012). The researcher has legal authority to collect data from the school without interfering to the learning activities. The process of getting random respondents was done by contacting teachers from several schools who then shared a link to fill out the questionnaire, then the teachers immediately distributed it to the group chat of their students.

1.4 Operational Definition

In order to interpret some of the terms used in this research linearly and to prevent misconceptions, some of the terms used in this research are explained as follows:

1) Students' ethical perceptions in this study were obtained by using a questionnaire focusing on the opinions of junior high school students regarding the use of animals in science learning activities. The questionnaire consist of simple multiple choice questions and simple questions that only focuses on science learning activities that use animals. The questionnaire was made by adopting criteria from previous research which were then translated into Indonesian to reach potential respondents widely and is easier for respondents to understand. Questionnaires distributed to respondents to fill in according to what they feel or think through a Google Form, with a disclaimer that if any questions are left unanswered, the respondent will be unable to send the questionnaire. The data in the questionnaires submitted were automatically recorded and stored without any manipulations. All questionnaires are re-checked and data

processing is performed after they are complete. The descriptive analysis is performed using IBM SPSS Statistics and Microsoft Office Excel for results.

1.5 Research Instrument

The research instrument is very important to use in this research for the collection of data. There is only one research instrument to find out the student's ethics perception to the use of animal in science learning, which is a questionnaire probing the ethical perceptions of middle-school students. The processes of developing the questionnaire are presented in figure 3.1 below.

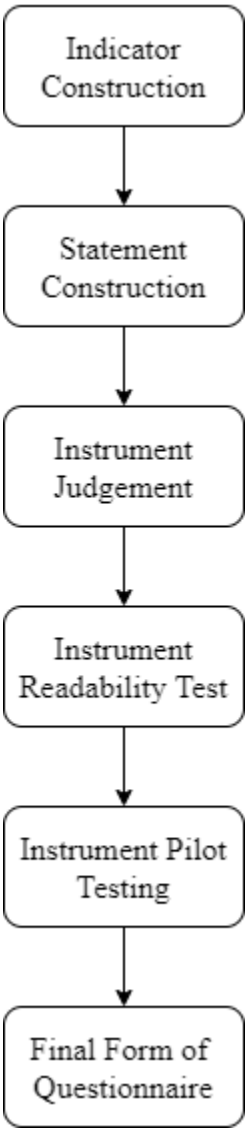


Figure 3. 1 Developing the Questionnaire Proccesses

1.5.1 Indicator Construction

The questionnaire on student perceptions about the ethical use of animals in science education was based on criteria used in a recent American study (NYU

Langone Medical Centre, 2020), including specific principles in lessening the use of animals in research. Briefly, the Three Rs proposed by Russell and Burch in 1959:

1) Replacement: methods which avoid or replace the use of animals in research
2) Reduction: use of methods that enable researchers to obtain comparable levels of information from fewer animals, or to obtain more information from the same number of animals.
3) Refinement: use of methods that alleviate or minimize potential pain, suffering or distress, and enhance animal welfare for the animals used.

Five criterias that has been established for the questionnaire in this study, specifically:

1. Utilization of animals in science learning activities.
2. Types of animals used in science learning.
3. Ethics of using animals in science learning.
4. Replacement of animals with other methods in learning activities.
5. Reducing the number of animals used in learning activities.

1.5.2 Statement Construction

The statements in the questionnaire are made upon the five criterias. In the statement, students' ethics perception will be profiled. The initial questionnaire consists of 24 statements, there were 30 statements to be used for expert judgment. The statements were made more than the target intended. It is because there would be a high possibility that some items would be removed due to the validity and reliability issues. The initial form of the questionnaire had a detailed classification, as shown in Table 3.1 below.

Table 3. 1
Initial Version of The Questionnaire

Criteria	No	Statement	Likert Scale			
			Strongly Disagree	Disagree	Agree	Strongly Agree
Utilization of animals in science learning	1	*Penggunaan hewan untuk percobaan dalam pembelajaran sains memudahkan saya*				

activities		*memahami makhluk hidup* [Using animals for experiments in science learning makes it easier for me to understand living things].
	2	*Pemanfaatan hewan dalam pembelajaran sains dapat dilakukan untuk tujuan Pendidikan* [Animals can be used in science education for educational purposes].
	3	*Menurut saya penggunaan hewan hidup dalam pembelajaran sains menyalahi norma* [I think the use of live animals in science learning is against the norm].
	4	*Penggunaan hewan dalam pembelajaran sains akan membuat hewan kesakitan* [Animals will become sick if they are used in science lessons].
	5	*Menurut saya penggunaan hewan dalam pembelajaran sains mengganggu populasi hewan* [I think the use of animals in science learning is disrupting animal populations].
	6	*Penggunaan hewan sebagai objek pembelajaran sains merupakan tindakan yang benar karena hewan diciptakan untuk manusia gunakan* [Using animals as objects of science learning is the right thing to do because animals were created for humans to use].
Types of	7	*Penggunaan hewan untuk*

animals used in the experiment		*percobaan dalam pembelajaran sains lebih baik menggunakan hewan liar daripada hewan ternak* [It is preferable to use wild animals rather than farm animals for science experiments].
	8	*Menurut saya hewan yang berpopulasi tinggi lebih baik digunakan untuk percobaan dalam pembelajaran sains* [I think high population animals are better used for experiments in science learning].
	9	*Dalam pembelajaran sains lebih baik menggunakan hewan hidup daripada hewan yang sudah mati* [In science learning it is better to use live animals than dead animals].
Ethics of using animals in science learning	10	*Saya akan mempelajari etika penggunaan hewan sebelum melakukan pembelajaran sains* [I will study the ethics of using animals before doing science learning].
	11	*Saya akan memberi makan hewan sebelum melakukan percobaan untuk pembelajaran sains* [I will feed the animals before doing the experiment for science learning].
	12	*Saya akan meletakan hewan di tempat berventilasi sebelum digunakan sebagai bahan pembelajaran sains* [I will put the animals in a ventilated place before using them as science learning materials].
	13	*Saya akan memberi obat*

		bius kepada hewan sebelum digunakan sebagai bahan pembelajaran sains [I will anesthetize the animals before they are used as science learning materials].
Replacement of animals in learning activities with other methods	14	*Menurut saya mempelajari ilmu sains cukup dengan teori saja* [In my opinion, learning science is enough with theory].
	15	*Saya akan menonton video pembedahan hewan daripada membedahnya langsung* [I will watch the veterinary surgery video instead of dissecting it live].
	16	*Pembelajaran sains menggunakan hewan hidup tidak dapat digantikan dengan metode lain* [Learning science using live animals cannot be replaced by other methods].
	17	*Kegiatan yang melibatkan hewan dalam pembelajaran sains dapat digantikan melalui program realitas virtual* [Virtual reality can be used to replace animal-related activities in science classes].
Reducing the number of animals used in learning activities	18	*Jumlah hewan yang digunakan dalam pembelajaran sains harus dikurangi* [The number of animals used in science learning should be reduced].
	19	*Praktek pada pembelajaran sains dilakukan secara berkelompok agar jumlah hewan yang digunakan*

		lebih sedikit [Practice in science learning is carried out in groups so that fewer animals are used].	
	20	*Proses pembelajaran yang melibatkan hewan harus dilakukan seluruh siswa agar setiap siswa mendapat pengalaman dan pemahaman yang baik* [The learning process that involves animals must be carried out by all students so that each student gets a good experience and understanding].	
Criteria	No	Question	Answer
Utilization of animals in science learning activities	21	*Kemukakanlah pendapatmu tentang pemanfaatan hewan dalam pembelajaran sains* [Share your opinions on the use of animals in science learning].	
	22	*Menurutmu jenis hewan apakah yang lebih baik digunakan dalam pembelajaran sains?* [What kind of animal do you think is better to use in science learning?].	
Ethics of using animals in science learning	23	*Jika harus menggunakan hewan dalam pembelajaran sains, menurutmu bagaimana cara terbaik untuk mengelola penggunaannya?* [If you have to use animals in science lessons, what do you think is the best way to manage their use?].	
Reducing the number of animals used in learning activities	24	*Menurutmu adakah metode lain yang dapat menggantikan penggunaan hewan dalam pembelajaran sains?* [Do you think	

	there are other methods that can replace the use of animals in science learning?].

From Table 3.2, the whole statements were 20 with 4 open questions. The number of statements for each criterion does not amount to the same depending on how important the statement is to capture what students' perceptions are like. The statements and questions for the questionnaire in this research used Indonesian. The use of good and appropriate Indonesian language for junior high school students will make it easier to fill out questionnaires, especially for students in Bandung who use Indonesian as their daily language.

1.5.3 Instrument Judgement

To make sure the questionnaire was appropriate to be administered, the questionnaire needed to be reviewed by experts. Because the questionnaire takes science subjects that emphasize the use of animals in their activities, the experts should be educators with an educational background in Biology and Chemistry. Two experts joined in the instrument judgment process. The judgments were more about content validity because it was very important for the questionnaire to be as qualified as possible. The expert judgment submission is attached in Appendix A.1. The feedback from Expert Judgment is mostly in these three issues, as summarized in Table 3.2.

Table 3. 2
Statements Revision from Expert Judgment

No	Revision	Statement
1	Writing error	1, 3, 4, 6, 13, 17, 20, 24
2	Additional aspects	8, 24,
3	Need more information	1, 17

Table 3.2 explains the revision that needed to be done towards the questionnaire. The experts requested that the sentences and suggestions for simplifying the languages used in the statements should be correctly organized in order to make it easier for students to understand. The experts then requested sources related to the aspect to be assessed in the questionnaire statements. Meanwhile, the review of the need for further information shows that the previous statements were too general and need to be more specific.

1.5.4 Instrument Readability Testing

The Instrument Readability Testing helps to ascertain whether every term in the instrument is compatible, easy to understand and appropriate for junior high school students. This test was carried out after the questionnaire adjusted according to the expert opinion. Twenty statements and five short questions were given to fifteen students from science and language faculty of a university in Bandung. They were asked to provide advice, and suggestions on the questionnaire before tested on junior high school students. Readers act as if they were junior high school students, so that the questionnaires sentences will be more appropriate to the target. This readability testing was done online via a Google Form (http://gg.gg/readabilitytesting).

The feedback from the readers on the readability of the questionnaire are summarized in Table 3.3.

Table 3. 3
Feedback from University Students on Readability Testing

No	Revision	Statement
1	Writing error	17
2	Incompatible sentence	1, 10, 11, 21
3	Difficult to understand	5, 23

Table 3.3 explains the feedback from university students that is needed to be done towards the questionnaire. According to the readability test results, there was a writing error in statement number 17, such as the absence of one letter in one of the words. Statement number 17 has been corrected based on the input provided. Then, in statements 1, 10, 11, and 21, there is an ineffective sentence structure, so word adjustments are needed. Readers provide some suggestions for changing sentences to be more effective, this becomes a reference for improving sentences that are less effective. While statements 5 and 23 are considered difficult to understand sentences, it is better to redesign the sentence as a whole, add information, and adjust words for junior high school students

The readability test that has been carried out indicates that the questionnaire is ready to enter the instrument pilot testing stage.

1.5.5 Instrument Pilot Testing

The purpose of the instrument pilot testing was to test if it was ready to be

distributed in the real research in order to answer the research questions precisely and appropriately. The questionnaire was administered to forty junior high school students from another city. Respondents in this instrument pilot testing process have the same characteristics as the target population for this study. The test was online-based, by distributing the questionnaire to junior high school students through social media. After the instrument pilot testing, the data obtained then validated. The details of the respondents at this stage are described in table 3.4.

Table 3. 4
Instrument Pilot Testing Detail Respondent

Classification	Number of Sample	Percentage (%)
Gender		
Female	18	45
Male	22	55
Grade		
7th grade	12	30
8th grade	9	22.5
9th grade	19	47.5

Based on table 3.4 respondents at this pilot testing stage were dominated by 9th grade junior high school students. Forty students who became respondents came from Cianjur, Sukabumi, Bekasi, Depok, Garut, Tangerang, Bogor, Karawang, and Sumedang.

1.5.6Instrument Validation Result

The validity and reliability of the instrument are two very important requirements and cannot be separated in a research process using a questionnaire. The appropriateness, meaningfulness, correctness, and usefulness of a researcher's inferences are referred to as validity. The consistency of scores or answers from one administration of an instrument to another, and from one set of items to another, is referred to as reliability (Fraenkel et al., 2012).

Content validity refers to content and format with the definition of the variable and the sample to be measured. This formula that used to measure the validity value:

$$r_{xy} = \frac{n \sum xt - \{(\sum x)(\sum y)\}}{\sqrt{\{n\sum x^2 - (\sum x)^2\}\{n\sum y - (\sum y)^2\}}}$$

Information:

r_{xy} = items correlation coefficient

x = total score in test items

y = total score of each student

n = number of students

$\sum x$ = sum of total score of all students for each questions item

$\sum y$ = sum of total score of all students for whole test

(Fraenkel & Wallen, 2012)

The results validity values are 0.275-0.727 and are declared valid if there are no questions that are negative and the value is greater than 0.05. The reliability of this test instrument was carried out using the Cronbach alpha formula. The Cronbach's alpha method formula is shown in the table below:

$$a = \frac{K}{K-1} 1 - \frac{\sum_{t=1}^{K} \sigma_{Yi}^2}{\sigma_x^2}$$

Information:

K = number of items

σ_x^2 = the variance (square of standard deviation)

σ_{Yi}^2 = observed variance from item

Table 3. 5
Interpretation Value of Reliability

Correlation coefficient	Interpretation
0,80 -1,00	Very High
0,60 - 0,79	High
0,40 - 0,59	Prosperous
0,20 - 0,39	Low
0,00 - 0,19	Very Low

(Vehkalahti, 2000)

The reliability value obtained is 0.858 which is stated by the Alpha value > 0.8 had a very high of reliability value. This test provides evidence that the questionnaire in this research has been tested for validity and reliability. The research instrument was validated so that it could be determined as an instrument for collecting research data. The final form of the questionnaire can be seen in Appendix A.2.

1.5.7 Data Analysis Technique

The variables analyzed univariately in this study were students' perceptions of the

use of animals in science education and the factors that might influence it. The factors influencing student perceptions in this study focused on gender differences and pet ownership. The first thing to do in the data analysis process is to check the responses were complete, legible and relevant. Then change the data in the form of letters into numbers to facilitate data analysis. Categorical responses are coded as follows:

Strongly Disagree (SD) = 1
Disagree (D) = 2
Agree (A) = 3
Strongly Agree (SA) = 4

While the gender categorization of students is divided into two codes which are: Male as number 1 and Female as number 2. Students who have pets are coded number 1 while those who do not have pets are coded number 2. Provided code like this for each variables is meant to make the data processing process easier.

Furthermore, the process of entering data into the computer according to the code that has been determined for data processing per the criteria was done using SPSS IBM for Windows version 25.

1.6 Research Procedure

In order to ensure that this research is well organized in a systematic way, the research procedure is divided into three main phases. The three main stages are preparation, implementation, and completion stage.

1.6.1 Preparation Stage

The author intends to analyze all of the variables in this research before conducting the research itself in this stage. The following information is provided in greater detail:

1) Identify the research problems.
2) Decide some research variables.
3) Literature study about students ethical perception and the use of animals in science education. All the literatures come from the sources such as books, e-books, journals and articles.
4) Arrange the research proposal.
5) Construct the research instruments of students ethical perception on the use of animals in science education.

6) Instrument judgement by experts.

7) Revise the instrument based on the expert judgement advice.

8) Test the questionnaires' readability.

9) Pilot test of the research instrument.

10) Validate and revise the instrument based on the result of pilot testing.

1.6.2 Implementation Stage

At this stage, the researcher begins to carry out the research in order to obtain the data. Detailed information as follows:

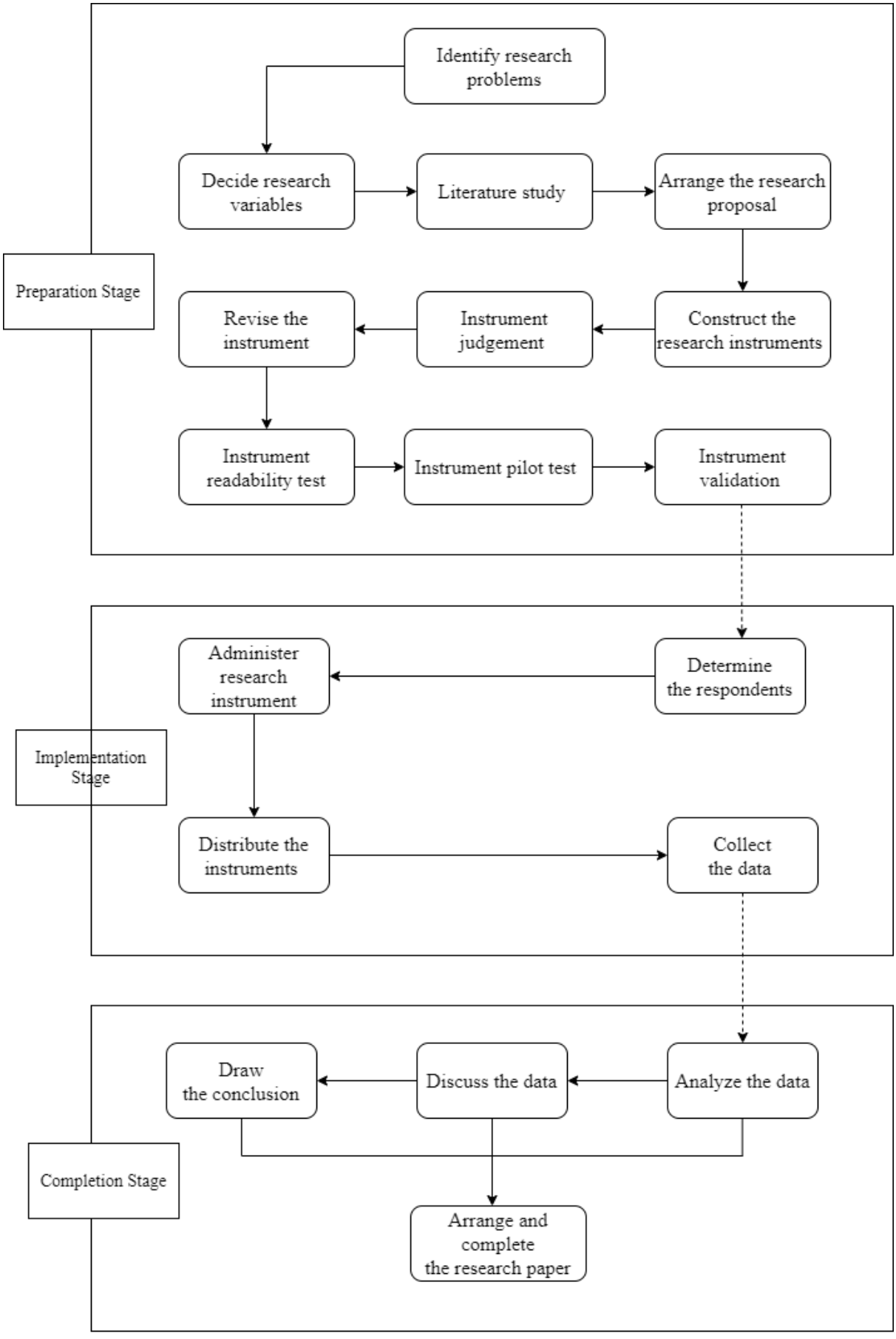
1) Determine the research survey responders and prepare the permission letter.
2) Administer the research instrument.
3) Distribute the research instruments to the students.
4) Collect the data from a research instrument.

1.6.3 Completion Stage

This is the last stage of this research, which means that the data is collected and reviewed. Detailed information on this stage as follows

1) Analyze the data.
2) Discuss the data.
3) Draw the conclusion based on the analysis and discussion.
4) Arrange and complete the research paper.

1.6.4 Research Flowchart


Identify research problems
Decide research variables
Literature study
Arrange the research proposal
Preparation Stage
Revise the instrument
Instrument judgement
Construct the research instruments
Instrument readability test
Instrument pilot test
Instrument validation
Administer research instrument
Determine the respondents
Implementation Stage
Distribute the instruments
Collect the data
Draw the conclusion
Discuss the data
Analyze the data
Completion Stage
Arrange and complete the research paper