CHAPTER III
RESEARCH METHODOLOGY

3.1 Research Method

This research was conducted by using poor experimental design. In this research, experimental research methods were used to examine the developing of students' creativity, writing skills, and concept mastery about global warming through digital comic. Based on Fraenkel, Wallen, & Hyun (2011), the poor experimental design does not have built-in controls for threats to internal validity.

3.2 Research Design

In this study, the researcher was used one group pre-test and post-test design. According to Fraenkel, Wallen, & Hyun (2011), the one-group pre-test and post-test design consists of measuring or observing a single group not just after being exposed to a treatment but also before it. Cresswell (2014) stated that quantitative research is described as an evaluation method between two variables or more in order to evaluate the objectives theories. Then, these variables are measured by using instruments, resulting in the form of numbered data, and examining by using statistical processes. In addition, to pre-test and post-test, the researcher also gave treatment to students.

The same treatment was given by all the students by applying digital comics to their learning activities about global warming. The three stages of this design given were that pre-test, treatment, and post-test. The types of questions for pre-test and post-test were in the form of multiple choices. The type of multiple choices questions aimed to analyze students' concept mastery. Table 3.1 shows the research design as follows.

Table 3.1
Pre-test and Post-test Design

O	X	O
Pre-test	Treatment (Digital Comic)	Post-test

3.3 Population and Sample

According to Fraenkel,Wallen, & Hyun (2011), the population is the larger group to which one hopes to apply the results. The population size is the cumulative number that comprises all the participants tested. Therefore, assessing the population is an important phase in the data collection and analysis of data. This research conducted in Indonesian school that located in abroad. The population is 7th graders of junior high school.

A group on which information is obtained is called sample. Fraenkel, Wallen, & Hyun (2011) mentioned that there are two types of sampling, namely random sampling and non-random sampling. In non-random sampling, it is divided into three types, which are systematic sampling, convenience sampling, and purposive sampling. Meanwhile, in random sampling, it is divided into four types, namely simple random sampling, stratified random sampling, cluster random sampling, and two-stage random sampling.

The sampling technique used was cluster random sampling in which the researcher chose the class. Fraenkel, Wallen, & Hyun (2011) defined that cluster random sampling is the selection of groups, or clusters, of subjects rather than individuals. In this research, the students of 7th graders are as the samples from one class.

3.4 Operational Definition

1. Digital Comic

   The digital comic was used for creating a comic on global warming topic. In digital comics, they have to make stories and think about the elements that exist in comics. Students was involved in making digital comic using online software program. Digital comic was used as a tool in the learning process.

2. Students' Creativity

   Students' creativity is strategies that students need to look at the topic from different and creative points of view and explore their imagination through the media that has been presented. In this research, the creativity is built after the students make digital comics. Pre-test and post-test was done

by writing an essay question to draw related to global warming and students are asked to explain. Besides that, creativity also measured by rubric, the indicator of rubric creativity are fluency, content, authenticity, design or detail, and elaboration.

3. Students' Writing Skills

Students' belief in this research is that one can successfully improve students' writing skills and creativity. In this research students' writing skills can be seen from students' digital comic output, how the student organize the sentences in the digital comic. Students' writing skill competence measured by pre-test, pos-test by doing two essay questions that were asked to explain an image and make a story related to global warming. Besides of pre-test and post-test, the rubric is also used for measuring the writing skills with 2 scales, namely narrative elements and linguistic aspects. In the narrative scale, there are four sub-scales, namely theme, background, conflict, and plot. Meanwhile, in linguistic aspects, there are four sub-scales, namely content, organization, style: structure and diction choice, and spelling, punctuation, and capitalization.

4. Students' Concept Mastery

In this study, students' concept mastery based on the cognitive domain by Bloom's Taxonomy are remembering (C1), understanding (C2), applying (C3), and analyzing (C4). An objective test in the form of multiple-choice questions was given for the students' to put the concept mastery. The implementation of objective test with pre-test for the initial knowledge before treatment and applied treatment on students and after that does the post-test.

5. Global Warming

Global warming will be main topic for the students. Global warming in this study is about greenhouse effect, the understanding of global warming, the cause of global warming, the impact of global warming, and overcoming global warming. The material based on Indonesia curriculum 2013.

3.5 Assumption

According to the literature review, it could be assumed that:

a. Digital comics can be a helpful learning product to make innovative product development by students.
b. Digital comic can be helpful learning product for students' writing skills to master the idea in order to get better in writing.
c. Digital comics can be a useful learning product for students' concept mastery to get better score results in final test.

3.6 Hypothesis

The hypothesis that will be tasted in this research is as follow.

a. H_0: There is no significant difference in students' creativity in learning global warming after making digital comic.
b. H_1: There is a significant difference in students' creativity in learning global warming after making digital comic.
c. H_0: There is no significant difference in students' writing skills in learning global warming after making digital comic.
d. H_1: There is a significant difference in students' writing skills in learning global warming after making digital comic.
e. H_0: There is no significant difference in students' concept mastery in learning global warming after making digital comic.
f. H_1: There is a significant difference in students' concept mastery in learning global warming after making digital comic.

3.7 Research Instrument

The data must be collected using the method. There are two tools used in this research, namely objective test and rubrics. The instruments are as follow:

1. Rubric for Creativity (RCr)

The RCr aimed to assess the imagination of students in narrative writing, referring to the scoring rubric adopted from Cropley (1997) as shown in Table 3.2.

Table 3.2
Creativity Evaluation Grid

Indicator	Item	Score	Description
Fluency	Fluency argues in describing global warming.	1	Not fluent arguing in describing global warming.
		2	Quite fluent arguing in describing global warming.
		3	Fluent arguing in describing global warming.
		4	Very fluent arguing in describing global warming.
Content	The completeness and clarity of the global warming content. (Criteria: Text, information, legibility)	1	The text of describing a material is too long, lacks of information and unclear legibility of the topic.
		2	Only one criteria is fulfill.
		3	Two criteria are fulfill.
		4	The text of describing a material is short, rich of information and clear legibility.
Authenticity	The extent to which develops the originality of the story. (Criteria: content, language, design)	1	Doesn't develop the originality of the story, doesn't have something unique and different from others in terms of content, language, and design.
		2	A bit develop the originality of the story, only one criteria is fulfill
		3	Doesn't develop the originality of the story, two criteria are fulfill.
		4	Develop the originality of the story, have something unique and different from others.
Design/Detail	The ability of	1	Color, element are not matching,

Indicator	Item	Score	Description
	student to decorate stories into an interesting digital comic. (Criteria: color, size, and matching element)		and size of the elements are not proportional (doesn't represent a good design).
		2	Only one criteria is fulfill.
		3	Two criteria are fulfill.
		4	Attractive color, matching elements, and size of the elements are proportional (represent a good design).
Elaboration	Idea and explanation of the story are well elaborated and coherent	1	The idea/explanation are unclear and incomplete.
		2	The idea/explanation are unclear and incomplete at times.
		3	The idea/explanation are elaborated and coherent
		4	The idea/explanation are well elaborated and coherent

Rubric creativity is used to assess the pre-test and post-test on students' creativity and writing skills. The pre-test is to know the students' initial creativity. After that, treatment was implemented making digital comics as a product and seeing whether each comic experienced an increase in creativity. After that, a post-test was conducted to determine the creativity of students after making digital comics.

2. Rubric for Writing Skills (RWS)

Centered on narrative and linguistic elements, the RWS was used to assess the writing abilities of students. The evaluation applies to the following grid for narrative evaluation. Thompkins & Hoskisson (1995) have adopted the predictor of narrative writing abilities in Table 3.3.

Table 3.3
Writing Skills Assessment Grid

Scales	Sub-scales	Score	Description
Narrative Elements	Theme	1	Mentioning the theme does not match the picture
		2	Mentioning the theme does not match the picture
		3	Mentioning the theme is sufficient according to the picture
		4	Mentioning the theme fits the picture perfectly
	Background	1	Didn't mention anything
		2	State the setting of the story but it is not complete, precise, and according to the picture
		3	State the setting of the story but it is incomplete, precise, and according to the picture
		4	Mentioning the setting of the story is very complete, precise, and according to the picture
	Conflict	1	Has an interesting conflict, unclear and less understood by the readers
		2	Has an interesting conflict, clear enough, but is poorly understood by the reader
		3	Has an interesting conflict, clear enough, and can be understood by the readers
		4	Have an interesting, clear, and understandable conflict for the

Scales	Sub-scales	Score	Description
			reader
		1	Has an interesting plot, unclear and less understood by the readers
		2	Has an interesting plot, clear enough, but is poorly understood by the reader
	Plot	3	Has an interesting plot, clear enough, and can be understood by the readers
		4	Have an interesting, clear, and understandable plot for the reader
		1	The topic is unclear and the details are not relating to the topic
		2	The topic is complete and clear but the details are not relating to the topic
	Content	3	The topic is complete and clear but the details are almost relating to the topic
		4	The topic is complete and clear and the details are relating to the topic
Linguistic Aspects		1	Identification is not complete and descriptions are arranged with misuse of connectives
		2	Identification is not complete and descriptions are arranged with few misuse of connectives
	Organization	3	Identification is not complete and descriptions are arranged with almost proper connectives
		4	Identification is not complete and

Scales	Sub-scales	Score	Description
			descriptions are arranged with proper connectives
	Style: Structure and Diction Choice	1	Very poor knowledge of words, word form, and not understandable
		2	Limited range confusing words and word form
		3	Few misuse vocabolaries, word form, but change the meaning
		4	Effective choice of words and word form
	Spelling, Punctuation, Capitalization	1	It is dominated by errors of spelling, punctuation, and capitalization
		2	It has frequent errors of spelling, punctuation, and capitalization
		3	It has occasional errors of spelling, punctuation, and capitalization
		4	It use correct spelling, punctuation, and capitalization

Rubric writing skills is used to assess the pre-test and post-test on students' creativity and writing skills. The pre-test is to know the students' initial writing skills. After that, treatment was implemented making digital comics as a product and seeing whether each comic experienced an increase in writing skills. After that, a post-test was conducted to determine the writing skills of students after making digital comics.

3. Objective Test

Students' concept mastery is assessed through an objective test. Students will be given an objective test on the topic of global warming as a pre-test and a post-test. In the pre-test and post-test, there were 25 multiple-choice questions based on blooms' taxonomy from (remembering) (C1), understanding (C2),

applying (C3), and analyzing (C4). The subtopic on global warming is divided into five parts in accordance with the National Curriculum of 2013. The unrevised blueprint of concept mastery test items on global warming topic is in Table 3.4.

Table 3.4
Blueprint of Objective Test Item
(Before Revision)

Sub-Topic of Global Warming	Cognitive Process Dimension and Number Of Test Item			
	C1	C2	C3	C4
Greenhouse Effect	3,6	1,2,4,7	-	5
The Understanding of Global Warming	8,9	-	-	-
The Cause of Global Warming	12	10,14	11,13	-
The Impacts of Global Warming	-	16,17	-	15,18,19
Overcoming *Global Warming*	-	20,23	22, 21,25	24

The final test items in both of the tests were reduced to 18 multiple choice questions by considering expert recommendations, competency domains, and subtopic distributions as shown in Table 3.5.

Table 3.5
Blueprint of Objective Test Item
(After Revision)

Sub-Topic of Global Warming	Cognitive Process Dimension and Number Of Test Item			
	C1	C2	C3	C4
Greenhouse Effect	2	1,4	-	3
The Understanding of Global Warming	5,6	-	-	-
The Cause of Global Warming	9	7	8,10	-
The Impacts of Global Warming	-	11,12	-	13,14
Overcoming *Global Warming*	-	-	15,16,18	17

3.8 Data Analysis

The cognitive test was evaluated based on student validation and expert judgments. The students' validation was conducted by using Google Form in public and private school on 8th and 9th grade students. The students who participate of students' validation were 55 students in global warming topic. The instruments consist of 25 questions multiple choices.

1. Validity Test

   Validity is a critical component of effective research. A piece of research is worthless if it is invalid (Cohen, Manion, & Marrison, 2007). The validity of the instrument was checked using IBM SPSS version 25. The result from IBM SPSS version 25 for the validity on this research instrument shown on the Table 3.6.

Table 3.6
Validity Result

Question Number	Pearson's Correlation	Interpretation	Decision
1	0.010	Very low	Rejected
2	0.293	Low	Revision
3	0.555	Enough	Accepted
4	0.184	Very low	Rejected
5	-0.079	Very low	Rejected
6	0.251	Low	Revision
7	0.301	Low	Revision
8	0.285	Low	Revision
9	0.385	Low	Revision
10	0.337	Low	Revision
11	0.413	Enough	Accepted
12	0.597	Enough	Accepted
13	0.559	Enough	Accepted
14	0.001	Very low	Rejected
15	-0.487	Very low	Rejected
16	0.299	Low	Revision
17	0.494	Enough	Accepted
18	0.406	Enough	Accepted
19	0.494	Enough	Accepted
20	0.175	Very low	Rejected
21	0.283	Low	Revision
22	0.432	Enough	Accepted

Question Number	Pearson's Correlation	Interpretation	Decision
23	0.232	Low	Revision
24	0.247	Low	Revision
25	0.432	Enough	Accepted

Based on the result of the validity test above, it was showed that which questions should be rejected, revise, and used. Based on Ali, Carr, & Ruit (2016), the requirements for each item were provided in Table 3.7.

Table 3.7
Validity Interpretation

Value r	**Interpretation**
$0{,}80 < r \leq 1.00$	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

(Ali, Carr, & Ruit, 2016)

The final test items were reduced to 18 multiple choice questions by considering expert recommendations, competency domains, and subtopic distributions.

2. Reliability Test

A measuring instrument is said to be reliable if it produces good data trustworthy, which is true to reality. Implicitly, this reliability contains objectivity because the measurement results do not affected by who the gauge. So, a measuring instrument has reliability if the measurement results are carried out in the same case even though measured in different times. In quantitative research, reliability is essentially a synonym for dependability, consistency, and replicability across time, instruments, and respondent groups (Cohen, Manion, & Marrison, 2007). The result from IBM SPSS version 25 for the reliability on this research instrument shown on the Table 3.8.

Table 3.8
Reliability Result

Cronbach's Alpha	N of Items
0.734	25

Based on the data, the value of the reliability test is 0.734. Based on Ali, Carr, and Ruit (2016), the reliability interpretation to know the level of reliability test is presented on Table 3.9.

Table 3.9
Reliability Interpretation

Correlation coefficient	Realiability Intrepetation
0,80, - 1,00	Very High
0,60, - 0,79	High
0,40, - 0,59	Enough
0,20, - 0,39	Low
0,00, - 0,19	Very Low

(Ali, Carr, & Ruit, 2016)

Based on the results of the instrument reliability test above, it can be seen that the reliability coefficient value obtained is 0.734 which indicates that the measuring instrument used shows high reliability, the 25 test items have been reliable and can be used as research instruments.

3.9 Research Procedure

There are three stages in the procedure to ensure that the research is well planned and systematic. There are three procedure stages; there are preparation stage, implementation stages, and completion stage.

1. Preparation Stage
   a. Starting by identifying the research problem
   b. Relevant search from various sources related to digital comic, global warming, students' creativity, students' writing skills, and student's concept mastery.
   c. The instruments for students' creativity, students' writing skills, and students' concept mastery were designed.

d. Expert judgments
e. Research judgment revision
f. Validating the instruments to the students who have learned about global warming
g. Revising the instruments based on validation activities done previously, both from the expert or the students.

2. Implementation Stage
   a. As the initial condition, pre-test gives to the students at the initial condition.
   b. After the students did the pre-test, the teacher provides learning materials by means of lectures and discussions. The teacher explains or divides several groups of students to discuss.
   c. Before treatments are given to the class, the teacher give the example of the comic in different topic and explain what elements should be include in the comic. So the students can make their own digital comic based on the example that teacher give.
   d. Treatments are given to the class with making digital comics.
   e. Post-test are given to the students which to get the final condition.
   f. Collecting the data
3. Completion Stage
   a. Process and analyze the data
   b. Discussed data analysis
   c. Making result and conclusion
   d. Reporting result paper

3.10 Research Flowchart

The researcher constructed the stages into the flowchart to make the research systematically arranged. The flowchart is shown in Figure 3.1 below.

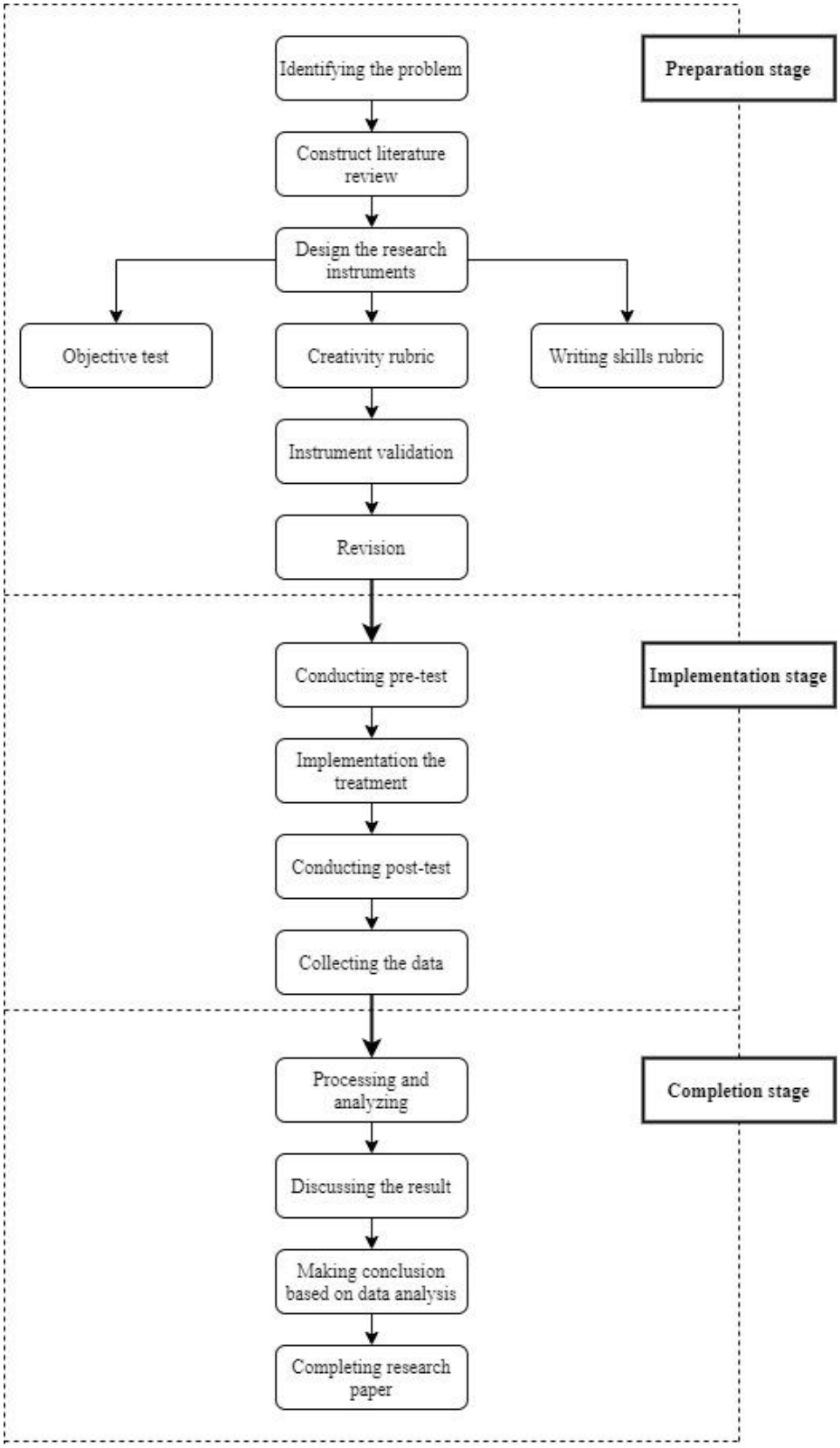

Figure 3.1 Research Procedure Flowcharts