

CHAPTER III

METHODOLOGY

A. Research Method and Design

The research method is used as scientific way to get the data with the purpose and specific uses. Research method and research design in this study will be described as follow:

1. Research Method

This research using weak experimental method, According to Fraenkel and Wallen (2009), weak experimental design is design that are “weak” do not have built-in controls for threat to internal validity. In addition to the independent variable, there are a number of other plausible explanations for any outcomes that occur.

2. Research Design

This research using One-Group Pretest-PosttestDesign according to Fraenkel and Wallen (2006). In the one-group pretest-posttest design, a single group is measured or observed not only after being exposed to a treatment of some sort, but also before. A diagram of this design is as follows:

Table 3.1 Research Design: The One-Group Pretest-Posttest Design

<i>O</i>	<i>X</i>	<i>O</i>
Pretest	Treatment	Posttest

B. Population and Sample

1. Research Location and Period

The location of this research was in one international school in Bandung Barat in the school period of 2014/2015. The school used Cambridge curriculum combine with 2006 Curriculum of Indonesia. This school using English as main language in the teaching learning process.

2. Population and Sample

The population in this research was 7th grade students. The sample was one class in seventh grade. The sample was all of cognitive abilities and motivation on thermal physic chapter in one class. Sampling were selected by purposive sampling technique according to Fraenkel and Wallen (2007) because the researcher choose sample based on the specific purpose namely having internet and gadget as media to learn this topic.

C. Assumption

The assumption as the foundation of this study as follow

1. Web-based educations introduce the student to a much richer variety of text, external links, audios, and videos to the virtual classroom.
2. For student Edmodo is very effective learning tool.
3. Web based learning may useful tool to reach a wider range of student ability levels, as average grade did not appear to influence student learning performance.

D. Hypothesis

Hypothesis that is tested in this study are as follow:

H_0 : There is no difference of students cognitive and students' motivation in learning thermal physic using Edmodo as Web-Based Learning.

H₁ : There is difference of students cognitive and students' motivation in learning thermal physic using Edmodo as Web-Based Learning.

E. Operational Definition

In order to avoid the misconception in this research. Some operational definitions are explained in this research. Those terminologies are explained as follow:

1. Learning activities using Web-Bases Learning conducted by using Edmodo.
2. Cognitive level in this research is competence of students that covers the level cognitive such as understanding (C2), applying (C3) and analysing (C4), based on Taxonomy Bloom (Anderson *et al.*, 2001). This competence is measured by using multiple choice questions (pre-test and post-test).
3. Students' motivation in this research is referring to ARCS model by Keller. ARCS model consist of attention, relevance, confidence, satisfaction. Data obtained through questionnaire that is adjusted with ARCS model.

F. Research instrument

In this research, instrument is necessary to be used for gaining data. There are two types instrument that are used in this research. Those instruments are described below.

1. Objective test

Objective test in a form of multiple choice questions is used to measure students' cognitive before and after used Edmodo as web-based learning in thermal physic topic. Pretest used to see student prior knowledge about the thermal physic and posttest to see student improvement after using Edmodo. There are three cognitive domains that will be used in multiple choice questions, there are understanding (C2), applying (C3), analyzing (C4).

2. Questioner of Motivation

To see improvement of student motivation, this research used Motivational design by Keller to see student motivation, there are 36 statement which distributed into four category with positive and negative statement. The data will collect by score that student give. The range of score that student can choose from 1 until 5. The classification of statement present in table 3.2.

Table 3.2 Statement Classification in Motivation Questionnaire Based On Criteria and Conditions

No	Condition	Motivation Questionnaire	
		Number of Positive Statement	Number of Negative Statement
1.	Attention	2, 8, 9, 11, 17, 20, 23, 24, 28	12, 15, 22, 29
2.	Relevance	4, 6, 16, 18, 30, 33	26, 31
3.	Confidence	1, 13, 25, 35	3, 7, 19
4.	Satisfaction	5, 10, 14, 21, 27, 32, 36	34

G. Instrument Development

The objective test in form of multiple choices will be analyzing using ANATES 4.9.0 statistical software. All of the test items after analyzed and judged by the expert will be tested to the students. The result of the test items after tested will be used, revised or deleted.

There are some aspects that must be analyzed while making the objective test, there are:

1. Validity

To get valid result of the activity, the instrument that will be used must be valid Arikunto (2013). The validity which will be used is content

validity. Content validity has a relation with the instrument, the content or materials will be put in the content validity. To determine the number of validity, it is done with the product moment correlation equation as follows.

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

Where,

r_{xy} = coefficient correlation or item validity

$\sum X$ = sum of total score of all students for each question item

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

N = total number of students

X = score of each student for each question item

Y = total score of each student

The validity interpretation is represented in the table below.

Table 3.3 Interpretation of Validity

No.	Value r_{xy}	Criteria
1	$0.80 < r \leq 1.00$	Very High
2	$0.60 < r \leq 0.80$	High
3	$0.40 < r \leq 0.60$	Fair
4	$0.20 < r \leq 0.40$	Low
5	$0.00 < r \leq 0.20$	Very Low

(Arikunto, 2013)

2. Reliability

Reliability is a measurement which stated about consistence of the measurement tools that used. (Arikunto, 2013) states that the reliability tends to a definition about trust instrument which is used as collecting data tools.

To define the reliability of objective test, alpha formula will be used as a formula because the question using multiple question.

$$r_{11} = \left[\frac{n}{n-1} \right] \left[1 - \frac{\sum \sigma_i^2}{\sigma_i^2} \right]$$

Where,

r_{11} : Instrument reliability

n : Amount of question

$\sum \sigma_i^2$: Amount of variant score in each item

σ_i^2 : Varian total

The reliability interpretation is represented in the table below.

Table 3.4 Interpretation of Reliability

No.	Reliability Coefficient	Criteria
1	$0.00 < r \leq 0.20$	Very Low
2	$0.20 < r \leq 0.40$	Low
3	$0.40 < r \leq 0.60$	Fair
4	$0.60 < r \leq 0.80$	High
5	$0.80 < r \leq 1.00$	Very High

(Arikunto, 2013)

3. Difficulty Level

Level of difficulty here means level of difficulty of the student's but not from teacher perspective, the good question are the question that is not too hard for the student but also not too easy to be answered.

To show the difficulty level of the question, difficulty index can be used to show the difficulty level of question. The range of level of difficulty is from 0,00 to 1,00. The lower the index, then the more difficult the question and vice versa.

To find out the difficulty index the formula that is used is shown below:

$$P = \frac{B}{JS}$$

Where,

P : Difficulty index

B : Number of students who answer the question correctly

JS : Number of all students who join the test

The classification of difficulty level is represented in the table below.

Table 3.5 Interpretation of Difficulty Level

No.	Difficulty Value	Criteria
1	0.00 – 0.30	Difficult
2	0.30 – 0.70	Medium
3	0.70 – 1.00	Easy

(Arikunto, 2013)

4. Discriminating Power

Discriminating power means an ability of question to discriminate between high-achiever students and low-achiever students (Arikunto, 2013). The question that can be answered both from high-achiever and the low-achiever student is not good question because it is too easy to answer. Otherwise, the question that cannot be answered both of them is also not good question because it is too hard for the student. Number that shows discriminating power is called as discriminant index (D). Discriminant index range is about 0,00 to 1,00. Good questions will have discriminant index between 0,4 and 0,7 (Arikunto, 2013).

The formula of discriminant index is

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

Where,

D : Discriminating Power (Discriminant Index)

B_A : Number of high-achiever students which answer the question correctly

B_B : Number of low-achiever students which answer the question correctly

J_A : Total of students in upper group

J_B : Total of students in lower group

P_A : Proportion of upper group who answer question correctly

P_B : Proportion of lower group who answer question correctly

P is level difficulty

To determine whether the discrimination index is a good or not, it can be checked in the table 3.6

Table 3.6 Classification of discriminating power (discriminant index)

D	Classification
0,00-0,20	Poor
0,21-0,40	Satisfactory
0,41-0,71	Good
0,71-1,00	Excellent

(Arikunto, 2013)

5. Distractor

A good distractor will be choose by almost all student that did not understand about the concept, but if the student that understand the concept choose the same answer with student that did not understand that is mean that is not good distractor. A good distractor at least chosen by 5% of the student that joined the test (Arikunto, 2013).

6. Recap Result

Before using objective test in the class, the objective test should be tested in form of validation, reliability, distraction level, discriminator power and distractor. The test using ANATEST, the recapitulation of test presented on table 3.7 below.

Table 3.7 Recapitulation of Limited Test for Students' Cognitive

Question Number	Discriminating Power	Validity	Difficulty Level	Status
1	Excellent	Very Low	Very Easy	Revised
2	Poor	Negative	Medium	Revised
3	Poor	Low	Difficult	Revised
4	Poor	Low	Very Easy	Revised
5	Good	Fair	Difficult	Accepted
6	Good	Fair	Medium	Accepted
7	Good	Fair	Easy	Accepted
8	Good	Low	Medium	Revised
9	Good	Fair	Medium	Accepted
10	Negative	Negative	Difficult	Revised
11	Good	Low	Medium	Revised

Question Number	Discriminating Power	Validity	Difficulty Level	Status
12	Good	Low	Easy	Accepted
13	Good	Low	Medium	Accepted
14	Good	Low	Medium	Revised
15	Good	Low	Difficult	Revised
16	Negative	Negative	Difficult	Revised
17	Good	Low	Medium	Revised
18	Good	Low	Medium	Revised
19	Good	Very Low	Difficult	Revised
20	Good	Very Low	Difficult	Revised
21	Good	Low	Difficult	Revised
22	Good	Low	Difficult	Accepted
23	Good	Very Low	Very Difficult	Revised
24	Good	Low	Difficult	Revised
25	Good	Low	Medium	Revised

H. Data analysis

In this research the data processed in quantitative. The data that gain from experiment processed to measure cognitive aspect and student motivation. Data that used for cognitive aspect collected from student score in pretest and posttest meanwhile, for student motivation the data taken from questioner of student motivation.

1. Data Analysis Toward Student Cognitive Aspect

Quantitative data analysis done by Microsoft excel and SPSS 2.0, in order to determine the score of pretest and posttest from student. Of data will be processed as the following explanation.

a. Score test item

Pre-test Post-test that is used in this research combine between test that conducted in Edmodo and test that using paper test. Pretest conducted in Edmodo, there are 20 test item that student should answer. For student

that cannot use Edmodo, test item given in paper test. Each number that correct given by 5 point and if wrong 0 point. Question that given in posttest same question with pretest and conducted using paper test.

b. Calculation of gain score and normalized gain

The result of score test item will be processed using SPSS 20.0 to find gain score and normalized gain score. Gain score is the gap between pretest and posttest while normalized gain used to find the improvement categorize. According to Hake, here this the formulas:

$$G = Sf - Si$$

Description:

G: Gain Score

Sf: Average Post-test Score

Si: Average Pre-test

The calculation of gain score used to see whether the Edmodo give a significant positive impact or not. Normalized gain calculation used to find and the improvement of Edmodo. Normalized gain of each student (*g*) determines by followings this formula:

$$(g) = \frac{G}{G \text{ max}} = \frac{Sf - Si}{\text{Max Score} - Si}$$

Description:

$\langle g \rangle$: Normalized Gain

G : Gain Score

Sf : Average Post-test

Si : Average Pre-test

Result from normalized gain will categorized by 3 classifications by hake. The classification of n-gain provided in table 3.4.

Table 3.8 Normalized Gain Score Classification

Value	Categories
$\langle g \rangle > 0.7$	Low
$0.7 > \langle g \rangle > 0.3$	Medium
$\langle g \rangle < 0.3$	High

c. Normality test

Parametric assume that each variable in this research has a normal distribution. Normality test use to see whether the data has normal distribution or not. This research using SPSS 20.0 to test normality, Kolmogorov-smirnov with significant level (α) is 0.05. when significant value of Kolmogorov-smirnov > 0.05 H_0 will accepted and when value $< 0,05$ H_0 will rejected the hypothesis like shown below.

H_0 : Sample comes from population that has normal distribution.

H_1 : Sample comes from population that has not normal distribution.

d. Wilcoxon test

Wilcoxon test chosen because the number of sample that used less than 30 samples. This test used to compare two groups that related each other. H_0 rejected if significant p-value < 0.05 with hypothesis:

H_0 : There is no difference of students cognitive and students' motivation in learning thermal physic using Edmodo as Web-Based Learning.

H_1 : There is difference of students cognitive and students' motivation in learning thermal physic using Edmodo as Web-Based Learning.

e. Data Analysis for Student Motivation

Quantitative data analysis done by Microsoft excel. The data taken from student questioner of motivation. There are 36 statement with 5 number of likert-scale that student can choose. The statement classifies into four, there are attention, relevance, confidence, and satisfaction based

on Keller. The statement also divided into positive and negative , and each statement has score. The score for each statement is given in table 3.9.

Table 3.9 Scoring Guidelines likert-score

Statement	strongly agree	Agree	Hesitate	Disagree	Strongly Disagree
Positive	5	4	3	2	1
Negative	1	2	3	4	5

I. Research Procedure

1. Preparation Stage

In this stage, the researcher conduct several stages that support the research, the steps will be explained as follow:

- a. Analysis of ,
 - 1) Analysis of Cambridge Curriculum,
 - 2) Analysis of Edmodo,
 - 3) Analysis of WBL,
 - 4) Analysis of student cognitive,
 - 5) Analysis of student motivation.
- b. Arranged the research instrument and being judged by the expert (pretest –posttest and questioner).
- c. Revised of research instrument after having suggestion.
- d. Try out of research instrument.

2. Implementation stage

The stage explains the step of how research will be implemented, it consists of:

- a. To see student prior knowledge, pretest will be conducted in the first meeting of the classroom.
- b. Processing pretest result.
- c. Implementation Web-Based Learning model using Edmodo in the classroom while learning thermal physic.
- d. Posttest will be conducted to see student improvement after using Edmodo as Web-Based Learning while learning thermal physic.

3. Completion stage

This is the final stage of the research design, the step that will be conducted in this stage will be explained as the following steps:

- a. Analyze the result of the whole research from based on the instrument result.
- b. Conclude for the data analysis result.

J. Research Scheme

Scheme of research is a view how is the research conducted. Starting from preparation, implementation, and analysis and conclusion stages. Detailed of the research scheme will be shown as Figure 3.1 in the next page.

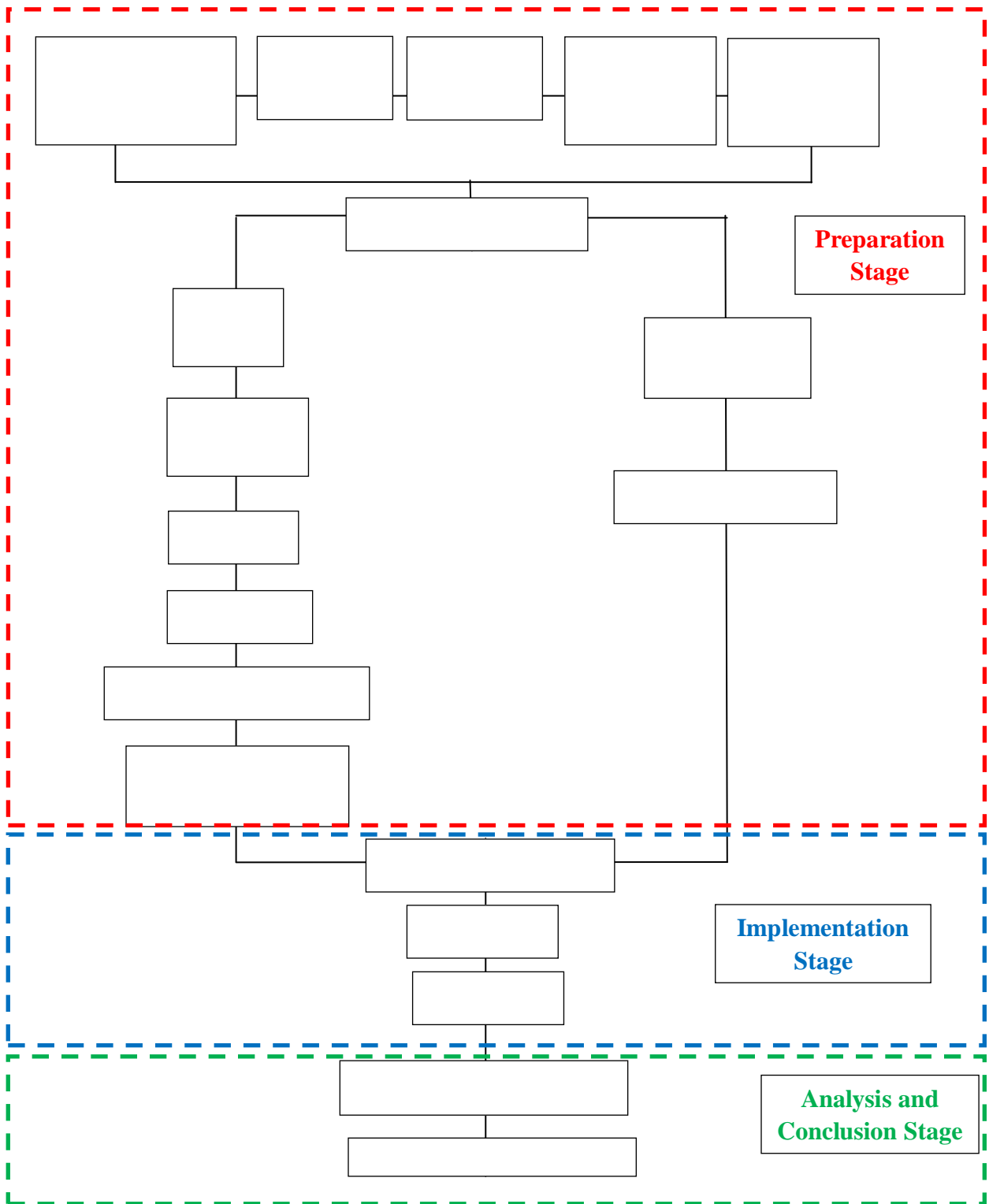


Figure 3.1 Research Scheme