

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design

The method which was used weak experiment method. According to Fraenkel, Wallen & Hyun (2011) a weak experimental design involving one group that is give a pretested first, and then exposed to a treatment, then posttested. That is related to the purpose of this study which is to investigate the effect of the implementation of Blended learning supported by Solar System Scope app, discovery learning and Google Classroom towards students' concept mastery in learning solar system.

The one group Pre-test and Post-test design is used in this research design. In the one-group pretest-posttest design, a single group is measured or observed not only after given a treatment, but also before given a treatment (Fraenkel, 2011). A pretest provides a measure on some attribute or characteristic that you assess for participants in an experiment before they receive a treatment. After the treatment, you take another reading on the attribute or characteristic. A posttest is a measure on some attribute or feature that is evaluated after a treatment that is Blended Learning for respondents in an experiment. Hence, we can analyze the independent variable which we expect to analyze by compairing the result between pre-test and post-test. The method that being used in this research will be shown in Table 3.1.

Vania Zhafirah, 2019
The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Table 3. 1
The One Group Pretest- Posttest Design

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

(Fraenkel, 2011)

3.2 Population and Sample

The study was conducted in Junior high school "X" that was located in Bandung, Indonesia. This school was applied *Kurikulum 2013* in teaching learning process. The Population in this research was 7th grade students with ages range between 13 until 14 years old. The samples are 7th grade students from one class in Junior high school "X" that consist of 16 males. The students classroom in this school was separated between male and female. Population and sample of this study will express in Table 3.2

Table 3. 2
Population and Sample

Population	Sample	
	Gender	Number of Students
7 th Grade Students	Male	16

The sampling technique that is used for this research was a convenience sampling. A convenience sample is a group of people accessible for research (conveniently) (Fraenkel, Wallen, & Hyun, 2011). The researcher selects participants because they are willing and available to be studied. The researcher chooses to study this group at

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

this one class because they are accessible and the researcher is allowed by the principal (Cresswell, 2012).

3.3 Assumption

The assumptions as the foundation of this study as follow :

1. The using of solar system scope helps students too much richer visualization of the topic that can not be seen directly.
2. Blended Learning is a students centered and teacher-facilitated strategy that utilized learner cognitive and emphasizing meaningful learning
3. Motivation of students' towards science topic is also very important variable in sucess of learning outcomes.

3.4 Hypothesis

Hypothesis that will be taste and prove in this research are as follow:

H_0 : There is no difference in students' concept mastery in learning solar system by using Blended Learning

H_1 : There is difference in students' concepts mastery in learning solar system by using Blended Learning

3.5 Research Instrument

Instrument is necessary to be use for gaining data and strenghten of this research. Three kinds of insruments will be use in this research: objective test, questionnaire, and observation sheet. Those instruments are described in table 3.3 below:

Table 3. 3
Research Instruments list

Instruments	Use for
Objective test	Test for pre-test and post-test for measuring concept mastery

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Questionnaire	Measuring students' motivation (SMQ)
Observation sheet	Checking/controlling the learning activity

3.5.1 Students' Concept Mastery

Students' Concept Mastery in this research will be measured by using objective test. An objective test is a test that require a user to choose or provide an answer to a question which correct answer is pre-determined the form of objective test in this research will be multiple choice. The estimated distribution of the question will be in the blueprint and will shown in the table 3.4. The purpose of objective test is to measuring the cognitive process dimension based on Revised Bloom's Taxonomy from C2 (Understanding), C3 (Applying), C4 (Analyzing) and C5 (Evaluating).

Table 3. 4
Blueprint of Objective test about Solar System Topic

No	Concept	C2	C3	C4	C5	Total
1	Solar system	1,5,10,22	8	6,12	18,19	9
2	Characteristic of member in solar system	4,7,9,17			30	5
3	Sun as the star	3,23				2
4	Effect of rotation and revolution of earth to our life on earth	21	15			2
5	Solar eclipse and lunar eclipse	2,11,13,14	16			5

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Total test item	15	3	2	3	23
-----------------	----	---	---	---	----

To make objective tests will be validated using anatest version 4.1 firstly the objective test should be analyze by using several test such as:

a. Validity

According to Fraenkel and Wallen (2012) Validity is refers to the meaningfulness, properness, correctness, and usefullness of the inferences a researcher makes. Objective test should be validated first and validity becoming important aspect of any test before the objective tets is use to measuring the students' concept mastery.

Using correlation formula stated by person so the Validity can be measured . The formula as a follow:

$$r_{xy} = \frac{N \cdot \sum XY - (\sum X)(\sum Y)}{\sqrt{N \cdot \sum X^2 - (\sum X)^2} \sqrt{N \cdot \sum Y^2 - (\sum Y)^2}}$$

(Bachman, 2004; Tuckman, 1978; Fraenkel, Wallen & Hyun, 2012)

Note:

R_{xy} : Correlation coefficient between variable X and YN

N : Number of test-takers

$\sum X$: Number of Test Items

$\sum Y$: Total score of test items

$\sum XY$: Multiplication of items score and total score

$\sum X^2$: Quadrate of number of test items

$\sum Y^2$:Quadrate of total score of test items

The Value of r_{xy} becomes the resurldr of validity. The interpretation of validity is expressed in Table 3.5 As follow:

Table 3. 5
Interpretation of validity

Value r	Interpretation
---------	----------------

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

$0.80 < r \leq 1.00$	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: Sugiyono, 2015)

b. Reliability

The consistency of the test outcomes is described by reliability. Reliability will evaluate the mistake in the objective test result of the score. Kuder-Richardson will be used to measure the reliability of the sample item in the studies. The formula is as follow:

$$r_{11} = \left(\frac{n}{n-1} \right) \left(\frac{1 - \sum \sigma_1^2}{\sigma_1^2} \right)$$

Note:

R : number of test items on the test

M : mean of the set of test scores

SD : standard deviation of the set of test scores

(Fraenkel and Wallen, 2012)

Table 3. 6
Interpretation of Reliability

No	Reliability Coefficient	Criteria
1	$0.80 < R < 1.00$	Very high
2	$0.60 < R < 0.80$	High
3	$0.40 < R < 0.60$	Enough
4	$0.20 < R < 0.40$	Low
5	$0.00 < R < 0.20$	Very low

(Source: Sugiyono, 2015)

c. Difficulty level

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Difficulty level relates to the mean score item test that matches the ratio of the correct response. To measure the difficulty level of question, the researcher used the formula below:

$$DI = \frac{A}{N} \times 100$$

(source: Cohen et.al.,2017)

Where:

DI = Level of Difficulty per Item

A = Number of test-takers answering the item correctly

N = Number of test-takers responding to that item

The level of difficulties can be interpreted in the Table 3.7

Table 3. 7
Interpretation of Difficulty level

Difficulty level value	Criteria
0 – 0.29	Difficult
0.30 – 0.69	Medium
0.70 – 1.00	Easy

(Source: Arikunto,2010)

d. Discriminating power

The capacity of a sample product to measure discrimination between powerful and weak groups can be defined as discriminating power (Gholamreza, 2010). Formula that can be used to measure discriminating power of test items will describe below:

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

(Source: Brown, 2004; Ebel & Frisbie, 1991)

Where:

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

- ID = item discrimination (Discriminating Power)
- BA = number of high achieving group that have correct answer
- BB = number of low achieving group that have correct answer
- JA = total participant of high achieving test-takers
- JB = total participant of bottom test takers

Discrimination index of an items which in between 0.25-0.35 were considered good, with indices more than 0.35 were excellent, between 0.20-0.24 were acceptable and below 0.20 were poor.

e. Distractor

Distractor is incorrect option in a multiple-choice question. The formula that can be use in to obtain the distractor is :

$$Correct\ score = R - \frac{W}{n-1}$$

(Kaplan, 2017)

Note :

R = Number of right answers

W = Number of wrong answers

n = Number of choices in each item

3.5.2 Students' Motivation

To measure the Students' Motivation the researcher will use a Questionnaire by using SMQ (Science Motivation Questionnaire) develop by Shawn M. Glynn, Gita Taasobshirazi, and Peggy Brickman. In face-to-face learning, the instructor can measure students confidence and motivation adjustments accordingly but it can be difficult in the self-directed learning environments to reflect the range of motivational conditions that characteristics of a learners points in the time (Keller, 1987). The questionnaire is adopted with chage in the statement. There are five dimensions of SMQ questionnaire which are intrinsic motivation and personal relevance, self-efficacy and assessment anxiety, self-

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

determination, career motivation, and grade motivation. It is contains of 20 questions with favorable and unfavorable question. the item were constituted using five-point liker scale. The questionnaire used in the Post-test. Blueprint of Student Motivation Questionnaire will shown in Table 3.8.

Table 3. 8
Blueprint of Students Motivation Questionnaire

Dimension	Catagory and Number	Total
Intrinsic motivation and Personal relevance,	Favorable Question: 1,2,3,4,5 Unfavorable Question:-	5
Self-efficacy and Assessment anxiety	Favorable Question: 9,10 Unfavorable Question:6,7,8	5
Self-determination	Favorable Question: 11,12,13,14 Unfavorable Question:-	4
Career motivation	Favorable Question: 15,16 Unfavorable Question:-	2
Grade Motivation	Favorable Question: 17,18,19,20 Unfavorable Question:-	4

The calculation for favorable and unfavorable question is different. The score for favorable question are “Never” is 1, “Rarely” is 2, “Sometimes” is 3, “Usually” is 4 and “Always” is 5. While for unfavorable question are Never” is 5, “Rarely” is 4, “Sometimes” is 3, “Usually” is 2 and “Always” is 1. The data was analyzed to get the total score of each students whether the students are high motivated or not. The reseacher use Microsoft Excel to analyzed the data. To know the criteria of students’ motivation researcher use interval claasification.

Vania Zhafirah, 2019
The effect of Blended Learning on Students’ Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Below is the formula to get the interpretation of motivation questionnaire.

a. Students Motivational Classification

- 1) Determining how many categories that we want to use (three categories: high, medium, low) or five categories (Very high, high, medium, low and very low)
- 2) Determining the highest score (XT) that might be achieved by students . Question = 20 (item) x 5 (highest score per scale) = 100
- 3) Determining the lowest score (XR) that might students' achieved. Question= 20 (item) x 1 (lowest score per scale) = 20
- 4) Determining R (Span) = $XT - XR = 100 - 20 = 80$. if three classification, then each classification interval = $80 : 3 = 26.7$. if five classification, then each classification interval $80 : 5 = 16$.
- 5) Determining M (average) = $(20 + 100) : 2 = 60$ (Haryono, 2017)
- 6) Determining the value of classification limits as shown in Table 3.9.

Table 3. 9
Interpretation of Motivation

Interval	Classification
If total score > 73.4	High Motivation
If total score between 46.7 – 73.4	Adequately Motivation
If total score < 46.7	Low Motivation

(Haryono,2017)

3.5.3 Observation sheet

Observation sheet in this research will use for checking/controlling the learning activity that was conducted in this study is in line with the lesson plan. Observation sheet contains of stpes of learning activities in Blended

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Learning with “yes” or “no” checklist column and the note during the step. Observation sheet will be filled by the observer.

3.6 Research Procedure

to make the study is systematically arranged, researcher construct the procedure that was divided into preparation stage, implementation stage and completion stage.

a. Preparation Stage

1. Identification of the problem to be investigated. The problem raised from reading journals and articles about Blended Learning.
2. Analysis of curriculum 2013
3. Analysis of literature review
4. Analysis of students' concept mastery
5. Analysis of students' motivation
6. Analysis of concept solar system
7. Making of Research instruments
8. Validation of Research instrument by the expert judgement
9. Research instrument revision

b. Implementation stage

1. Experimental class will determine.
2. Pretest will be done to the sample class to know the initial condition of students.
3. Pretest resulting process.
4. Conduct research activity by implementing Blended Learning in experimental class.
5. Give post-test in the sample class for recognizing the improvement of students' concept mastery.
6. Give the questionnaire to find out the students' motivation towards implementing of Blended Learning.

c. Completion stage.

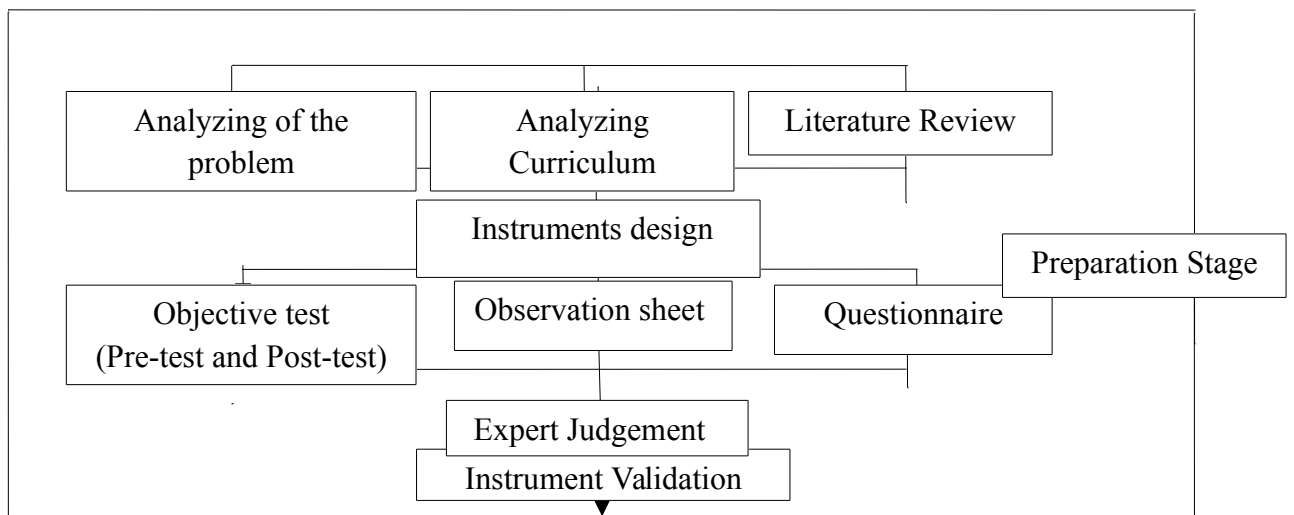
1. Analyze the data of the whole research
2. Make a conclusion from data analysis result
3. Reporting the result

In order to make this research arranged in systematically, the researcher make this stages into the flow chart. The flowchart will shown in figure 3.1.

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

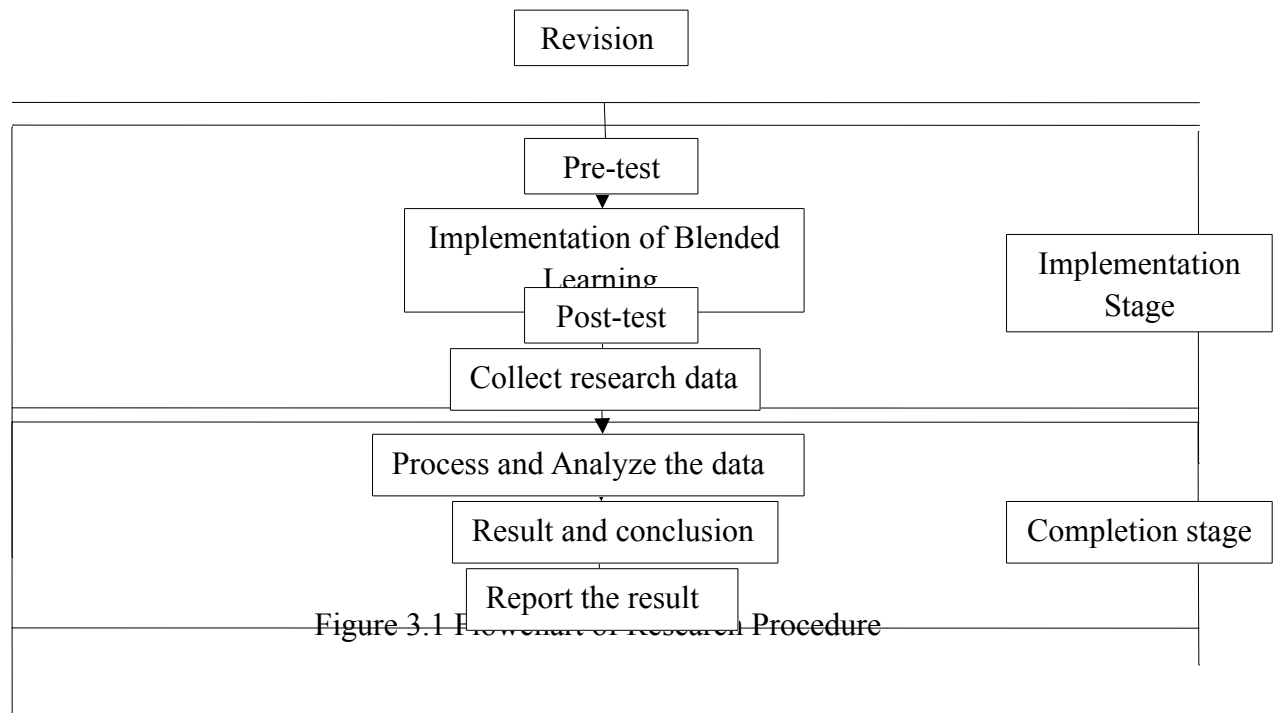
Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu



Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu



3.7 Instrument Validation Result

The objective test used in this study is issues of various choices. Before undertaking the study, the sample item made by the scientist should be screened for learners who have already learned materials on the subjects of the Solar System. There are 32 questions that assigned to 13 students who already learned solar system topics. The data obtained from the result test that was analysed by ANATES 4.0 software. Based on reliability calculation, it is obtained 0,70 and established as reliable. The recapitulation of test item will shown in Table 3.10.

Table 3.10
Analysis of Test item by ANATES

Test Item	Discriminating Power	Level of Difficulty	Validity	Noted
1	Poor	Easy	very low	Revised
2	Satisfactory	Very Easy	very low	Revised
3	Satisfactory	Very Easy	High	Accepted

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Test Item	Discriminating Power	Level of Difficulty	Validity	Noted
4	Satisfactory	Easy	Low	Revised
5	Satisfactory	Medium	very low	Revised
6	Poor	Very Easy	NAN	Rejected
7	Good	Difficult	Enough	Accepted
8	Poor	Medium	very low	Revised
9	Good	Easy	very high	Accepted
10	Poor	Medium	very low	Revised
11	Poor	Easy	very low	Revised
12	Poor	Very Easy	NAN	Rejected
13	Poor	very hard	very low	Revised
14	Satisfactory	Very Easy	very low	Revised
15	Satisfactory	Easy	very low	Revised
16	Satisfactory	Medium	Enough	Accepted
17	Poor	Very Easy	NAN	Rejected
18	Excellent	Medium	High	Accepted
19	Good	Easy	very high	Accepted
20	Good	Easy	very high	Accepted
21	Poor	Very Easy	NAN	Rejected
22	Excellent	Easy	High	Accepted
23	Poor	Medium	very low	Revised
24	Poor	Very Easy	NAN	Rejected
25	Excellent	Medium	High	Accepted
26	Satisfactory	Very Easy	High	Accepted
27	Poor	Very Easy	NAN	Rejected
28	Poor	Very Easy	NAN	Rejected
29	Good	Medium	Enough	Accepted
30	Satisfactory	Very Easy	High	Accepted
31	Poor	Very Easy	NAN	Rejected
32	Poor	Very Easy	NAN	Rejected

Since there are 9 questions that rejected, 11 questions should be revised therefore there are only 12 questions that used in this research based on this validation result. However, in this study the researcher used 23 questions whose 11 remaining questions took from some of the previously validated questions.

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

3.8 Data Analysis

Data was obtained from both qualitative and quantitative data. Quantitative data was obtained from pre-test and post-test. These data is used to measure improvement of students' understanding. Qualitative data was obtained from motivational questioner that is used to gain the students' motivation of students from learning solar system after the teaching and learning process by implementing Blended Learning with the support of discovery learning, Solar System Scope and Google Classroom. Explanation of data processing techniques were obtained as follows:

3.8.1 Analysis of Students' Concept Mastery

1) Scoring test item

The first step to process data was by scoring the test item that consists of 23 multiple choice test questions pre-test as well as post-test. Scoring for concept mastery will be one point if the answer is correct and zero point if the answer is incorrect.

2) Calculation of Gain and Normalized Gain

After finish to scoring all the test item, then the data processed to find the Gain and Normalized Gain scores. Gain score is obtained from the difference between post-test and pre-test. The following formula is use to determine the Gain score :

$$G = S_f - S_i$$

G is for Gain score, S_f is for post-test while S_i for pre-test.

The determination of the effect of Blended Learning on students' concept mastery was by the result of normalized gain which was achieved by the students during the teaching learning process. The formula which was used to calculate normalized gain score regarding to Hake (1999) is :

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

$$\langle g \rangle = \frac{100 - \langle S_f \rangle}{\langle G \rangle_{max}} \geq 0$$

(Hake,1999)

Description :

$\langle g \rangle$ = Normalized gain

$\langle G \rangle$ = Actual gain

$\langle G \max \rangle$ = maximum gain possible

$\langle S_f \rangle$ = Average of post-test score

$\langle S_i \rangle$ = Average of pre-test score

The value of Normalized Gain that has been gained continue to be interprets using interpretation table as shown.

Table 3.11
Interpretation of Normalized Gain

No	Value	Classification
1	$\langle g \rangle \geq 0.7$	High
2	$0.7 < \langle g \rangle \geq 0.3$	Medium
3	$\langle g \rangle \geq 0.3$	Low

(Hake,1999)

3.8.2 Analysis of Students' motivation

The questionnaire have a purpose to measure students' motivation after teaching and learning activity. There are 20 questions of questionnaire. While for SMQ Questionnaire, the score will be at range 1-5 for each question in each dimension. The interpretation of score from questionnaire motivation shown in Table 3.12 below.

Table 3.12
Interpretation of Motivation

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Interval	Classification
If total score > 73.4	High Motivation
If score between 46.7 – 73.4	Adequately Motivation
If total score < 46.7	Low Motivation

(Hariyono,2017)

3.8.3 Hypothesis Test

The hypothesis in this research tested by using SPSS version 16 program. Before determining which kind of hypothesis test that will be used, normality test should be done first. If the data normally distributed, the test of hypothesis will use parametric test. If not, the hypothesis test will be continue with non-parametric test.

Normality test is used to know whether the data that comes from sample is normally distributed or not. Meanwhile, homogeneity test is also used to determine whether the data is homogeneity or not. The non-parametric test that used in this study is Wilcoxon test. If the level of significant (sig) ≤ 0.05 then the H_0 is rejected. If the level of significant (sig) > 0.05 H_0 accepted. The hypothesis of this study:

H_0 : There is no difference in students' concept mastery in learning solar system by using Blended Learning

H_1 : There is difference in students' concepts mastery in learning solar system by using Blended Learning

3.8.4 Qualitative Data Analysis

Observation sheet in this research is qualitative data. For the analysis of observation sheet is conducted by the raw score that obtained into percentage. For converting score into percentage was by using the formula shown below.

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

$$P = \frac{R}{MS} \times 100$$

(Arikunto,2013)

Where:

P = Percentage

R = Raw score

MS = Maximum score

The percentage that obtained form the obseravtion sheet on implementation of Blended Learning, continue can be interpret and will be catagorized into certain criteria according to Arikunto (2013) as shown in Table 3.13.

Table 3.13
Interpreation of implemenetation percentage of Blended Learning

No	Percentage (%)	Classification
1	85-100	Very Good
2	66-79	Good
3	56-65	Enough
4	40-55	Low
5	<40	Very Low/ Failed

(Arikunto,2013)

3.9 Operational Definition

In order to avoid misconception or misunderstanding about this research, the researcher make some operational definitions that will be explained in this research. Those terminologies are explained as follow:

- a. Blended Learning definition presented by Graham, Allen and Ure in Bonk and Graham (2006) Blended Learning is combination between online learning and face-to-face learning which the online learning composition is 30-79%. Here the online learning will limited up around 35% from the total of time in teaching learning process. Station

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

rotation model will be use in this research which is involve 3 Station which are online station, hands on activity station and small group discussion station. Solar system topic will be delivered in this research The indicators is taken from the subtopics in Solar system system topic. This will be measure by using Observation sheet that is assessed by other teacher.

- b. Students' concept mastery is the process of acquiring and understanding knowledge through our thoughts, experiences, and senses (Anderson & Krathwohl, 2001). In this research will be about the competence of students that covers the level cognitive such as understanding (C2)applying (C3), analyzing (C4) and evaluating (C5). This competence will be measure by using multiple choice questions (pre-test and post-test).
- c. Students' motivation consists of the amount of effort a person is willing to exert in pursuit of a goal (Keller, 2006). Students' motivation in this research will be gain from the students feedback after they learn using Blended Learning environment.

Vania Zhafirah, 2019

The effect of Blended Learning on Students' Concept Mastery and Motivation in learning Solar

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu

Vania Zhafirah, 2019

***The effect of Blended Learning on Students' Concept Mastery and Motivation
in learning Solar***

Universitas Pendidikan Indonesia | repository.upi.edu | perpustakaan.upi.edu