CHAPTER III
RESEARCH METHOD

A. Type of Research

This research is quantitative method, using experimental research. By considering the condition of each class in this Junior high school, which each class has different capabilities of student. For example, class VIII-A has a better academic achievement and english capability rather than VIII-B and VIII-C, so researcher would like to choose pre-experimental research especially one group pretest posttest study which only use one class so that this research would be on target and representative.

B. Research Design

One group pretest – posttest study design will be used in this research. The one-group pretest-posttest design is a research design where one group of participants is pretested on the dependent variable and then posttested after the treatment condition has been administered. This is a better design than the one-group posttest-only design because it at least includes a pretest, that indicates how the participants did prior to administration of the treatment condition. The design could be seen clearly as the diagram shown below:

One Group Pretest – Posttest Study

O_1 X O_2

Key: O_1 = Pretest

O_2 = Posttest

X = Treatment

Figure 3.1 : Diagram of one group pretest – posttest study

As the name suggest, one group pretest posttest comprises pretest and posttest as its main data. In this design, the effect is taken to be the difference between the pretest and posttest scores. It does not control for potentially confounding extraneous variables such as history, maturation, testing, instrumentation, and regression artifacts, so it is still difficult to identify the effect of the treatment condition.

C. Population and Sampling

Population of students is taken from one of the school in Bandung. Meanwhile the sample of students is taken in grade VIII-A since photosynthesis chapter is learnes in this grade. The class itself is taken by purposive sampling.

D. Research Variable

Variable is considered as the object of research, in order word it is explained as the main focus of the research that will be done. In this research, The object of research is role play learning method as independent variable and student's achievement as dependent variable.

E. Operational Definition

In order to avoid miss conception in understanding some of the term used in this research, therefore some of the terms need to be explained as the following explanation:

1. Role Play

   Role-play is a teaching method that is structured experience in which learners get an opportunity to act out problems concerning human relations and human interactions before a group of co-learners and

facilitators. Based on its age recommendation, analogy role play will be used in this research. To evaluate and to know the response of students in this activity, researcher use 15 questions from questionnaire.

2. Achievement

Achievement consist of many acpects, such as understanding, creative thinking, etc. While in this thesis, researcher focus on cognitive domain. According to Bloom's Taxonomy there are six levels of cognitive complexity: knowledge, comprehension, application, analysis, synthesis, evaluation. Level 1-3 are included into lower order thinking (LOT), level 4 is included into middle order thinking (MOT), meanwhile level 5-6 are included into higher order thinking (HOT). In this taxonomy, hierarchical arrangement means that higher levels subsume ability in lower levels. The higher the level, the presumably more complex mental operation is required. Higher levels are not necessarily more desirable than lower levels, because one cannot achieve the higher levels without an ability to use the lower levels. As one moves up into higher levels, however, the more applicable the skills are to those needed in daily life. In this report, this domain is evaluated by 20 multiple choice test items in pre-test and post-test

3. Role Play Implementation

Role play implementation is an activity in this research for students on their teaching learning process. Role play itself is derived from psychodrama that may be used to to integrate the knowledge in action, by addressing problems, exploring alternatives, and seeking creative solutions. To evaluate this activity researcher use classroom observation sheet and group observation sheet which was used by observer to help them observing the activity.

4. Photosynthesis

Photosynthesis is a topic that spans disciplines (biophysics, biochemistry, ecophysiology) and organisational levels (molecules, cells, organs, organisms, ecosystems). Photosynthesis is often de-emphasised in Biology curricula, because of the tendency to focus on living things.

In this thesis, researcher use photosynthesis process for Junior High School since the target of this research are for VIII grade Junior High School. This topic is used on the instruments such as lesson plan, power point presentation, and worksheet.

F. Instructional Tools

To conduct teaching learning process through role play learning method, there are some tools that have to be prepared, those are:

1. Lesson Plan

Lesson plan is the design of instructional arrangement that will be used in the implementation. This arrangement is set in every unit of class meeting implemented by the teacher. Through lesson plan, teacher is able to do teaching learning process based on the instruction stated. Lesson plan can be seen on appendix.

2. Role Play Worksheet

Role play worksheet is a worksheet for each groups of students to guide them to make scenario. It contains learning materials and instruction. so in teaching learning process students have to synthesis this learning materials and then try to make their own scenario and then act like a things

that is stated there. Through this worksheet, students are able to deliver facts about photosynthesis topic.

3. Role Play Scenario's Outline

Role play outline is an outline for teacher to guide their students to make their own scenario, so that students can make their scenario well and avoid misconceptions. Role play outline contains a scenario which is made by teacher itself.

4. Power Point Presentation

Power point presentation is a tools to present photosynthesis material. It contains general topic of photosynthesis so that students know basic concept of photosynthesis before making their scenario.

G. Research Instrument

Instrument which is used to collect the data in this research consist of:

1. Achievement Test (pretest and post test)

Test Instrument is used for analyzing cognitive aspect of students. Pretest is given to students before the activity to know students ability in photosynthesis concept, while post test is given to students after the activity as evaluation to measure student's improvement. Pre-test conducted to determine the student's ability before given treatment. While post-test is conducted to determine the achievement after being given treatment. Thus, it can be seen that differences in cognitive skills may ultimately provide an overview of the level of learning success.

a. Construction of Pretest and Posttest blueprint

Construction of pretest and posttest blueprint is aimed to determine the aspect of poster presentation aspect that will be measure

which is appropriate with learning indicator. Blueprint of pretest and posttest is provided on the table below:

Table 3.1 Recapitulation of Pretest and Posttest

No.	Thinking Skills	Indicator	Test Item
1	Lower	1) Remembering	1, 3, 9, and 15
		2) Understanding	2, 4, 5, 7, and 8
		3) Apply	10, and 14
	Middle	4) Analyze	6, 11, 12, and 13
	Higher	5) Evaluate	16, 17, 18, and 19
		6) Create	20

b. Determine the validity of test item

In this research, instruments are validated by research experts. Based on the validation, there are suggestions from the expert for the test items. After the items fixed, the items are tested through trial of test items

c. Conduct trial of test item

Trial test item will implemented in the upper grade of population. In this research, the trial of test item will implemented in grade 9.

d. Conduct analysis of test item based on trial test

Analysis of test item involves validity test, reliability test, difficulty level and discriminating power.

1) Validity test

Validity test which is used in this research is content validity, which is related to the ability of assessment tool to measure what should be measured (Sudjana, 2009). To measure the validity of each test item, the researcher use the Coefficient of Product Moment Karl Pearson, there is:

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

(Sudjana, 2005)

With, r_{xy} : correlation coefficient between x and y variable

n : amount of student

x : total score in test item

y : total score of student

Interpretation about r_{xy} will be divided into different categories based on Guilford.

Table 3.2 Classification Validity Coefficient

Value r_{xy}	Interpretation
0,90 ≤r_{xy}≤ 1,00	Very high validity
0,70 ≤r_{xy}<0,90	High validity
0,40 ≤r_{xy}< 0,70	Medium validity
0,20 ≤r_{xy}< 0,40	Low validity
0,00 ≤r_{xy}< 0,20	Very low validity
r_{xy}< 0,00	Invalid

(Arikunto, 2010).

After testing the validity, trial test to measure realibility, difficulty index, and discriminating power was conducted.

2) Reliability test

KR 20 equation is used to calculate reliability of the test because the questions are multiple choices, the equation is (Arikunto, 2012):

$$r_{11} = \left(\frac{k}{k-1}\right)\left(1-\frac{\sum pq}{s^2}\right)$$

r_{11} = instrument reliability

k = amount of test item

$\sum pq$ = multiplication result of p and q
s = deviation standard

Table 3.3 Reliability Value of Question

Reliability coefficient	Criteria
$0.00 < x \leq 0.20$	Very low
$0.20 < x \leq 0.40$	Low
$0.40 < x \leq 0.60$	Satisfactory
$0.60 < x \leq 0.80$	High
$0.80 < x \leq 1.00$	Very high

(Arikunto, 2012)

3) Difficulty Level

A good test item is neither too easy nor too difficult. A scale that shows the difficulty level of test item is difficulty index. The equation which is used to calculate the difficulty level is:

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

P = difficulty index

B = amount of student who answer question with the right answer

JS = total amount of students who undertakes the test

(Arikunto, 2012)

Table 3.4 Criteria of Difficulty Level

P Value	Category of test
$P > 0.7$	Very Easy
$0.3 \geq P \geq 0.7$	Medium
$P < 0.3$	Difficult

(Arikunto, 2012)

4) Discriminating power

Discriminating power of test item is the ability of test item to differentiate between high achiever and low achiever. To determine discriminating power of test item, the equation below is used:

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

D = discriminating power
JA = amount of high achiever
JB = amount of low achiever
BA = amount of high achiever who answers question with the right answer
BB = amount of low achiever who answers question with the right answer
P_A = proportion of high achiever who answers question with the right answer
P_B = proportion of low achiever who answers question with the right answer

(Arikunto, 2012)

Table 3.5 Criteria of Test Item Discriminating Power

Discriminating power interval	Criteria of discriminating power
Negative	Test item is not appropriate
$0.00 < x \leq 0.20$	Poor
$0.21 < x \leq 0.40$	Satisfactory
$0.41 < x \leq 0.70$	Good
$0.71 < x \leq 1.00$	Excellent

(Arikunto, 2012)

Table 3.6. Recapitulation of Validity Test Item in Concept Comprehension.

No	Discriminating Power		Difficulty Index	Validity		Conclusion
	Value	Significant		Value	Significant	
1	0,00	Poor	Very Easy	NAN	NAN	-
2	0,00	Poor	Very Difficult	0,075	-	-

3	50,00	Good	Medium	0,424	Very Significant	Used
4	75,00	Excellent	Easy	0,584	Very Significant	Used
5	0,00	Poor	Very Difficult	NAN	NAN	-
6	25,00	Satisfactory	Very Easy	0,165	-	-
7	-25,00	Not Appropriate	Easy	-0,207	-	-
8	25,00	Satisfactory	Very Easy	0,321	Significant	Used
9	25,00	Satisfactory	Easy	0,260	-	-
10	-25,00	Not Appropriate	Medium	-0,028	-	-
11	75,00	Excelent	Medium	0,582	Very Significant	Used
12	25,00	Satisfactory	Medium	0,326	Significant	-
13	100,00	Excelent	Medium	0,820	Very Significant	Used
14	50,00	Good	Medium	0,311	Significant	Used
15	75,00	Excelent	Easy	0,793	Very Significant	Used
16	50,00	Good	Easy	0,434	Very Significant	Used
17	50,00	Good	Very Easy	0,478	Very Significant	Used
18	25,00	Satisfactory	Easy	0,326	Significant	Used
19	0,00	Poor	Very Easy	-0,182	-	-
20	100,00	Excelent	Easy	0,856	Very Significant	Used
21	75,00	Excelent	Easy	0,705	Very Significant	Used
22	25,00	Satisfactory	Medium	0,254	-	-
23	25,00	Satisfactory	Medium	0,395	Very Significant	Used
24	50,00	Good	Medium	0,261	-	-
25	25,00	Satisfactory	Medium	0,141	-	-
26	0,00	Poor	Easy	0,027	-	-
27	0,00	Poor	Very Easy	-0,021	-	-
28	50,00	Good	Medium	0,288	-	-
29	50,00	Good	Medium	0,370	Significant	-
30	75,00	Excelent	Medium	0,422	Very Significant	Used
31	0,00	Poor	Medium	0.166	-	-
32	75,00	Excelent	Medium	0,661	Very Significant	Used
No	**Discriminating Power**		**Difficulty Index**	**Validity**		**Conclusion**
	Value	**Significant**		**Value**	**Significant**	
33	75,00	Excelent	Medium	0,529	Very Significant	Used

34	-50,00	Not Appropriate	Medium	-0,451	-	-
35	50,00	Good	Easy	0,625	Very Significant	Used
36	75,00	Excelent	Medium	0,793	Very Significant	Used
37	75,00	Excelent	Medium	0,587	Very Significant	Used
38	25,00	Satisfactory	Difficult	0,169	-	-
39	100,00	Excelent	Difficult	0,529	Very Significant	Used

Notes: Amount of subjects:15
Amount of test items: 39
Standard deviation: 5,18
Reliability: 8,2 (Very High)

2. Non-test Instrument

a. Questionnaire

Questionnaire is used for analyzing affective aspect of students. Questionnaire is done by spreading questionnaire sheets to all members of the class after lecturing ends, so that the researcher is able to know students idea about an implementation of role play activity during teaching learning process. The fulfillment of the questionnaire is give a mark on the available number with range 1-5 which represent strongly agree, agree, neutral ,disagree, and strongly disagree. Questionnaire is given to students, and the students are asked to give checklist (√) sign according to the statement.

Table 3.7 Recapitulation of the Questionnaire.

Indicator	Question Number
Students opinion towards photosynthesis concept in biology	1, 2, 3, and 4

Role play toward student's interest	5, 6, and 7
Role play toward student's collaboration in their groups	8
Role play toward student's understanding	9 and 10
Role play toward student's activeness	11
Contextuality of role play	12 and 14
Role play as an innovation	13
Role play toward student's communication	15

b. Observation Sheet

This instrument is used to observe activity during teaching learning process. The observer will observe students' activities and looking up the indicator on the observational sheet. The observer gave the checklist on the observational sheet if the obsever found the indicator appear in students' activities individually.

There are 2 observation sheet, the first one is observation toward classroom activity. This observation sheet are used both in first and second meeting. Meanwhile the second one is observation toward each groups of students. This observation sheet is used to observe groups activity during teaching and learning process.

c. Student's Multiple Intelligence Analysis (Preliminary Study)

This instrument is used to know student's multiple intelligence since students are unique, they have different charracteristic each other. Presumably not all students are able to grasp the ideas from role play method because they have different talent. There are 8 types of multiple intelligence, those are verbal/linguistics, logic/mathematics, visual/spatial, kinestetics, musical, interpersonal, intrapersonal, and natural (Winarto, Paulus. 2010). The result of this study can be seen on the figure below.

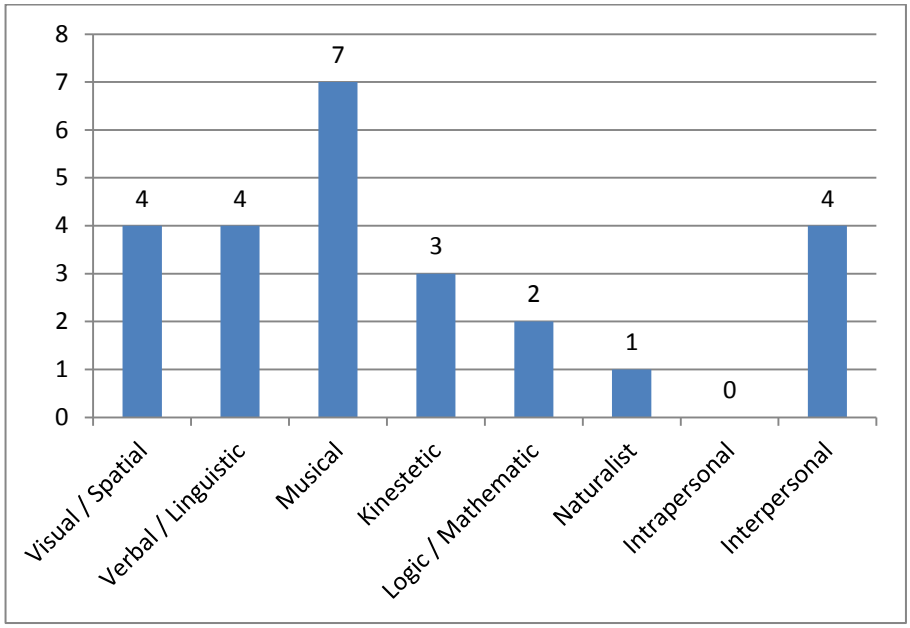

Figure 3.2 Recapitulation of students multiple intelligence result

The score above represent the amount of students that have a dominan multiple intelligence. Most of students have musical intelligence with 7 students. Meanwhile visual/spatial, verbal/linguistic, and interpersonal intelligence are owned by 4 students each. 3 students have kinestetic intelligence, 2 students have logic/mathematic intelligence, and 1 student have naturalist intelligence. Meanwhile there is no students that have intrapersonal intelligence.

H. Research Plot

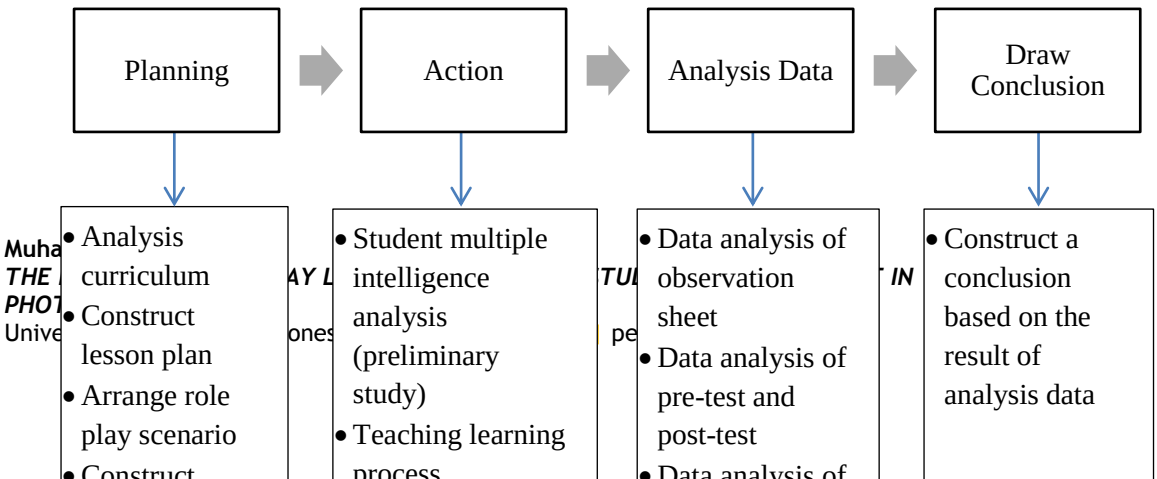

Figure 3.3 Research Plot

I. Research Procedure

Data is taken from one class of junior high school that conduct photosynthesis topic in science subject. This research is conducted in 4 steps, those are; 1.) Planning, 2.) Action, 3.) Analysis Data, and 4.) Draw Conclusion. Detailly the procedure could be explained as follows:

1. Planning

   This step is important before doing the research. Planning can make researcher ready to do the experiments. This steps can be detailly described in the explanation below:

   a. Analyze the curriculum.

      Before starting all the instruments, researcher have to analyze the curriculum, whether the material is available in the curriculum or not. So that the material will be on target and appropriate with student's needs.

b. Construct lesson plan of photosynthesis.

Since photosynthesis topic was available in curriculum, then this topic is used for the research. In this step, researcher construct the lesson plan of photosynthesis topic by role play method. Teacher should be able to imagine what would happen in the classroom then write the plan in the lesson plan

c. Arrange role play scenario outline.

This role play scenario outline for teacher is important in order to guide their students making their role play scenario. This outline can minimize the chance of misconception.

d. Construct observation sheet for observer.

After arranging the plans, researcher constructing the observation sheet for observer based on lesson plan made. This observation sheet is useful for measuring whether the implementation is good or not.

e. Construct test instruments (Pretest and Posttest).

This instrument is used to measure students achievement before and after the lesson. This instrument is very useful for this research in order to measure the effect of role play learning method to the improvement of student's achievement in photosynthesis topic.

f. Construct questionnaire.

After constructing test instruments, researcher construct questionnaire. This instrument is useful for this research in order to measure students response toward role play learning method.

2. Action

In this step researcher perform the planning that have been prepared before. The explanation can be described as the steps below:

a. Preliminary study (Student's multiple intelligence analysis)

Since each students are unique and have different characteristics, not all characteristic of students can grasp the idea of role play. This study is used to identify student's multiple intelligence profile, so that this could be identified along with role play learning method.

b. Teaching learning process

Before spreading the pre test, researcher was teaching the basic concept of photosynthesis. Because if teaching learning process is done after pre test, the measurement of pre test and post test will not be purely on role play method. Beside that, students will not be able to make a scenario without any knowledge about photosynthesis. This step can minimize the chance of misconception to students.

c. Pre test

In this step, researcher spread the pre test and give certain time for students to answer the questions. This test is useful to measure student's achievement before role play treatment.

d. Role play treatment

In this role play treatment, students are asked to have a group and make a scenario based on role play worksheet. Researcher guide the student's by role play scenario outline to avoid misconception in students scenario. After making the role play scenario, students are asked to present the scenario in front of the class.

e. Post test

After the treatment, students are asked to do post test. The content of post test is similar as in pre test. This test is useful to measure student's achievement after role play treatment.

f. Spread questionnaire

The last one is spread the questionnaire in order to know student's response toward role play learning method. Through this questionnaire, researcher will be able to describe students idea about role play learning method.

3. Analysis Data

In this step, analysis toward a whole activity and evaluation is conducted. Pretest and Posttest result is analyzed to gain students cognitive data, meanwhile Questionnaire result is analyzed to gain students affective data. (scoring, descriptice stastictic, compare mean test)

a. Data Analysis of Observation Sheet

Observation sheet data is obtained in order to identify the activity in classroom and each groups. This instuments are able to measure the successfulness of the activity in the class. the check list from observers are calculated by a formula shown below:

$$Percentages = \frac{Amount\ of\ Check\ in\ Done\ Column}{Total\ Check\ list}\ x\ 100\%$$

This formula is used to calculate the percentage of activities done in each of observation sheet, so that the score will represent how was the implementation, whether it is done well or not.

b. Data Analysis of Pretest - Posttest

Pre –test Analysis is obtained to identify the prior skill of student before the treatment is implemented. The analysis of pre-test data processes are described as:

1) Descriptive analysis

Descriptive analysis is conducted to identify the mean , deviation stadard ,maximum score, minimum score, and variance of data. These analysis will be used to get variable that will be used in the next stage.

2) Compare mean test

Compare mean test is purposively conducted to identify whether the significant difference is represent between the sample and standard score. According to the research method used ,one sample t-test is used in analysing the data.

Supposed that data that is gained is normally distributed and homogen, so the analysis is conducted by using one sample test. On the other hand, if data is normally distributed but it has no homogenity variance, thus t test is preferred to be used. Furthermore, if the data neither normally distributed nor homogen, consequently the analysis uses non parametric Mann Whitney.

To analyse the correlation of pre-test and post-test result, the determination of normalized gain index is conducted. Normalized gain is calculated by using the formula proposed by Meltzer:

$$N\ Gain < g >= \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

(Wardhani, 2006)

Moreover , to identify the quality of student's achievement improvement, normalized gain index is interpreted. The criteria used for interpretation process is criteria proposed by Hake represented in Table below

Table 3.8 Gain Criteria

N-Gain	Interpretation
<g> > 0,7	High
0,3 < <g> < 0,7	Average
<g> < 0,3	Low

(Wardhani, 2006)

c. Data Analysis of Questionnaire

Analysis of students questionnaire is used by classifying data based on alternative answers given. In the time of data analysis, the process uses Likert scale by calculating the following value:

$$\mathbf{P = \frac{f}{n} \times 100\%}$$

P : Precentage
f : frequence of the answer
n : total of the respond.

(Wardhani, 2006)

4. Conclude the Findings

In this step, researcher make conclusion for a whole activity. Researcher answer the question based on research problem stated in this research scientificaly based on the data achieved in the data analysis.