CHAPTER III

RESEARCH METHODOLOGY

A. Location and Subject

1. Research Location and Period

This research have already implemented in Bina Nusantara International School Serpong which applied Cambridge Curriculum in the learning process. The data collection was done in May 2013.

2. Population and Sample

Population of this research is all of students' ability in concept comprehension and creativity that belongs to grade 10 consists of 10 classes in Bina Nusantara International School Serpong.

The sample of this research is one class of grade 10 consists of 23 students in science class. The sampling technique of this research is random cluster sampling from all of the population, the consideration of the sample is based on the cluster sampling in each class.

B. Type of Experimental Design

The design that used in this research is one group pretest and posttest design, this group is small group with poster presentation. In this research design there was a test to know students' prior knowledge or pretest (O_1), poster presentation (X), and after the concept given the treatment the final posttest will be conducted (O_2) (Arikunto, 2010).

One group pretest and posttest design

Pretest	Treatment	Posttest
O1	X	O2

O1	: Pretest
X	: poster presentation
O2	: Posttest

C. Research Method

The type of method in this research is weak experiment. This method is chosen because using one class in making a poster presentation without control group. Based on Arikunto (2010) weak experiment method is only use one group research without any control group.

D. Operational Definition

1. Poster Presentation

Poster presentation has already implemented in the class activities. It was advantageous for students to become active learner and to develope their communication skills. In order to implemented of poster presentation, one class of experimental group has already choosen. Class divided into several group, one group consists of 4 students. They have to discuss about pollution before they make a poster. In this activity, students should work together. After students finished their poster, they should present their poster in front of the class. Students have to explore their knowledge and creativity through poster presentation. Rubric was used to evaluate the poster.

2. Creativity

Creativity is the ability to find some new links, in looking at the subject from a new perspective and create new combinations from several ideas, products, colors, textures, and other things. Students' creativity were assed through poster presentation that use observation sheet as an instrument. There will be such indicators in observation sheet for making a poster such as Fluently, Flexibility, Originality, and Elaboration. Pollution is a topic to be raised in the learning using a poster presentation. Class will devided into several group. During making a poster, students will be observed by oberserver by using obervational sheet.

3. Concept Comprehension

Students' concept comprehension in this research is a cognitive domain in pollution concept. Mastery and understand the concepts is essential in teaching and learning activities. According to Bloom's Taxonomy cognitive domain are C1 (remember), C2 (understand), C3 (apply), C4 (analyze), C5 (evaluate), C6 (create) that are measured by using an objective test consist of 20 multiple choice question.

E. Research Instrument

The experimental instrument which is used to collect the data in this research based on Harahap (1982) consist of:

1. Objective test in a form of multiple choice question is used to measure students' achievement before and after treated poster presentation in pollution concept
2. Rubric form is used to guide students for making a poster during class activities. Rubric is also used to measure students' creativity. The poster will be analyzed based on Munandar (1992) indicator such as Fluency, Flexibility, Originality, and Elaboration.
3. Observational sheet is used to measured students' creativity in making a poster. The indicator was adapt from Munandar (1992) which is consits of Fluency, Flexibility, Originality, and Elaboration.
4. Questionnaire form. This instrument is used to give feedback after making a poster in the class. To know students' respond about poster presentation. Students will be answered with yes or no questions.

F. Instrument Development

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

1. **Achievement Test in a form of pretest and posttest.** This test is used to measure students' comprehension skill before and after conducting poster presentation. The instrument for this test is an objective test (multiple choice). Instrument which is prepared for this research and validated.

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.	Indicator	Test Item
1	1) Remembering	8, 9, 15, and 16
	2) Understanding	4, 7, and 17
	3) Apply	1, 2, 3, and 20
	4) Analyze	6, 10, and 11
	5) Evaluate	5, 13, 18, and 19
	6) Create	14

Adopted from Bloom's Taxonomy (Anderson, 2001)

b. Determine the vailidity of test item

Validity which is used in this research is content validity, which is related to the ability of assessment tool to measure what should be measured. In this research, instruments are validating by research supervisor.

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 was implemented in grade 11.

d. Conduct analysis of test item based on trial test

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

1) 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 (Arikunto,2010).

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

In this research, instruments are validating by the expert. After judgement by the expert, 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 3.2 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

Source : 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 (Arikunto, 2012). 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

Table 3.3 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

Source : Arikunto (2012)

4) Discriminating power

Discriminating power of test item is the ability of test item to differentiate between high achiever and low achiever (Arikunto, 2012). 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

Table 3.4 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

Source : Arikunto (2012)

Table 3.5. Recapitulation of Validity Test Item in Concept Comprehension.

No	Discriminating Power	DP	Difficulty Index	Validity		Conclusion
				Value	Significant	
1	0,00	Poor	Easy	-	-	
2	0,00	Poor	Easy	0,115	-	
3	0,00	Poor	Easy	-	-	
4	0,00	Poor	Easy	-0,074	-	
5	80,00	Excellent	Medium	0,792	Very significant	Used
6	60,00	Good	Easy	0,532	Very significant	Used

No	Discriminating Power	DP	Difficulty Index	Validity		Conclusion
				Value	Significant	
7	40,00	Satisfactory	Medium	0,208	-	
8	20,00	Poor	Easy	0,321	Significant	Used
9	0,00	Poor	Medium	0,114	-	
10	60,00	Good	Medium	0,619	Very significant	Used
11	20,00	Poor	Easy	0,529	Very significant	Used
12	20,00	Poor	Easy	0,529	Very significant	Used
13	20,00	Poor	Easy	0,205	-	
14	20,00	Poor	Easy	0,339	Significant	Used
15	40,00	Satisfactory	Medium	0,148	-	
16	20,00	Poor	Easy	0,148	-	
17	40,00	Satisfactory	Medium	0,435	Very significant	Used
18	0,00	Poor	Difficult	0,092	-	
19	80,00	Excellent	Medium	0,556	Very significant	Used
20	80,00	Excellent	Easy	0,665	Very significant	Used
21	10,00	Poor	Medium	0,738	Very significant	Used
22	0,00	Poor	Easy	-	-	
23	20,00	Poor	Difficult	0,361	Significant	Used
24	60,00	Good	Easy	0,539	Very significant	Used
25	-20,00	Not appropiate	Difficult	-0,322	-	Used (revision)
26	40,00	Good	Meidum	0,449	Very significant	Used
27	20,00	Poor	Difficult	0,247	-	
28	20,00	Poor	Difficult	0,247	-	Used (revision)
29	40,00	Good	Easy	0,467	Very significant	Used

No	Discriminating Power	DP	Difficulty Index	Validity		Conclusion
				Value	Significant	
30	0,00	Poor	Difficult	-	-	
31	20,00	Poor	Difficult	0,196	-	
32	40,00	Good	Easy	0,482	Very significant	Used
33	60,00	Good	Easy	0,710	Very significant	Used
34	100,00	Excellent	Meidum	0,889	Very significant	Used

2. Rubric to Asses the Poster

This instrument will be used to guide students for making a poster and also to evaluate poster of students. The range of rubric is 1-4, the lowest score of rubric is 1 and the highest score of rubric is 4. Teacher will change the score by calculated the final score of rubric into 100% scale. The score will be generally same with the other instruments.

Table 3.6 Rubric for Measure Creativity.

	Indicator	**1**	**2**	**3**	**4**
Content – accuracy (Fluency)	• Sparkling a lot of idea • Always think about more than one answer	Less than 3 accurate facts about pollution are displayed on the poster.	At least 3-4 accurate facts about pollution are displayed on the poster.	At least 5-6 accurate facts about pollution are displayed on the poster.	At least 7 accurate facts about pollution are displayed on the poster
Labels - Organization (Flexibility)	• Interpretation to some picture, story, and problems	Labels are too small to view or no important items were labeled	Several items of importance on the poster are clearly labeled with labels that can be	Almost all items of importance on the poster are clearly labeled with labels that can be read	All items of important on the poster are clearly labeled with labels that can be read from at

	Indicator	1	2	3	4
			read from at least 3m away.	from at least 3m away.	least 3m away.
Attractiveness (Originality)	• Create and produce new expression.	The poster is distractingly messy or very poorly designed and colourless	The poster is acceptable colourfull thought it maybe a bit messy	The poster is colourfull in terms of design, layout, and neatness.	The poster is exceptionally colourfull in terms of design, layout, and neatness.
Steps (Elaboration)	• Solve the problem with some steps and detail.	There is no steps to solve the problem of pollution.	The poster has a way to deal with pollution but there is no step to solve this problem.	The poster has steps to solve the pollution but the steps are not detail.	The poster has steps to solve the pollution

Source: (Munandar, 1992)

3. Observation sheet

This istrument will used to measure students' creativity of making a poster. The instruments have an indicator, the indicator based on Munandar (1992). The observer will observe students' activities and looking up the sub indicator on the observational sheet. The observer gave the checklist on the observational sheet if the obsever found the sub indicator appear in students' activities individually. To final score of observation sheet is 20 based on the amount of sub indicator.

Table 3.7 Observation Sheet to Measure Students' Creativity

No	Indicator	Sub Indicator	Checklist
1	Fluency	Student is able to sparks his/her ideas.	
		Student helps their friend to solve the problem.	
		Student post questions in a group.	
		Students give a suggestions to help his/her friends	

No	Indicator	Sub Indicator	Checklist
		Student always think about more than one answer	
2	Flexibility	Student produce new ideas based on their mind	
		Can see the problem from the perspective of different area	
		Giving a various skill towards unusual things	
		Giving a various interpretation to some picture, story, and problems	
		Implement the concept or idea differently	
		Give consideration to some situation, that have different situation given by someone else	
3	Originality	Create and produce a new expression and unique	
		Think differently to express their selves	
		Can make a combinations that is different with other things	
		Chose asymmetry design to create a picture or design	
		Refer to synthesize than analyzes	
4	Elaboration	Finding the meaning of some question deeply	
		Solve the problem with some steps and detail	
		Trying and testing a detail to see the final goal	
		Have a beautiful sense so there will be dissatisfaction with blank or simple appearance, and adding some line, colors, and details with their own picture or the other picture.	
Total			

Source: (Munandar, 1992)

4. Questionnaire

Questionnaire form. This instrument is used to measure the activity of poster presentation of the students, learning material, and worksheet that will be used. The fulfillment of the questionnaire is give circle mark on the available number with range 1-4 which represent strongly agree, agree, disagree, and strongly

disagree. Questionnaire is given to students, and the students are asked to give checklist (√) sign according to the statement.

Table 3.8 Recapitulation of the Questionnaire.

Indicator	Question Number
Students opinion towards pollution concept in biology	1, 2, 3, 4, 5, 6, and 7
Students opinion towards poster presentation	8, 9, 10, 11, 12, 13, 14, 15, 16, and 17
Students opinion towards creativity in making a poster	19, 20, 21, 22, 23, and 24

G. Data Analysis

1. Data Analysis on students concept comprehension

The initial step is to give a score on the pretest and posttest in experimental 1 and experimental 2. Then the scores are converted into 0-100 scale value.

Convert score of each student in form percentage (%) using equation :

$$\textit{Student's score}\ (\%) = \frac{total\ right\ answer}{Maximum\ score}\ x\ 100\%$$

Source : Arikunto (2010)

Table 3.9 Category scale of students understanding

Score	Category
$S \leq 20$	Very poor
$21 \leq S \leq 40$	Poor
$41 \leq S \leq 60$	Satisfactory
$61 \leq S \leq 80$	Good
$81 \leq S \leq 100$	Excellent

Source: Arikunto (2010)

Gain score (actual gain) was obtained from the difference of pretest score and post-test score. The difference in pretest scores and the post-test is assumed as the effect of the intervention. Normalized gain calculations are intended to determine

the categories of students' achievement improvement. According to Hake (1998) normalized gain is calculated by using this following formula:

$$G = S_f - S_i$$

Description :

G = Gain
S_f = Post-test score
S_i = Pretest score

The effectiveness poster presentation in increasing students' achievement of concept comprehension in pollution will be seen from the result of the normalized gain that achieved by students during the learning process. For the calculation of the normalized gain value and its classification will use equations (Hake, 1999) as follows:

Normalized gain of each student <g> defined as following formula:

$$< g >= \frac{\%G}{\%Gmax} = \frac{(\%S_f - \%S_i)}{(100 - \%S_i)}$$

Description:

$<g>$ = Normalized gain
G = Actual gain
G_{max} = Maximum gain possible
S_f = Post-test score
S_i = Pretest score

Then, the value of <g> is determined based on criteria below on the table below:

Table 3.10 Criteria of N Gain Improvement

N-Gain (g)	Improvement Criteria
0,00 – 0,29	Low
0,30 – 0,69	Medium
0,70 – 1,00	High

Source : (Hake, 1999:1)

b. Calculate students' average score using equation below :

$$Average\ score = \frac{total\ score\ of\ students\ (\sum x)}{Maximum\ score amount\ of\ students\ (N)}$$

2. Data processing in students creativity

Making a poster is an activity that can ehncance students' creativity. To measure students' creativity in this research is used an observational sheet. The fulfillment of the observational sheet is give the check list mark on the available coloum that representative of appereance of students' creativy based on the indicator from Munandar. The observer will observe students appereance of creativity and guided by observational sheet. Data obtained from observational sheet using percentage, the following formula:

$$P = \frac{R}{Rmax} X100\%$$

Source: (Arikunto, 2010)

Explanation :
P = Response percentage
R = Actual response observed
Rmax = Maximum possible response

3. Data processing in questionnaire

Making a poster is an activity that can enhance students creativity. This treatment measured by questionnaire, there will be 24 questions with 2 optional answers. The fulfillment of the questionnaire is give check list mark on the available coloum that representative of yes and no.

Data obtained from the questionnaire using percentages, the following formula:

$$P = \frac{R}{Rmax} X100\%$$

Source:(Arikunto, 2010)

Explanation :
P = Response percentage
R = Actual response observed
Rmax = Maximum possible response

Percentage of students responses were interpreted using a qualitative interpretation of the questionnaire by (Arikunto, 2010) in this table below:

Table 3.12 Interpretation of Questionnaire

Percentage	Interpretation
0%	Nothing
1% - 25%	A small portion
26% - 49%	Nearly half
50%	Half
51% - 75%	Majority
76% - 99%	In general
100%	Entirety

Source : (Arikunto, 2010)

4. Correlation and regression between students' creativity and concept comprehension using SPSS.

Correlation analysis was perfomed to find the value of r or it called by correlation coeficient. Correlation analysis can be seen by using IBM SPSS 20 for windows. Correlation analysis can be interprete in some category by Arikunto (2010) in this table below:

Table 3.13 Interpretation of Correlation Coefiient

Correlation coeficient	Interpretation
0,0 – 0,29	Very low
0,30 – 0,49	Low
0,50 – 0,69	Medium
0,70 – 0,89	Strong
0,90 – 1,00	Very strong

Source: Arikunto (2010)

After that is calculation of coeficient determination is done by using the formula shown in table below:

$$R = (r^2) \times 100\%$$

R = Coefficient determination
r = correlation

H. Research Procedure

There are three stages of procedure that is conducted in this research, including preparation stage, implementation stage, and analysis and conclusion stage.

1. Preparation stage

In this stage, the activity is focusing on arranging and designing the instruments and lesson plan by considering the curriculum, instruction how to construct poster presentation, and skill achievement.

a. Determining teaching material that will be used in this research.
b. Designing teaching learning.
c. Making research instrument.
d. Instrument Validation.
e. Revising instrument.
f. Preparing research license.
g. Determining research subject.

2. Implementation stage

This stage is the chance for students to implement poster presentation as an Assessment, take some data, and evaluate the data gained using valid instrument.

a. Conducting pretest.
b. Conducting lecturer method.
c. Conducting poster presentation method.
d. Conducting posttest.
e. Giving questionnaire.

3. Analysis and Conclusion stage

This is the final stage of research design. In this stage the observer will analyze and process all the data gained from the implementation. After all data being processed the whole research will be conclude.

I. Scheme of Research

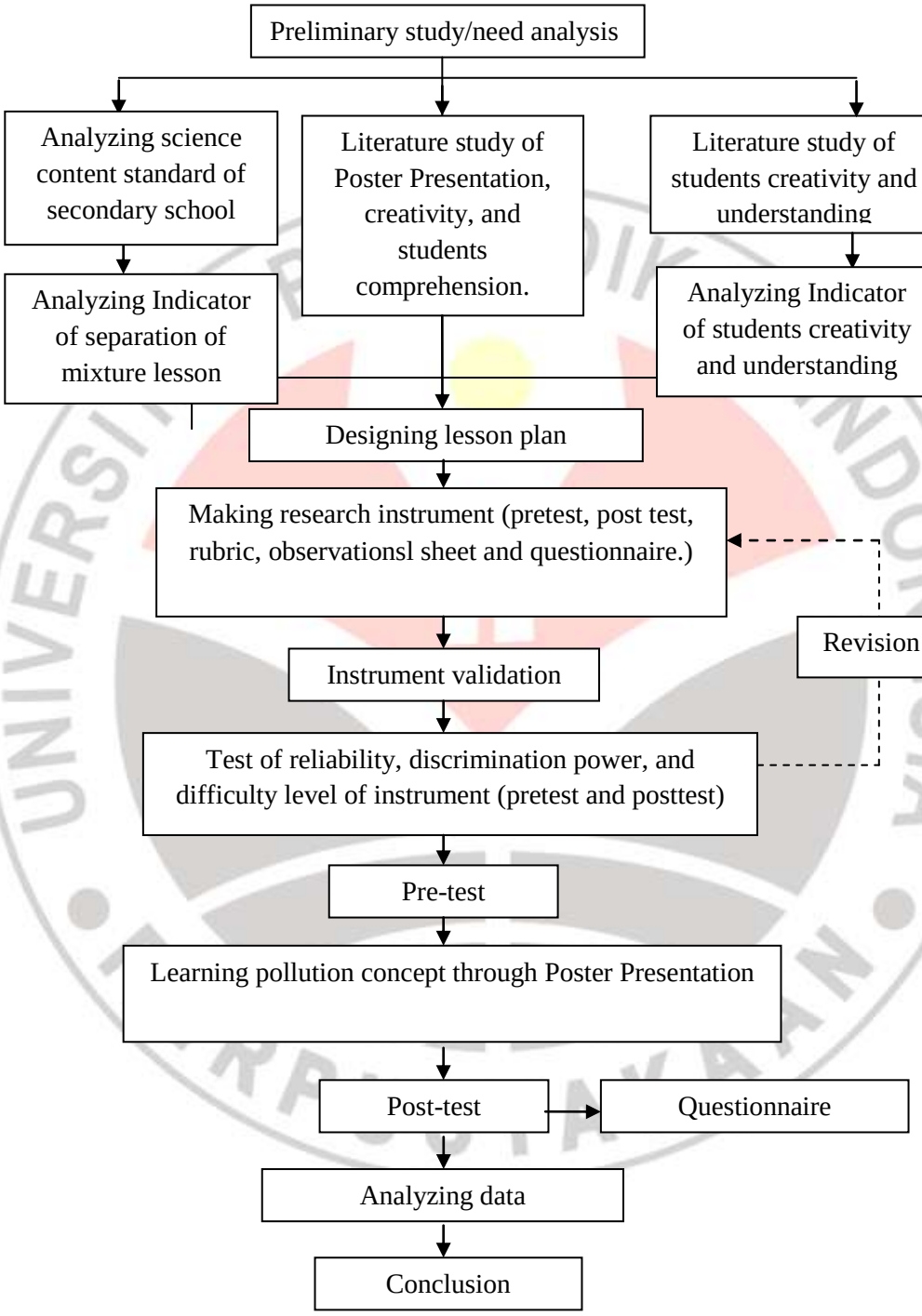

Figure 3.1 Scheme of the Research

J. Design of Poster Presentation

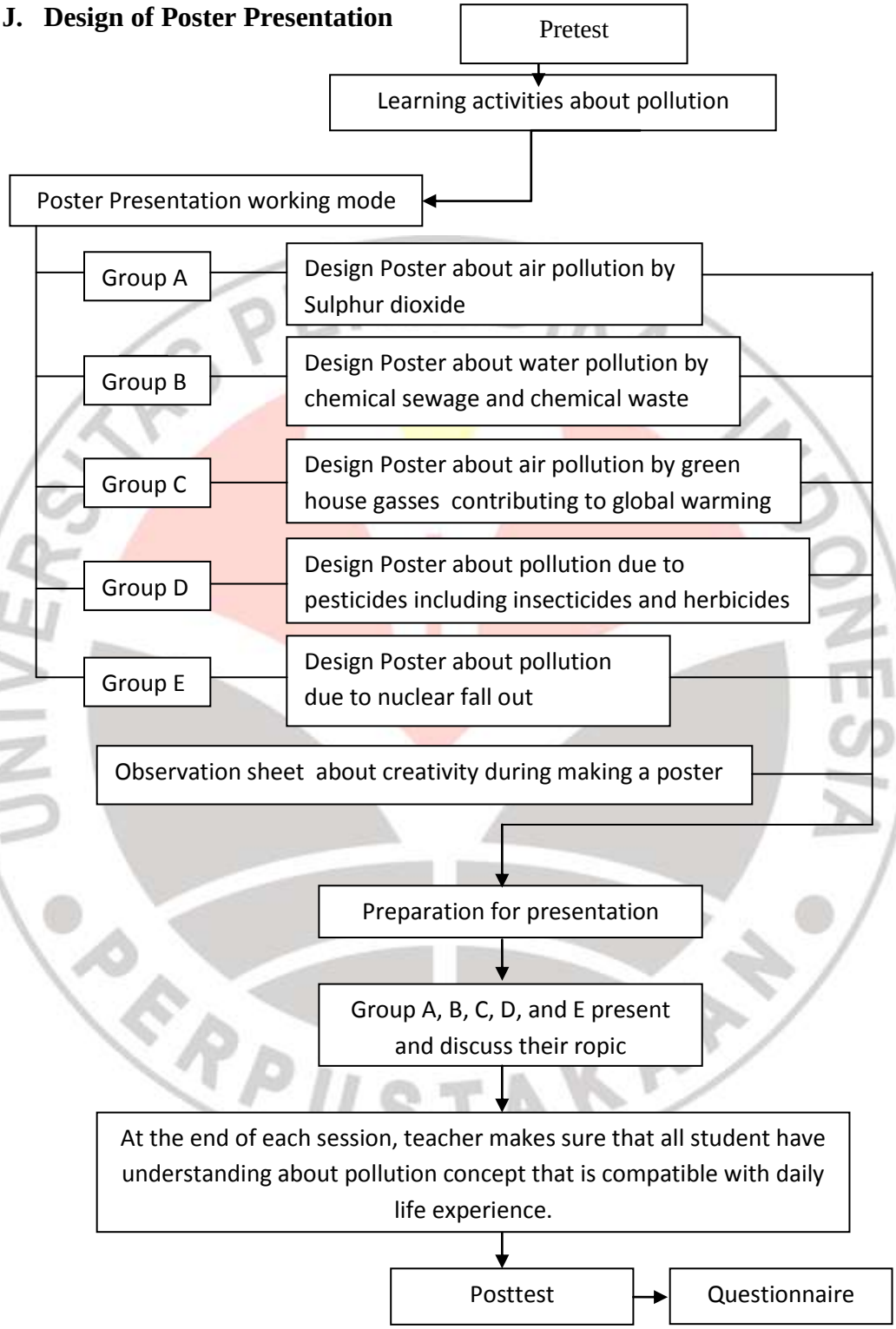

Figure 3.2 Design of Poster Presentation and Assessment