

CHAPTER III

RESEARCH METHODOLOGY

A. Location and Subject

This research is implemented in one of International School in Bandung which applied KTSP in the learning process. The subjects of this research are 15 students in secondary 1(grade 7). The sampling method that is carried out is availability sampling method where the selection of subject with this method is not regarding to the aspect of strata, random or region, but subjects are selected based on its availability. In fact, this form of sampling is the most common type in educational research since probability samples, particularly in experimental studies, are maybe impossible (McMillan and Schumacher, 2001).

B. Research Design

Method that is used in this research is weak-experimental with one class pre-test post-test design. Because the number of classes that given treatment is only one class in the absence of control class. In this design, observations are done before and after treatment given. Observations were conducted before the treatment is given is called the pre-test, whereas the observations made after the treatment given is called the post-test.

Table 3.1

Pre-test and post-test design

Pretest	Treatment	Post test
O_1	X	O_1

(Arikunto,2010)

With:

- | | | |
|----|---|--------------------------------------|
| O1 | = | Pre-test before treatment is given |
| O2 | = | Post-test after treatment is given |
| X | = | Instruction with Contextual Teaching |

C. Research Method

This research uses quantitative method; type is a weak-experimental study. Design used is "One group pretest-posttest design". Knowledge is measured before and after treatment.

D. Scheme of Research

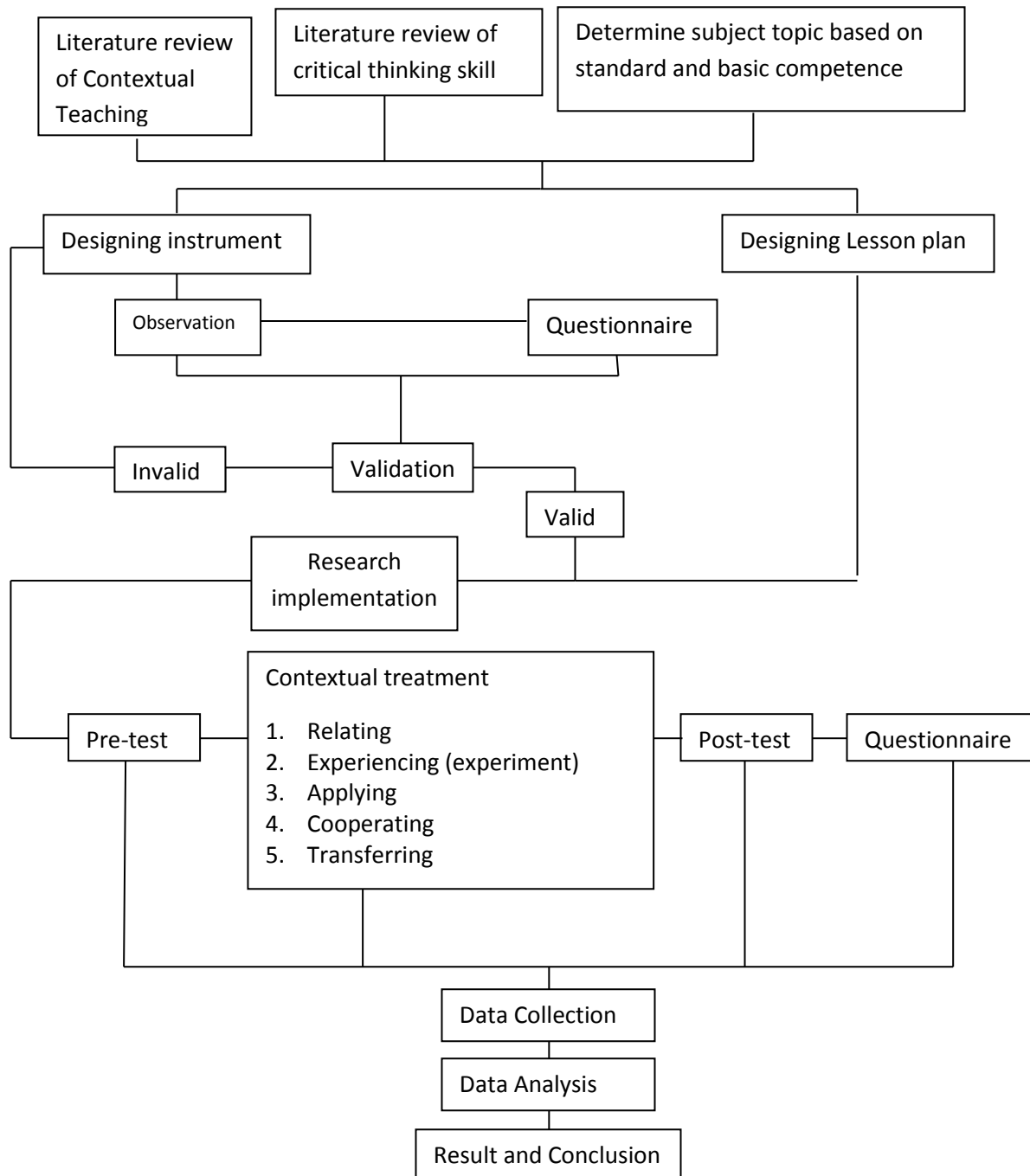


Figure 3.1

Steps of Research Method

E. Operational Definition

1. Contextual Teaching Learning

Contextual Teaching Learning is an educational process that aims to help students see meaning in the academic material they are studying by connecting academic subjects with the context of their personal, social, and cultural circumstances. To achieve this aim, the system encompasses the following eight components: making meaningful connections, doing significant work, self-regulated learning, collaborating, critical and creative thinking, nurturing the individual, reaching high standards, and using authentic assessments (Sitinjak, 2002).

In this research contextual teaching learning is used as an approach which carried out by giving students a problem that relating with surrounding and asking students to make product or opinion to solve the problem.

2. Critical Thinking Skill

Critical thinking skill is critical thinking as a permitted of individual to do these cases: exactly know main issue and supposing plan to find the connection of issues and make inferential and appropriate formula better than announce the data, and then give interpretation a conclusion with data (Pascarella and Terenzini, 2005).

The critical thinking that by using critical criteria include of was identified and formulated criteria of possibility answer, identify conclusion, use procedure, ability to give reason, hypothesis, concept application, and consider of alternative solutions. The data of critical thinking was gained by students' objective test.

3. Changes of Matter Concept Comprehension

The concept comprehension in this research is seen from the average normalized gain value obtained from students' pre-test and post-

test score that will be interpreted into category of improvement according to Hake (1998).

F. Instructional Materials

The instructional materials that will be used in this research includes lesson plan, learning scenario, instructional tools, media and sources. The lesson plan is made according to the Scheme of Work (SOW) of Secondary 1 Science used in school which is derived from the Cambridge Combined Science Syllabus 2012. The learning scenario is then constructed according to the weekly lesson plan that has been made. The learning scenario itself is made to make the planning of the lesson is more specific and detailed.

In an instruction tools, media and sources are essential. By the presence of those three, the instruction can be made more effective in achieving the desired objectives. The instructional tools that are used in the implementation of Contextual Teaching are projector, laptop and board. The Medias that will be used are power point slides and students' worksheet.

G. Instruments

The research instruments which are designed and used in this study are in the form of tests and non-test. Associated with the data needed, the test instrument to be used consists of achievement test, while non-test instrument to be used consists of observation sheet towards students' learning activities that cannot be observed by observation, observation sheets for Contextual Teaching such as:

1. Test

A test is commonly defined as a tool or instrument of measurement that is used to obtain data about a specific trait or characteristic of an individual or group. The test used to determine student learning achievement in this research is objective test in form of multiple choices.

2. Non Test

In this research, non-test instrument that will be used is in form of observation sheets as follow:

a. Observation sheet towards Contextual Teaching implementation

Use the observation sheet to measure implementation of teacher and the activity levels and criticality of students in the learning process as the objects. Observation sheet contains the learning stage which is used to view the activities teacher and students.

b. Questionnaire of students' response toward the implementation of Contextual Teaching Learning.

This instrument will be used to record the students' response toward the implementation of Science Technology Society. Students are required to choose one of five scale (strongly disagree, disagree, undecided, agree and strongly agree) for each statement

H. Instrument Development Process

Analysis of Test Instrument

Before being used in research, test instrument need to be judged and tried first. The result from the trial will then be analyzed based on its validity, reliability, difficulty level, and discriminating power.

a. Validity

According Arikunto (2012), a test is said to be valid if the test measures what it intends to measure. Test has high validity if the results are in accordance with the criteria, in the sense of alignment between Contextual Teaching and criteria. Using a measuring instrument intended to measure a certain aspect that will not give an error. Valid measurement tools that will have a small error rate so that the resulting figures can be trusted as a figure approaching the real situation.

To measure the validity of each test, using the Coefficient of Product Moment Karl Pearson, there is:

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

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
$0,90 \leq r_{xy} \leq 1,00$	Very high validity
$0,70 \leq r_{xy} < 0,90$	High validity
$0,40 \leq r_{xy} < 0,70$	Medium validity
$0,20 \leq r_{xy} < 0,40$	Low validity
$0,00 \leq r_{xy} < 0,20$	Very low validity
$r_{xy} < 0,00$	Invalid

(Arikunto,2010)

Instruments are validating by the expert then trial test measure realibility, difficulty index, and discriminating power was conducted.

b. Reliability

Reliability is the level of consistency of a test, which is the extent to which a test can be trusted to produce a good score, relatively unchanged despite tested in different situations. According Sukadji (2000) reliability of a test is a test to

measure the degree of target consistently measured. Reliability is expressed as a number, usually as a coefficient. High coefficient means high reliability. it can be concluded that reliability is a constancy of a test to measure or observe something that is the object of measurement.

The reliability coefficient can be obtained by using K-R 20 formula in Sugiyono (2008). The value is then interpreted according to its criteria.

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

(Arikunto,2012)

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

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)

c. Difficulty level

A good test item is an item that neither too easy nor too hard. The difficulty level of an item test is the proportion of all students that answer the item correctly. Difficulty index is a value that showing the difficulty of an item. It is between 0, 00 until 1, 00. The item with 0, 00 difficulty index indicate that it is too difficult, meanwhile the item with 1, 00 difficulty index indicate that it is too easy. The difficulty index that obtained is then interpreted according to item test difficulty level criteria.

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

(Arikunto, 2012)

- P = Difficulty index
 B = Amount of student who answer question with the right answer
 JS = Total amount of students who undertakes the test

Table 3.4

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)

d. Discriminating power

Discriminating power of a test item is the ability of an item test to differentiate high achiever students with low achiever students. The value that shows differentiating power is called discrimination index. This index is in between 0.00 until 1.00. The value which is obtain is interpreted according to discriminating power criteria in Arikunto (2012)

$$D = \frac{B_A}{J_A} - \frac{B_B}{J_B} = P_{A-}$$

(Arikunto, 2012)

- D = Discriminating power
 J_A = Amount of high achiever
 J_B = Amount of low achiever
 B_A = Amount of high achiever who answers question with the right answer

- B_B = 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 3.5

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

Item No.	Cognitive domain	Validity		Difficulty level		Discriminating power		Decision
		Value	Category	Value	Category	Value	Category	
1	C2	0.213	Low	0.52	Medium	0.29	Satisfactory	Used
2	C1	0.161	Very low	0.72	Easy	0.57	Good	Used
3	C5	0.017	Very low	0.24	Difficult	-0.14		Not used
4	C1	0.189	Very low	0.52	Medium	0.29	Satisfactory	Used
5	C4	0.599	Satisfactory	0.56	Medium	0.43	Good	Used
6	C2	0.372	Low	0.52	Medium	0.57	Good	Used
7	C4	0.202	Low	0.20	Difficult	0.57	Good	Used
8	C4	0.728	High	0.36	Medium	0.14	Poor	Used

9	C1	0.174	Very low	0.72	Easy	0.57	Good	Used
10	C5	0.293	Low	0.40	Medium	0.29	Satisfactory	Used
11	C2	0.126	Very low	0.36	Medium	0.43	Good	Used
12	C2	0.334	Low	0.52	Medium	0.57	Good	Used
13	C4	0.425	Satisfactory	0.44	Medium	0.57	Good	Used
14	C3	0.653	High	0.60	Medium	0.57	Good	Used
15	C2	0.168	Very low	0.44	Medium	0.29	Satisfactory	Used
16	C3	0.471	Satisfactory	0.56	Medium	0.29	Satisfactory	Used
17	C2	0.222	Low	0.36	Medium	0.14	Poor	Used
18	C1	0.416	Satisfactory	0.40	Medium	0.14	Poor	Used
19	C5	0.010	Very low	0.28	Difficult	-0.14		Not used
20	C4	0.190	Very low	0.36	Medium	0.14	Poor	Used

e. Observation sheet analysis

In this research, there are observation sheets toward students' learning activities, observation sheets toward learning interaction pattern and observations sheets toward the implementation of Contextual Teaching. These instruments are evaluated by supervisor first and judged by lecturer before it is used in the research.

Table 3.7

Observation Sheet to Measure Students' Critical Thinking

Indicator	No	Criteria	Checklist
Definition and classification of problem	1	Identify problem	
	2	Arrange question appropriate with problem	

Assess information related to the problem	1	Find causes of problem	
	2	Assess impact of problem	
	3	Predict the effects of further	
Designing solution based on problem	1	Design solution based on problem	

f. Questionnaire analysis

In this research, the questionnaire will be used to measure students' response toward working as a team, toward games in science and toward reading infusion. The questionnaire is evaluated by supervisor and judged by lecturer before it is used in the research. Questionnaire is given to students to give the checklist sign according of statements.

Table 3.8

Recapitulation of the Questionnaire

Indicator	Question Number
Students opinion towards states of matter concept in physics	1, 2, 3, 4, 5, 6, and 7
Students opinion towards Contextual Teaching	8, 9, 10, 11, 12, 13, 14, and 15
Students opinion towards critical thinking	16, 17, 18, 19, and 20

I. Data Analysis Technique

1. Data analysis on students concept comprehension

Steps to assess the students gain of concept understanding is comparing between pre-test and post-test. Then the scores convert into percentages (%)

$$\text{Students' score}(\%) = \frac{\text{totalrightanswer}}{\text{maximumscore}} \times 100\%$$

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

Gain score of the students was obtained from the differences between pre-test and post-test as the effect of the intervention. This calculation of gain is to determine the students' achievement improvement by using this formula:

$$G = S_f - S_i$$

(Hake, 1998)

G = Gain

S_f = Post-test score

S_i = Pre-test score

The effectiveness Contextual Teaching in increasing students' achievement of concept comprehension in states of matter will be seen from the result of the normalized gain that achieved by students during the learning process as follows:

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

(Hake, 1999)

<g> = Normalized gain

G = Actual gain

G_{max} = Maximum gain possible

S_f = Post-test score
 S_i = Pretest score

Then, the value of $\langle g \rangle$ is determined based on criteria below:

Table 4.10

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

(Hake, 1998)

Analyzed results of the test the level of concept understanding. Data gained from values that obtained by students, which are divided by the number of students in the class in order to obtain the average test which can be formulated:

$$AverageValue = \frac{\sum totalvalueofallstudents}{numberofstudents}$$

Then the final result can be compared between pretest and posttest.

4. The implementation of Contextual Teaching to measure the students' critical thinking

To measure students' critical thinking in this research is used an observational sheet. The fulfillment of the observational sheet is given the check list mark on the available coloum that representative of appereance of students' activity based on the indicator. The observer will observe students appereance of critical and guided by observational sheet. Data obtained from observational sheet using percentage by this formula:

$$P = \frac{R}{Rmax} \times 100\%$$

(Arikunto, 2010)

P = Response percentage

R = Actual response observed
Rmax = Maximum possible response

Table 4.11

Percentage of lesson implementation

Percentage	Category
80% or more	Very Good
60%-79%	Good
40%-59%	Satisfactory
21%-39%	Poor
0%-20%	Very Poor

(Arikunto, 2010)

5. Data processing in questionnaire

Contextual Teaching is an approach to enhance critical of students. This treatment measured by questionnaire, there will be 20 questions with 2 optional answers. The fulfillment of the questionnaire is given check list mark on the available coloum that representative of yes and no.

Data obtained from the questionnaire using percentages by formula below:

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

(Arikunto,2010)

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

Percentage of students responses were interpreted using a qualitative interpretation of the questionnaire below:

Table 4.12

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

(Arikunto, 2010)

4. Correlation a regression between students' critical thinking and concept comprehension.

Correlation analysis was performed to find the value of r or it called by correlation coefficient. Correlation analysis can be seen by using IBM SPSS 20. Correlation analysis can be interpreted in some category in this table below:

Table 4.13

Interpretation of Correlation Coefficient

Correlation coefficient	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

(Arikunto,2010)

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

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

(Arikunto,2010)

R = Coefficient determination
r = correlation

J. Research Procedure

Afif Naofal Pramana, 2014

Contextual Teaching Learning to Improve Students' Critical Thinking Skill and Concept Comprehension in Changes of Matter Topic for Junior High School

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There are three phases of research procedure in this research, such as:

1. Preparation

In this phase is the first what the researcher will do. This is also important because it will make the purpose of the paper. Researcher may focus on problem, searching information and then design the new method that researcher want to improve weakness from the problem. This is the procedure determine by steps:

- 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

This implementation phase is the action of design that researcher did. Design given to students such as solves of the problem. So there is a treatment in the experimental class such as construct the students' concept to make their respect to the real life of that problem (actually for all the subjects) which about states of matter. In the class must do pre-test and then in the end post-test. In this stage researcher will analyse the differences of pre-test and post-test.

3. Analysis

In this phase, this is what researcher waiting for. After doing all of activities and got the data, they will be analysed using statistical analysis. Analysis result can be compared so that the conclusion can be obtained from the result of this study.

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