

CHAPTER III

RESEARCH METHODOLOGY

A. Research Method

The research method is descriptive as the method to collect and describe data systematically, factual, and accurate about the characteristic of specific population from literature and in the field (McMillan and Schumacher, 2001). In this method, the research focus to develop inch's critical thinking multiple choice question and the profile of its application from 8th grade students in representative junior high school on sense topic.

B. Research Location and Period

The location of this research is in three private junior high school to develop the multiple choice test. The school named as A, B, and C. These school are private school which use 2013 curriculum or other curriculum such as Cambridge. These school is appropriate for this research because some of it used English as the main language and or has a good prospect of English.

C. Population and Sample

Population of this research are students' that belongs to 8th grade students private junior high school in Bandung. The sample is drawn from 20 random students of the 8th grades from three different private junior high schools.

Sampling are selected by purposive sampling technique according to Creswell (2003). The consideration is because the researcher choose samples based on the requirement of the good prospect in english and located around Bandung, due to limited time and resources. The sample chosen from three private Junior High school with 8th grade students as representative. A purposive sampling is selection of sites or participants that will best help the researcher understand the problem and the research question, they must be willing to reflect on and share this knowledge (Creswell, 2003).

Purposive sampling represents or also known as judgmental, selective or subjective sampling. It relies on the judgement of the researcher when

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it comes to selecting the units (e.g., people, cases/organisations, events, pieces of data, in this case school) that are to be studied. Total sampling will be 20 students from three schools of 8th grade students.

D. Operational Definition

In order to avoid misconception about this research, thus some operational definitions are explain in this research. The terminologies is described as follows :

1. Critical Thinking which reffered in this research is judicious reasoning about situation, phenomenon, question or problem and therefore what to do from the information given. Critical thinking in this research was plan to measured using test in multiple choice question type based on Inch with four options. Critical thinking used in this research is according to Inch et al. (2006) that consist of contain eight elements of critical thinking.
2. Multiple choice question which is reffered in this research is a set of critical thinking's multiple choice test item that fullfil eight elements of critical thinking. The elements are : purpose, question at issue, assumptions, point of view, information, concepts, interpretation and inference, and implication and concequences. The information and question given is based on the elements and this critical thinking measured by four option of multiple choice question.
3. Sense Topic that measured by the multiple choice test is based on the content that has been learn since primary up to secondary grade 8th using Cambridge and 2013 Curriculum. The characteristic of question which can measure student's critical thinking is the one that explore students' ability by the information given. This research used multiple choice that arrange based on eight elements and sub elements of critical thinking Inch et al (2006) and have validity and reliability with interpretation more than "prosperous". The question and information given related to humans and their surrounding and the aspect based on Science Curriculum for secondary school. The limitation of the content about human sensory organs that are often called the five senses, because it consists of the five senses, namely: senses of sight (eyes), sense of hearing (ears), sense of

smell / olfactory (nasal), sense of taste (tongue), the sense of touch (skin). The content of the questions is include in 5 senses with spesific aspect about: the structure, the function of each part, the disease, symptomps, and how to treat. All of it is something that students will be familiar with, because of they see it and use it in their daily life.

E. Research instrument

The research instrument that used in this research encompasses several instruments as follows:

1. Multiple choice test item is used as an item with four option based on eight indicator of inch's critical thinking to measure the critical thinking of students on sense concept.
2. Content validity for expert and questionnaire to identify student's impression on the instrument test.

The design of research instrument can be seen in Table 3.1

Table 3.1 Design of Research Instrument

Target	Methods	Instrument	Subject	Time
Development of multiple choice test	Expert judgement	Rating scale content validity	Experts and teacher	Once
	Questionnaire	Anecdotal note	Students	Once
Profile of critical thinking	Multiple choice respond test	Critical thinking test	Students 8th grade	Once (1 x 45 minute)

a. Design of Research Instrument

Multiple choice test item

The multiple choice test item used to measure critical thinking of students in learning senses concept with spesific aspect about: the structure, the function of each part, the disease, symptomps, and how to treat. The item contain eight elements of critical thinking as a related function. The elements are : purpose, question at issue, assumptions, point of view, information, concepts, interpretation and inference, and implication and concequences. After conducting limited test, measurement

test item consist of 20 out of 30 test items in the form of multiple choices. This instrument test has been analyzed using ANATES 4.0.9 statistical and IBM SPSS Statistics 20 software. The blueprint of multiple choice question before conducting instrument analysis is shown in table below.

Table 3.2 Distribution of Test Items before Validation

No	Critical Thinking Indicator	Topic's Number (total)						Σ total number	%
		Eyes	Ears	Nose	Tongue	Skin	All senses		
1	Purpose a. Clearly stated the purpose b. Distinguish primary purpose c. Stated purpose on target d. Stating a significant and realistic purposes.	1,7,9,11 (4)	4,5 (2)	3,6,10 (3)		8 (1)	2 (1)	11	36.7
2	Question at issue a. Stating the problem b. Asking the question in several way c. Stating sub question d. Identifying the problem	13,14 (2)		15 (1)		12 (1)		4	13.3
3	Assumptions a. Identifying assumption b. Considering that assumption can	18 (1)			17 (1)	16 (1)		3	10
4	Point of view a. Identify point of view b. Identify the strength and weakness	20 (1)	19 (1)					2	6.7
5	Information a. Expressed support based on	22,23 (2)	21 (1)					3	10

No	Critical Thinking Indicator	Topic's Number (total)						Σ total number	%
		Eyes	Ears	Nose	Tongue	Skin	All senses		
	data b. Looking for information that opposed d. Gather information								
6	Concepts a. Identify concept and clearly stated b. Stating alternative concept c. Using the concept	24, 25 (2)			26 (1)			3	10
7	Interpretation and inference a. Infer based on evidence c. Identify assumption can lead to conclusion	28 (1)			27 (1)			2	6.7
8	Implication and Consequences a. Finding the implication and consequences that follow c. Consider all possible consequences	30 (1)				29 (1)		2	6.7
Total number		14	4	4	3	4	1	30	-
Percentage (%)		46.7	13.3	13.3	10	13.3	3	-	100

The test items (critical thinking measurement) are analyzed in the process of judgment with some expert and after that it tested to the students (limited test process). The result of the test items after tested will be used, revised or deleted. After conducting instrument analysis, new result of instrument test is gained and used as research instrument. From 30 questions that have been judged 13 questions are used and 7 revised.

After tested to the students, total 20 question is accepted as measurement test instrument of critical thinking. The test items after instrument analyses are shown in the table below.

Table 3.3 Distribution of Test Items after Validation

No	Critical Thinking Indicator	Topic's Number (total)					Σ total number	%	
		Eyes	Ears	Nose	Tongue	Skin			All senses
1	Purpose a. Clearly stated the purpose b. Distinguish primary purpose c. Stated purpose on target d. Stating a significant and realistic purposes.		2 (1)			3 (1)	1 (1)	3	15
2	Question at issue a. Stating the problem b. Asking the question in several way c. Stating sub question d. Identifying the problem	5 (1)		6 (1)		4 (1)		3	15
3	Assumptions a. Identifying assumption b. Considering that assumption can				8 (1)	7 (1)		2	10
4	Point of view a. Identify point of view b. Identify the strength and weakness	12 (1)	11 (1)					2	10
5	Information a. Expressed support based on data b. Looking for information that opposed d. Gather information	16 (1)		19 (1)				2	10
6	Concepts a. Identify concept and	9, 13			14 (1)			3	15

No	Critical Thinking Indicator	Topic's Number (total)					Σ total number	%	
		Eyes	Ears	Nose	Tongue	Skin			All senses
	clearly stated b. Stating alternative concept c. Using the concept	(2)							
7	Interpretation and inference b. Infe based on evidence c. Identify assumption can lead to conclusion	10 (1)		20 (1)		17 (1)	3	15	
8	Implication and Consequences b. Finding the implication and consequences that follow c. Consider all possible consequences	15 (1)				18 (1)	2	10	
Total		7	2	3	2	5	1	20	-
Percentage (%)		35	10	15	10	25	5	-	100

Content Validity and Questionnaire

The result of validity of judgments in this research using formulation of CVR (Content Validity Ratio). Whenever experts make judgments, the question properly arises as to the validity of their judgments. Students' impression instruments are provided in the form of *yes*, *average*, *no* and short answer *question* which given to student to know about how is the impression of student toward the critical thinking item measurement test. The questionnaire was adapted based on basic concept of questionnaire by Campinas (2006).

QUESTIONNAIRE OF TEST INSTRUMENT

Terima kasih adik-adik telah mengisi soal :)
 susah atau tidak? :)
 hasilnya akan secepatnya diumumkan :)
 berikut ada pertanyaan terakhir untuk kesan adik-adik terhadap soalnya :)

Bagaimana pendapatmu tentang soal yang tadi dikerjakan?

Bagaimana pendapatmu soal bentuk soal, dan gambar-gambar di dalamnya? apakah bagus dan membantu dalam pengerjaan?

Apakah testnya menarik?

Ya
 Tidak
 Biasa saja

Apakah tesnya membuat kalian semakin berpikir tentang alat indera yang ada pada manusia?

ya
 tidak
 biasa saja

Apakah terdapat soal atau kata yang tidak dimengerti? yang menimbulkan kebingungan? atau tidak sesuai dengan tujuan soal? (Apabila ada, tuliskan saja nomer soal dan saran adik-adik)

Figure 3.1 Questionnaire

F. Instrument Analysis

The instruments which use to measure the critical thinking is a multiple choice test instrument, which includes to the problem of 8 indicators and total representative sub indicators from Inch. This instrument is in the form of item test, so that the analysis of instrument will be covers validity, discriminating power, and reliability.

1. Validity

This validity test will be judged by the expert to check wheather the test instrument is valid to test critical thinking on sense concept in secondary students.

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

Where,

r_{xy} = items correlation coefficient.

$\sum X$ = items scores

N = amount of subject

(Minium *et al.*, 1993)

The item test was checked using IBM SPSS Statistics 20, ANATES 4.0.9 and CVR (Content Validity Ratio). To interpretate about the validity, the author used reference as follow:

Table 3.4 Interpretation r value (Correlation)

The amount of r value	Interpretation
0,80-1,00	Very high
0,60-0,79	High
0,40-0,59	Prosperous
0,20-0,39	Low
0,00-0,19	Very low (not correlate)

(Jacobs and Chase, 1992)

2. Discriminating power

Discrimination power analysis is use determine the question is a good or bad quality. Thus the questions or problem which has a good discrimination power will be have a higher result if it given to the high achiever student than if it given to low achiever student (Arikunto, 2010). The analysis can be done conventional or statistically by using ANATES vers 4.0.9. The formula which can be used to analyze discriminating power as follows.

$$Dp = \frac{BA}{JA} - \frac{BB}{JB} = P_A - P_B$$

Where,

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

3. Reliability

Reliability shows that one instrument can be used and reliable to be the tools. Reliability deals with the consistency of measurements, substantial reliability in all test is a goal that says test are measuring in a consistent, not haphazard, and manner (Jacob & Chase, 1992). The analysis of reability can be done by conventional or statistical using ANATES vers 4.0.9 and IBM SPSS Statistic 20 software. The formula to calculate reability is using Spearman-Brown, as follows:

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

Where,

r_{11} = Instrument reliability

n =Amount of question

$\sum \sigma_i^2$ = Amount of Varian score in each item

σ_i^2 = Varian total

The interpretation of reability value was refer as table below:

Table 3.5 Interpretation Reliability Coefficient

Reability Coefficient	Interpretation
0,80-1,00	Very high
0,60-0,79	High
0,40-0,59	Prosperous
0,20-0,39	Low
0,00-0,19	Very low

(Jacobs and Chase, 1992)

4. Difficulty Level

The level of difficulties of question is important to know the portion of students that answering right from all. The value of difficulty level can be determined with formula :

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

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JS

(Kaplan and Saccuzzo, 2005)

Where,

P= difficulty index

B= the number of students answering right

JS= total number of students

5. Average score

The average score count with the total number divided total of question with categorization based on (Arikunto, 2010). If the interval 81-100% =Very High; 61-80%= High; 41-60%= Prosperous; 21-40%= low; 0-20%= very low.

G. Research Procedure

In order to make this research arranged systematically, there are three stages of procedure that had been conducted in this research, including preparation stage, implementation stage, and analysis and conclusion stage.

1. Preparation stage

In this stage, author focused on all of the preparation to conduct and support the research. Here are the steps of preparation stage:

- a. Formulate problem to be investigated
- b. Conduct literature review of critical thinking, science curriculum, and senses concept
- c. Revise of research proposal after having suggestions and critics from lecturers.
- d. Report research instrument.
- e. Ask for expert judgement to lecturer, teacher and experts.
- f. Revise instrument after having validation.
- g. Do limited test
- h. Revise the instrument
- i. Prepare research license.
- j. Determine research subject.

2. Implementation stage

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This is the process of data collecting in the school, with the steps as follows:

- a. Determine the profiling school and student to do limited test
- b. Conduct large test, this step was to give the multiple choice question on sense concept with 4 options.
- c. Process the result
- d. Revise or add question
- e. Conduct profiling measurement critical thinking test to 3 choosen school
- f. Give questionnaire to know the student's response towards the question book of critical thinking
- g. Do teacher's interview to know the feedback

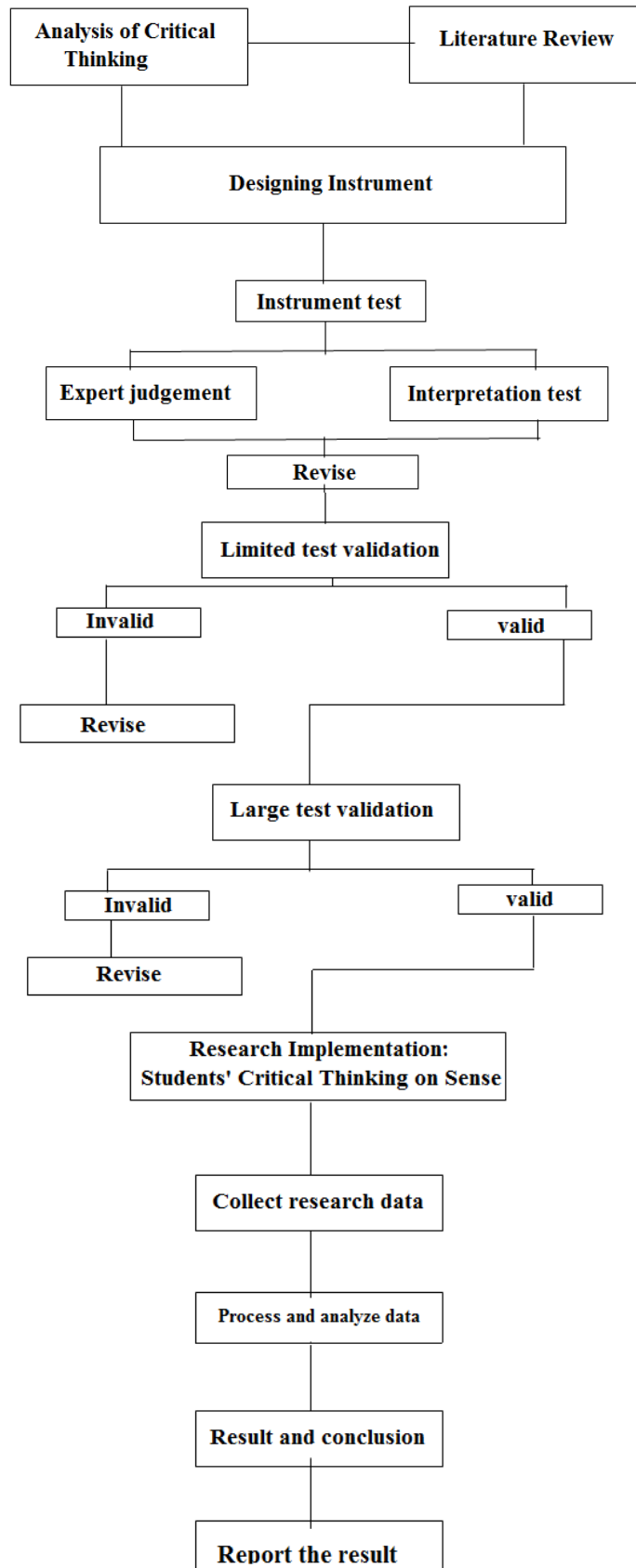
3. Analysis and Conclusion Stages

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

- a. Collecting data
- b. Analyze the result of the research, input the data to the software
- c. Discuss and concluded for the data analysis result
- d. Arrange the report of the research

The research design that used in this research is sample class with limited test and after that conduct in large test. Both of representative class come from secondary private school. Here is the study design which illustrated in Figure 3.2.

H. Research Plot



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