RESEARCH METHOD

A. Research Method

In every research, we always need a research method. The using of the method depends on research questions and aims of the research. It means that research method is very important in collecting and analysing data.

In this study, author use statistical path analysis to get relationship between all variables. Path analysis is the statistical technique used to examine causal relationship between three or more variables. Borg and Gall (1989: 613) explain that path analysis is a method for testing the validity of a theory about causal relationships between three or more variables that have been studied using a correlational research design. Path analysis is used mainly in the attempt to understand comparative strength of direct and indirect relationships among a set of variables.

There are some advantages of path analysis which also become the reasons why it is used in this study, they are:

1. Able to test overall models and individual parameters.

2. Able to model (multiple) mediator variables (processes).

Despite path analysis has many advantages, it also has weakness. The weakness of path analysis are:

1. Cannot reduce the impact of measurement error.

2. Only have observed variables.

In this study, students perception toward mathematics is the first variable,, motivation is the second variable, mathematics anxiety is the third variable, and the fourth variable is achievement in mathematics. The first, second, and the third variables are independent variables, while the fourth variable is dependent variable.

Beside path analysis, the author is also doing the interview for the research. Type of interview that will be conducted is standardized interview.

B. Research Design

Diagram 3.1
Structural Correlation of X_1, X_2, X_3, and Y
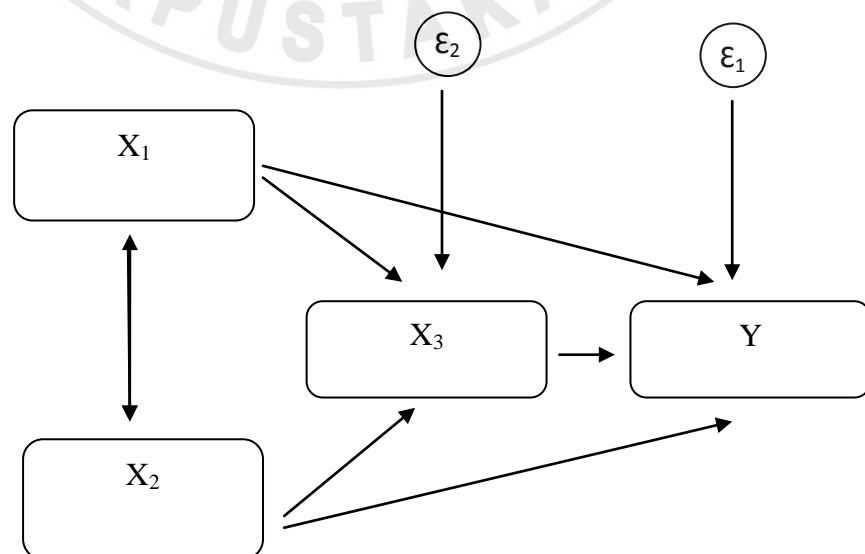
Source: Riduwan and Kuncoro, 2011: 129

As an effort to avoid misunderstanding in interpreting this research, so it is necessary to explain operational definition of each variable as follows:

X_1 = students perception toward mathematics

X_2 = students mathematics anxiety level

X_3 = students motivation of learning mathematics

Y = students achievement

C. Population and Sample

Sampling technique is very important in correlational study. The sample for a correlational study should be selected carefully, and if possible, randomly. The minimum acceptable sample size for a correlational study is considered by most researchers to be no less than 30.

Population in this study is international school and RSBI school students in Bandung. In international school of course there are some students from other countries, for example Korea and Japan, but there are still more Indonesian students. All of these students are fluent speaking english. Students of RSBI school are all Indonesian, but better in speaking english than other public school students because they regularly use english in teaching and learning process in class. The samples are 7th and 8th grade students of Pribadi Bilingual School and SMPN 2 Cileunyi.

D. Research Instrument

The data required and appropriate with the purpose of this study is students responses of written statements (questionnaire) and interview about motivation, perception, and anxiety. Another required data is students achievement in mathematics as the result of their learning process for one semester. The data required and appropriate with the purpose of this study is students responses of written statements (questionnaire) and interview about motivation, perception, and anxiety. Another required data is students achievement in mathematics as the result of their learning process for one semester.

1. Motivation questionnaire

Some aspects become the indicators to develop motivation questionnaire. These are some measured aspects in motivation questionnaire that will be use to get data.

Table 3.1
MEASUREMENT ASPECTS OF MOTIVATION QUESTIONNAIRE

No	Measured aspect	Statement list number	Number of statements
1	Passion and willing to be success in learning.	7, 21, 25	3
2	Feeling of joy in many ways.	1, 3, 5, 6, dan 30	5
3	A push and a need to learn new knowledge.	8, 13, 22, dan 37	4

4	A hope and goal to achieve in learning.	11, 15, 33, 36, dan 40	5
5	Appreciation in learning process.	9, 26, dan 27	3
6	Activities that showed interest to learn.	2, 14, 23, dan 39	4
7	Feeling of joy with environment and learning conditions.	4 dan 31	2
8	A push to avoid things that obstruct achievement.	12, 32, dan 34	3
9	Spirit to compete with others.	10, 19, 28, 29, dan 35	5
10	Seriousness, efforts, and hardwork in learning.	16, 17, 18, 20, 24, dan 38	6
	Amount of all statements	**40**	

2. Perception questionnaire

Some factors that become indicators for making perception questionnaire are as follows:

Table 3.2
MEASUREMENTS ASPECTS OF PERCEPTION QUESTIONNAIRE

No	Aspects	Sub Aspect	Statement list number
1	Functional	Needs	7, 10, 11, 15
		Past experiments	9
		Attention	1, 2, 13
		Emotion	6, 17, 23, 26
		Hope	8, 14, 19
2	Structural	Intensity	3, 22, 25
		Changes	16, 18, 24

		Repeatation	12
		Contra stimulus	5
3	Cultural	Cultur	4, 20, 21

3. Anxiety questionnaire

For the anxiety questionnaire the author uses Fennema-Sherman Mathematics Anxiety Scale. This scale is commonly used by many researcher who studied about mathematics anxiety. The Fennema-Sherman Mathematics Anxiety Scale (MAS) was specifically designed for secondary school students and had a high reliability in the pilot sample. It was thus decided that Fennema- Sherman Mathematics Anxiety Scale (MAS) would be the instrument adopted for assessing mathematics anxiety in the study design. For the purpose of the study, the scores were modified to range 1 (strongly agree) to 5 (strongly disagree) instead of the other way. Half the items were positively worded, while the other half was negatively worded. Scoring of negatively worded items was reversed so that a higher score would indicate higher mathematics anxiety. A high total score in the scale would reflect a high level of reported mathematics anxiety whereas a low total score would mean a low level of reported mathematics anxiety. The Fennema-Sherman Mathematics Anxiety Scale (MAS) comprises 12 items under four categories: Thinking about Maths (4 items), Taking Maths Test (3 items), Learning Maths Lesson (2 items), and Solving Maths Problem (3 Items).

4. Interview questions

There are two kinds of interview for a research, exploratory interviews and standardized interviews. In this research, the author uses standardized interview because the purpose of this interview is appropriate with this research.

The purpose of standardized interview in the typical large-scale survey is essentially that of data collection. The various research objectives and hypotheses have long since been formulated; the interview schedule and the wording of questions have been exhaustively tried out in pilot work; the sample has been drawn; the field force recruited (possibly); and arrangements made for coping with refusals and otherwise unobtainable respondents, with fieldwork checks and the return of the completed schedules for data processing. (Oppeinheim, 1992: 66).

The questions for interviews are made as possible as it can be to lead the answer to some causal of students to have high motivation, low motivation, good perception, bad perception, high anxiety, and low anxiety toward mathematics.

E. Instruments Validity and Reliability

This research use three kind of instruments, motivation questionnaire, perception questionnaire, and anxiety questionnaire. The author adopted motivation questionnaire from disertation of Zaenal Arifin (2008), so it is already tested and valid. The instrument has been tested with Q-Cochran statistic test to get how valid the instrument is. The result of the test are:

Table 3.3
MOTIVATION QUESTIONNAIRE'S VALIDITY TEST RESULT

N	4
Cochran's Q	1,875[a]
Df	39

Asymp. Sig.	0,599

From the table above, Asymp. Sig = 0,599. It means that the probability value is 0,599 and it is more than 0,05. So this can be concluded that significance degree $\alpha = 5\%$ H_0 is accepted. It means each statement in motivation instrument is valid and worth to use as an instrument for the research. Otherwise, the reliability is r coefficience = 0,895. According to this value, this can be concluded that the reliability level of the questionnaire is very high. It means that this motivation questionnaire is able to be used as an instrument for the research.

The instruments for students perception toward mathematics made by some aspects of perception.in order to get instrument validity, the researcher do some steps as follows:

1. Giving score to each statements suitable with respondent's answer.
2. Calculate correlation value of each item by using Pearson Product Moment formula:

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

Explanation:

r_{xy} = correlation coefficient between variable X and variable

N = amount of sample

$\sum X$ = amount of variable of certain items

$\sum Y$ = amount of all variables

$\sum XY$ = amount of items of variable and amount of all variables

Then it is tested whether the validity coefficient is signifficant on certain significant degree using this formula:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

T value compared to critical table value in the table for a certain significance degree, for example $\alpha = 0{,}05$ with degree of freedom $= n\text{-}2$. If $t_{count} > t_{table}$ then the test is valid.

Reliability instrument test is intended to see the accuracy of the instrument for the research. The category for reliability level is as follows:

$0{,}0 - 0{,}199$ = very low

$0{,}20 - 0{,}399$ = low

$0{,}40 - 0{,}599$ = medium

$0{,}60 - 0{,}799$ = strong

$0{,}80 - 1{,}00$ = very strong

Reliability test is using Alpha formula as follows:

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

Explanation:

r_{11} = reliability

$\sum \sigma_i^2$ = amount of score variance of each item

σ_t^2 = total variance

The instrument for anxiety measurement is adopted from The Fennema-Sherman Math Anxiety Scale (Fennema and Sherman, 1978). It is commonly use

by many researcher around the world who studied about mathematics anxiety, so this instrument is already valid and reliable.

F. Data Processing Procedures

1. Arranging research proposal

Arranging proposal is an initial activity in this research activity. The outline of this proposal contains the substance of issues, methodologies, and research data processing plans. Proposal that have been prepared then being criticized and advised in a seminar in order to get input from lecturers and the other seminar participants.

2. Arranging instrument

Arranging instruments is doing after research proposal have been accepted by the supervisors and lecturers in seminar. The instruments are motivation questionnaire, perception questionnaire, and anxiety questionnaire. Before the author write the statements of questionnaire, the author make indicators of each variable that become reference or hints to arrange statements of questionnaires. After that the questionnaire is being consulted and discussed with supervisors and lecturer from psychology department.

3. Data collecting

Data collecting for this study were conducted on 8th of March 2012 in Pribadi Bilingual School and on 22nd of March 2012 in SMP Negeri 2 Cileunyi. The activities in collecting data is as follows:

a. Explanation about purposes of questionnaires.

b. Distributing the questionnaires.

c. Explanations about instruction to answer the questionnaires.

d. Collecting questionnaires.

e. Closing.

4. Analysing Data

The next procedure is processing and analysing data with path analysis through statistical procedures using SPSS program. After all data has been analyzed, then the author tried to find conclusion from them.