# CHAPTER III
# RESEARCH METHODOLOGY

## 3.1 Research Time and Location

This research was conducted in SMA N 1 Rantau Selatan XI even semester of academic year 2017/2018 on salt hydrolysis material. This research was conducted in January 2018 - July 2018 covering stages of preparation of research proposals, stages of implementation and preparation of research reports.

## 3.2 Research Population and Sample

### 3.2.1 Population of Research

The population of this study is the students of SMA N 1 Rantau Selatan in the even semester of the academic year 2017/2018 with the curriculum 2013. Amount of IPA student in grade XI are 182 students with 5 classes.

### 3.2.2 Sample of Research

The sample is taken using purposive sampling, the students to be studied as a sample in this study were the students of XI IPA on the even semester of the school year of 2017/2018 in SMA N 1 Rantau Selatan.

In this research, 2 sample classes were determined through suggestions provided by teachers with almost homogeneous intelligence abilities. Each class is taught with different treatment. One class (called experiment class I) is taught with Discovery Learning model with an chemistry learning material integrated spiritual value. One next class (called experiment class II) is taught with a Discovery Learning model with a student handbook.

## 3.3 Research Variable

### 3.3.1 The Independent Variable

The independent variable of this research is the implementation of chemistry learning material integrated of spiritual value with Discovery learning model and student handbook with Discovery learning model.

### 3.3.2 Dependent Variable

The dependent variable of the study was chemistry student learning outcomes and increasing spiritual value.

### 3.3.3 Controlled Variables

Which is control variables of this research are:

The control variables in this research are:

- Time spent in teaching and learning
- Module Development of Islamic values in the subject of salt hydrolysis
- Student Handbook
- Pre-test and post-test issues

## 3.4 Types and Research Design

The type of research to be used in this study is the type of quasi-experiment. This research involves a different treatment that is between class groups that are taught by using the learning model of Discovery Learning with chemistry learning material integrated of spiritual values and teaching by using the learning model of Discovery Learning with students' handbooks. The research design can be seen in Table 3.1.

Table 3.1 Research Design

| **Group** | **Initial Test** | **Treatment** | **Final Test** |
|---|---|---|---|
| Experiment 1 | $T_1$ | $X_1$ | $T_1$ |
| Experiment 2 | $T_2$ | $X_2$ | $T_2$ |

Where: $T_1$ = Initial test (Pre-test)

$T_2$ = End test (Post-test)

$X_1$ = Learning using teachings integrated spiritual values

$X_2$ = Learning using student teaching materials

### 3.5 Research Procedure

In order to achieve the established research objectives, it is necessary to develop a systematic procedure. The steps taken are as follows:

#### 3.5.1 Research Preparation

Before doing this research, the writer will do some preparation to do research in the form of observation to the school where the research, identification of chemicals in accordance with curriculum 2013, prepare lesson plan according to an indicator which will be achieved by the student and prepare the necessary instruments.

#### 3.5.2 Implementation Phase

a. Determine the sample class of the existing population to become experimental class I and experiment class II.

b. Provides pretest test in both classes.

c. Conducting the learning process on the subject of salt hydrolysis, in the second class that is in the experimental class I using the learning model of Discovery Learning with teaching materials integrated spiritual values that have been developed and the experimental class II is taught using the discovery learning model with the textbook of students' handbook.

Observe students about spiritual attitudes according to indicators measured and assessed based on the scale of the assessment determined at the time of the learning takes place.

d. After conducting the learning process, posttest data collection was conducted in each class to test the students' final ability after being given treatment

e. Processing data obtained both from learning data and observation sheet.

f. Conducting analysis of data that has been obtained from the research then make a conclusion.

The above procedure can be illustrated through the scheme of Figure 3.1 below:

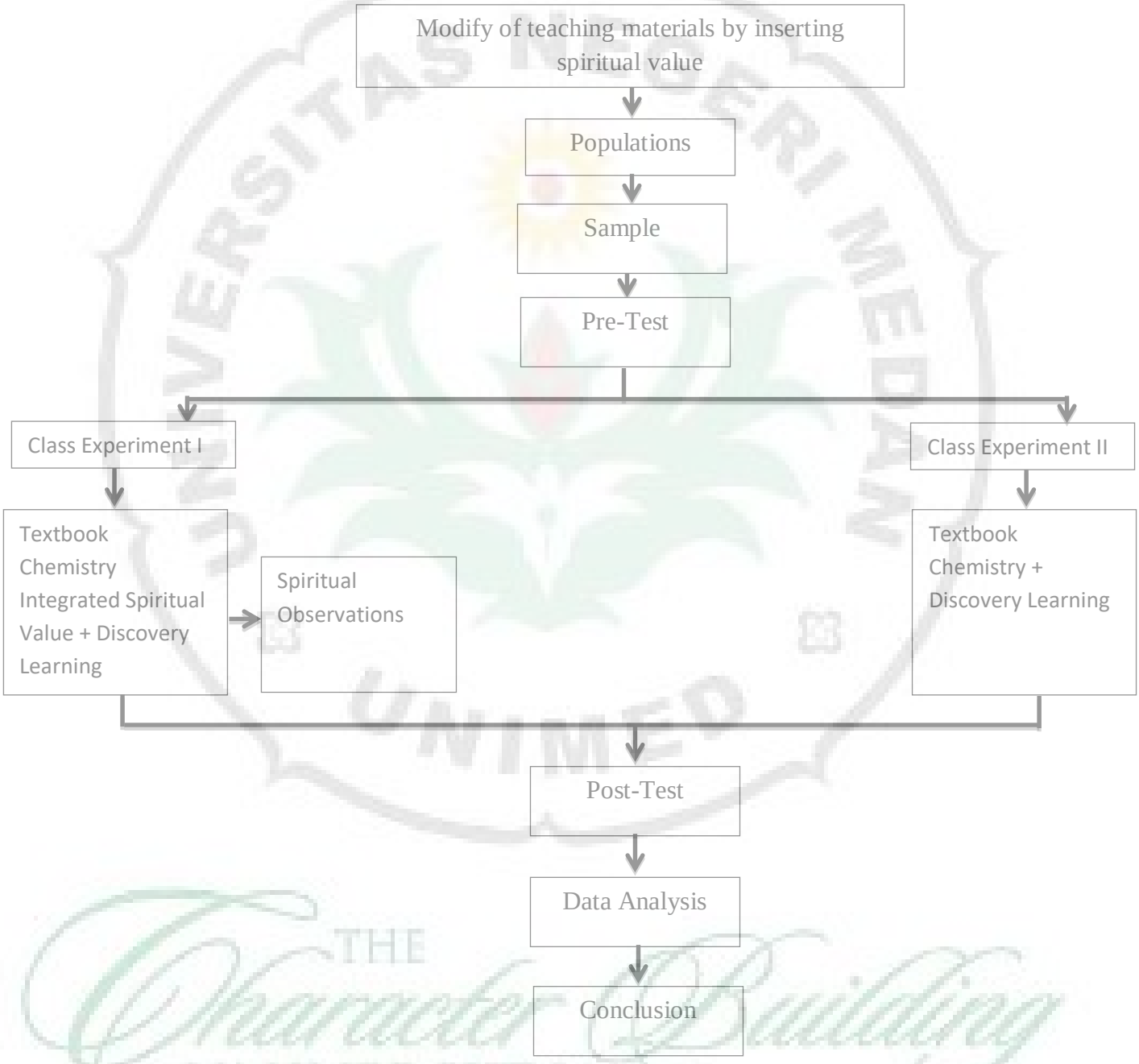


Figure 3.1 Scheme of Research Procedure

### 3.6 Research Instruments

The following will explain the instruments used in this panel it is as follows :

#### 3.6.1 Observation

This instrument is based on indicators to measure spiritual attitudes using the Likert scale. This observation sheet is used when the learning process is underway by the observer. The observed part of this spiritual attitude based on indicators amounted to 3 indicators for each spiritual attitude with 4 descriptors in each indicator. The indicator of spiritual attitudes is taken from the ministry of religion. Prior to use, the instrument has been validated by an expert validated. (M, Amirin, 2010)

#### 3.6.2 Questionnaire

The non-test instrument in the form of a questionnaire serves to analyze the developed spiritual attitudes in students after the learning process. Questionnaires in the learning process used to obtain data relating to the faith and devotion to God Almighty, in accordance with their respective religions and beliefs. Questionnaires in this study were prepared based on indicators using a Likert scale. A questionnaire was made as many as 12 questions. The indicator of spiritual attitudes is taken from the ministry of religion. Prior to use, the instrument has been validated by an expert validator. (M, Amirin, 2010).

#### 3.6.3 Objective Test

The instrument used to measure student learning outcomes is an objective test in the form of multiple choices with 5 choices of answers. This objective test is compiled into 40 questions that will be analyzed first before being used in the research and then the pre-test/post-test question will be obtained as an instrument.

The objective test sheet is prepared based on the indicators contained in the salt hydrolysis material. This objective test is given at the time of pretest and posttest. To know the validity, reliability, level of difficulty of problems, and

distinguishing power is done instrument test. Test this instrument is done before the implementation of data retrieval.

### 3.6.4 Validity Test

Validity is a measure that shows the levels of the validity of an instrument. To calculate the validity of the test using formula product moment correlation coefficient namely :

$$r_{xy} = \frac{n \sum XY - (\sum X)(\sum Y)}{\sqrt{\{n \sum X^2 - (\sum X)^2\}\{n \sum Y^2 - (\sum Y^2)\}}}$$ (Arikunto, 2012)

Where :

$r_{xy}$ = Correlation coefficient between items

$\sum X$ = Total scores of distribution X

$\sum Y$ = Total score of distribution Y

$\sum XY$ = Total score of samples X and Y

n = The amount of sample

$\sum X^2$ = sum of squares distribution scores X

$\sum Y^2$ = sum of squares total score distribution Y

Criteria to test the validity of each:

a. $0.81 < r \leq 10.0$ : Very high

b. $0.61 < r \leq 8.80$ : High

c. $0.41 < r \leq 0.60$ : Enough

d. $0.21 < r \leq 0.40$ : low

e. $0.00 < r \leq 0.20$ : very low

To interpreting the value of the validity of each item so the value, Consulted into the price moment product table, with criteria if $r_{count} > r_{tablel}$ then the item means valid.

Validity is the accuracy or accuracy of an instrument in measuring what you want to measure. Before the test is used first, review by an expert validated, Dr. Ajat Sudrajat, M.Si, as a lecturer in chemistry at the State University of Medan and tested to student. Validity test is an attempt to find out how far the test measures what is being measured. The validity of the test instrument is calculated using the product moment correlation formula (Appendix 8) with the condition that if $r_{count} > r_{table}$ at $\alpha = 0.05$ with n = 32 then the question is said to be valid.

Based on the validity table shows that out of 40 questions there are 29 valid questions. A summary of content validation tests can be seen in Table 3.2.

Table 3.2 Summary of Validity Instruments Test

| No | Criteria | Number of Question | Amount | Precent |
|---|---|---|---|---|
| 1 | Valid | 2,3,5,7,8,9,10,11,12,13,14,15,16,17,18,19,21,2, 23,23,26,27,32,33,35,36,37,38,40 | 29 | 72.5% |
| 2 | Unvalid | 1,4,6,20,25,28,29,30,31,34,39, | 11 | 27.5% |

**3.6.5 Reliability Test**

Reliability test is the stability of a measuring device, so that if the tools are being used always give consistent results. Reliable instrument means the instrument when used several times to measure the same object and the same conditions, will generate the same data. To test the reliability of the test used the formula Kuder Richardson (KR-20), namely:

$$r_{11} = \left(\frac{n}{n-1}\right)\left(\frac{S^2 - \sum pq}{S^2}\right)$$ (Arikunto, 2012)

Where:

$r_{11}$ = Reliability of item test

n = amount of items

1 = Constanta

P = Proportion of Subjects who answered correctly

q = Proportion of subjects who get a score 0 (q = 1-p)

$\sum pq$ = amount of multiplication products between p and q

n = amount of student

S = Total standard deviations-total score tests (standard deviation is the root variance)

Criteria for testing reliability as follows:

a. $0.91 - 1.00$ = Very High Reliability
b. $0.71 - 0.90$ = High Reliability
c. $0.41 - 0.70$ = Enough Reliability
d. $0.00 - 0.40$ = Low Reliability

To interpreting the value of the reliability from the question so the value is consulted to the price criticism product moment table with $\alpha = 0.50$ if obtained $r_{count} > r_{table}$ so the question is reliable.

To interpreting the value of the reliability from the question so the value is consulted to the price table with criticism product moment if obtained so the question is reliable.

Based on the reliability test data in this study as a whole, the reliability of the test $r_{count}$ = 0.905. After comparison with $r_{table}$ = 0.349 at $\alpha$ = 0.05 with n = 32 thus the questions in this research test instrument are reliable. (Appendix 9)

**3.6.6 Level of Difficulty Index**

The level of difficulty test is indicated by the magnitude of the test by a number indicating difficult or easy test. A number indicating the difficulty of a problem is called a difficulty index.

The formula of difficulty test level is :

$$P = \frac{B}{JS}$$ (Arikunto, 2012)

Where :

P = difficulty index

B = Amount of students who answered the question correctly

JS = Amount of all students test participants

The classification of difficulty test index is as follows:

For $P = 0.71 - 1.00$ : Easy question

For $P = 0.31 - 0.70$ : Medium question

For $P = 0.00 - 0.30$ : Difficult question

So, from this research there are questions that are categorized as difficult, medium and easy. Based on the trial level of difficulty on the subject of salt hydrolisis known as many as 1 problem with difficult criteria, 37 with medium and 2 criteria with easy criteria. (Appendix 10)

**3.6.7 Different Index**

The different index test is ability of a test item of learning outcomes to be able to distinguish between students who are smart (high-ability) with students who are less (low-ability). A good question is a matter that is not too difficult and not too easy. Based on the calculation of the level of difficulty (Appendix 11). To determine the distinguish power test of each item about the following formula:

$$D = \frac{B_A}{J_A} - \frac{B_B}{J_B} = P_A - P_B$$ (Arikunto, 2012)

Where:

D = Discrimination index test

$B_A$ = Amount of upper group students who answer correctly

$J_A$ = Amount of upper group student

$B_B$ = Amount of lower group students who answer correctly

$J_B$ = Amount of lower group students

Classification of Discrimination index test:

a. For $D = 0.70 - 1.00$ : Problem categorized is Very good
b. For $D = 0.40 - 0.69$ : Problem categorized is Good
c. For $D = 0.20 - 0.39$ : Problem categorized is Medium
d. For $D = 0.00 - 0.19$ : Problem categorized is Bad

Based on the results the topic of salt hydrolysis there are 5 questions with good categories, 22 questions with good enough categories, and 13 questions with bad categories.

### 3.7 Data Analysis Techniques

#### 3.7.1 Normality Test

The test is performed to calculate whether the two groups have the same variance level or not. Test F is known by simultaneous test or model test, that is to see how influence all independent variables together to the dependent variable or to test whether the model we make good/significant or not good/non significant. To test whether the sample is normally distributed or not the Kolmogrov-Smirnov normality test is used. The steps are as follows:

1. Searching for raw numbers

   The formula is : $Z_i = \frac{X_i - \overline{X}}{S}$

   $\overline{X}$ = mean value

   S = standard deviation (Sudjana, 2005)

This normality test uses Kolmogorov Smirnov with the help of SPSS 20 For Windows . The normality of the data is done by SPSS 2 0 For Windows with the Kolmogorov-Smirnov approach. Data is said to be normally distributed if the significance value > α(0.05), then the residual value is normally distributed. If the significance is < α(0.05), the residual value is not normally distributed.

#### 3.7.2 Homogenity Test

The test is performed to calculate whether the two groups have the same varia nce level or not. Test F is known by simultaneous test or model test, that is to see how influence all independent variables together to the dependent variable or to test whether the model we make good/significant or not good/non significant. To test the similarity of variance used F test as follows:

$$F = \frac{S_1^2}{S_2^2}$$

Where:

$S_1^2$ = Greatest Variance

$S_2^2$ = Smallest Variance (Sudjana, 2005)

Homogenity testing is done with the approach Levene's Test using SPSS 20 For Windows , with the provision that if the value of the probability or the Sig.> α(0.05), the research data is stated to have homogeneous variance or come from a homogeneous population.

### 3.7.3 Differences in Learning Outcomes

The hypothesis test is performed to determine the conclusion of whether the hypothesis is accepted or not. To known is the hypothesis test can be accepted or rejected then the authors use statistical test that is t-test two parties with a level of trust $\alpha = 0.50$ is :

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$ (Sudjana, 2005)

Where, S is the composite variance calculated by the formula:

$$S^2 = \frac{(n_1 - 1) + (n_2 - 1)S_2^2}{(n_1 + n_2) - 2}$$ (Sudjana, 2005)

Where :

t = Calculation results

$\bar{X}_1$ = Average learning outcomes of the experimental group

$\bar{X}_2$ = Average learning outcomes control group

$n_1$ = Amount of students in the experimental class I

$n_2$ = Amount of students in the experimental class II

$S_1^2$ = variance in experimental class I

$S_2^2$ = variance in experimental class II

$S^2$ = combined variant

The criteria that apply in testing data using SPSS 20 For Windows are if Sig. < α(0,05) so, Ha is accepted.

### 3.7.4 The Effectiveness of Integrated Teaching Materials Spiritual Value in Growing Spiritual Attitude

The effectiveness of instructional materials integrates spiritual values in fostering spiritual attitudes by using the formula:

$$\text{Percentage of Effectiveness} = \frac{\text{The Number of Scores Obtained}}{\text{Total Score}} \text{x} 100\%$$

(Amalia, 2012)

### 3.7.5 Relationship of Spiritual Values to Learning Outcomes

To test hypothesis 2 Correlation is used in SPSS 20 for windows, Sig, (2-tailed) <α (α = 0,05).. This test is done to obtain correlation coefficient.

a. Correlation analysis

For the next step to know more whether or not the influence of students' spiritual intelligence on the learning achievement of SMA N 1 Rantau Selatan students, the authors use the correlation formula because of the existence of two variables that influence each other, then the data is processed by using Product Moment correlation formula (r) from Carl Pearson , that is :

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

Where :

$r_{xy}$ = The correlation index number "r" Product moment

N = Number of cases

$\sum$ = Number of multiplication results between X and Y score

$\sum x$ = Total number of score X

$\sum y$ = Total number of score Y

Having known the relationship of two variables, the next step is to hold the interpretation of data in two ways, namely:

a. Simple interpretation by matching the calculation with the correlation index number "r" Product Moment as below:

Table 3.3 Correlation Analysis

| **The magnitude of "r" Product Moment ($r_{xy}$)** | **Interpretation** |
|---|---|
| 0,00-0,20 | Between the variables X and Y there is indeed a correlation but, *very weak* or *very low* so, the correlation was ignored (assumed no correlation between variables X and Variable Y. |
| 0,20-0,40 | Between variables X and Variable Y contained a *weak* or *low* correlation. |
| 0,40-0,70 | Between variables X and Y are available *moderate* or *sufficient* correlation. |
| 0,70-0,90 | Between variables X and Y are available *strong* or *high* correlation. |
| 0,90-1,00 | Between variables X and Y are available *very strong* or *very high* correlation. |

b. Interpretation of "r" Product Moment, ie by first formulating the hypothesis of work/ alternative (Ha) and nil hypothesis (Ho). Then look for degrees of freedom (db) or degrees freedomnya (df) the formula:

**df = N-nr**

Where :

df = Degress freedom

N = Number of Cases

Nr = Number of variables correlated After the results obtained from df, then can be searched magnitude

"R" listed in the "Product Moment" Value table, either at a significance level of 1%. If the "r" of observation (ro) is equal to or greater () than "r" table (rt) then the Alternative Hypothesis (Ha) is accepted or proved true. Means true between the variables X and variable Y there is a positive correlation (negative correlation) is significant. While Ho is unacceptable or unproven. This means that there is no correlation between the variables X and the Y variable is wrong. Conversely, if the "r" of observation (ro) is equal to or smaller () than the "r" table (rt) then the alternative Hypothesis (Ha) is unacceptable or unproven. (Karl Pearson, 1898)