CHAPTER III

RESEARCH METHODOLOGY

3.1 General Overview of Research

This research is a Research and Development (R & D) which includes analysis of the existing textbooks in curriculum 2013, development and standardization of teaching materials. The result of existing books analysis become the basic of development of teaching materials which will be developed. The development of teaching materials includes the integration of *problem-based learning* (PBL) model in chemistry textbook grade X even semester according to curriculum 2013. The standardization of textbooks is made to know the level of eligibility of teaching materials that have been developed.

3.2 Research Design

Figure 3.1 can explain the research steps which conducted by the researcher. The first stage is analysis. The researcher determines the chemistry textbook to be analyzed then the researcher analyzed that book. Books analysis doing to know it has or not problem based learning model in the book The second stage is development. The researcher develops chemistry teaching material in grade X which integrated to *problem-based learning* model. Then in the third stage is validation. The teaching materials will be standardized by using the BSNP standard questionnaire and the advisability questionnaire of integrated teaching materials of *Problem Based Learning* model with the validator expert's help that is given to the chemistry lecturer and chemistry teacher to get the response and the assessment of the developed textbook advisability. The next stage, revise teaching materials that have been developed based on ratings, suggestions, and comments given by professors, teachers, and students.

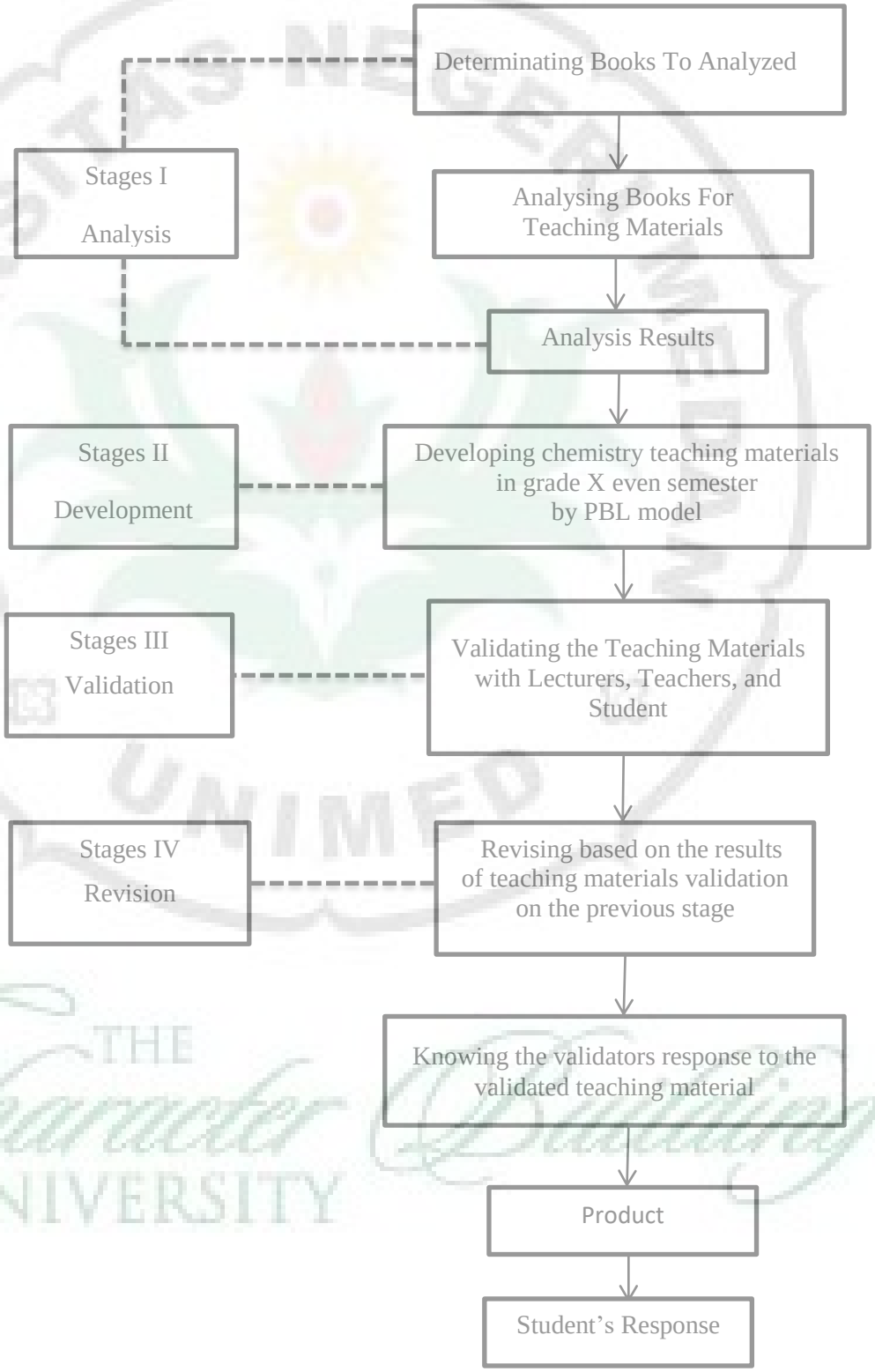

Figure 3. 1 Flow Chart of The Research developed teaching material with PBL model (Borg and Gall in Sasmi, 2016)

3.3 Research Time and Location

The research conduct in Chemistry Department Faculty of Mathematics and Natural Sciences Medan State University and in SMA 3 Medan. Time of research conduct from February to May 2018. During the period, the following activities are:

1. Chemistry book analyzing, conducted in Medan from February 2018.
2. Designing and developing teaching materials, conduct in February to April 2018.
3. Chemistry textbook standardizing, conduct in Medan State University and in SMAN 3 Medan in May 2018.
4. Giving questionnaires to student's to get responses about the developed teaching material in May 2018.

3.4 Research Population and Sample

Population and sample in this study is used to standardize teaching materials that will be developed by the researcher. Populations in this research are :

1. Chemistry lecturers who are categorized as education lecturer in Medan State University
2. Chemistry teachers in senior high school in Medan.
3. Students in SMAN 3 Medan.

The sample in this research are:

1. Two persons chemistry lecturers of Medan State University selected by purposive sampling.
2. Three persons chemistry teachers who teach actively for senior high school in Medan. They are randomly selected.
3. Twenty Students of grade X selected by purposive sampling.

3.5 Type of Data Research

Data on standardization of teaching materials include: 1) Truth of content and suitability of chemistry materials obtained by experts and instructional design,

2) integration of problem-based learning model, 3) quality of displays and presentation of materials, 4) learners' responses towards the teaching materials developed.

The data obtained is adjusted to the purpose and design of the development used. Therefore, the type of data collected in this research is quantitative descriptive data as basic data, collected through a questionnaire with assessment scale of 1 to 4. The respondents will give numerical scores on each item on the questionnaire based on the established criteria. Quantitative data is used to calculate the successfull of teaching materials. In addition, the type of data collected is qualitative data in the form of a description of suggestions and written input by respondents as additional data.

3.6 Research Procedure

The procedure of this research is following the research procedure that has been done by previous researchers consist of several stages, including:

3.6.1 Procedure of Analysis Chemistry Teaching Material (book)

On this stage, the researcher determines and analyzed the chemistry textbooks of 3 different authors based on the BSNP standard assessment of materials. The books are:

1. Kimia Untuk SMA/MA Kelas X
   Author : Unggul Sudarmo Publisher : Erlangga
2. Kimia Untuk SMA/MA Kelas X
   Author : Watoni, A. H. Publisher : YramaWidya
3. Panduan Belajar Kimia 1B
   Author : Riandi Hidayat dkk Publisher : Yudhistira

The material that is analyzed from teaching materials is chemistry material of grade X even semester. The purpose of this analysis is to look at the advantages and disadvantages of chemistry teaching materials in grade X from several books. Material analysis includes assess chemistry books whether it has or no integration *problem based learning* model on teaching materials and content analysis of the

book, whether it has or doesn't have introduction, glossary, bibliography, index, periodic table of elements, key answers, summaries and evaluation questions and analyzed sub- the teaching materials.

3.6.2 Procedure of Design and Developed Teaching Material

On this stage, the researcher sets up a framework to address a number of problems resulting from analysis necessity (analysis phase). The framework includes research schedules, defining patterns, incorporating problem-based learning models into teaching materials, compiling modules, and organizing instruments.

On development stage, the researcher conducts the development of problem-based teaching materials on chemistry subject grade X even semester. The developed of teaching material are packed in printed papers.

3.6.3 Standardization of Teaching Material

Teaching materials that is developed and then standardized by expert respondents, UNIMED chemistry lecturer with the criteria of teaching analytical chemistry at least five years, S-2 and chemistry teacher with the criteria have gotten the professional certificate of teacher and especially teaching chemstry in grade X. Respondents are asked to assess based on the standard assessment of teaching materials that have been established by BSNP, namely the content advisability component, language advisability, advisability of presentation, and advisability of graduation. In this assessment, respondents are asked to provide suggestions for improvements to teaching material developed to improve the quality so that it can be revised / improved.

3.6.4 Revision of The Teaching Material

On this stage, the researcher revised the problem-based teaching materials on the chemistry material class X even semester that has been developed based on the results of standardization assessment done. Revisions are made to correct the

weaknesses of teaching material developed based on the ratings, suggestions, and comments provided by lecturers, teachers, and learners.

3.7 Technique Collection of Data

Techniques of data collection in this study is using research instruments to assess the product of teaching materials that have been developed. The instruments used to collect data in this development are as follows:

a. Form of assessment rubric of BSNP

This questionnaire is used to obtain assessment data from expert validator and teacher validator about the developed product that is integrated as chemistry instructional model of problem-based learning in chemistry grade X even semester.

b. Instrument for measuring student's opinions related to develop teaching materials integrated problem-based learning model.

3.8 Technique Analysis of Data

Technique analysis of data in this research is quantitative data analysis and will be analyzed using descriptive analysis percentage. Percentage descriptive analysis is used to describe each percentage. According to Rohmad, et al (2013: 2) in the descriptive analysis of this calculation percentage is used to determine the percentage score of answers from each sample used the formula:

$$P\% = \frac{\sum q}{\sum r} \text{ X } 100\%$$

Where:

P% = percentage score obtained, in this case the percentage component of the standard assessment of textbook content according to BSNP

Σq = Number of concepts with marks (√) on teaching materials (modules) chemistry

Σr = Number of concepts that exist in chemistry teaching material (module).

The data will be tabulated in a recapitulation table, with the following categories: <0.40: very bad; 0.40 - 0.75: Good; > 0.75: very good. In this study, the rating scale used is 1 to 4, where the lowest score is 1 and the highest score is 4. The determination of the range can be known through the highest score range minus the lowest score range divided by the highest score. Based on the determination of the range obtained a range of 0.75. The score assessment will be explained as follows:

a. Number 4 means very good / very valid / very interesting / very easy / very clear / very precise / strongly agree.
b. Number 3 means good / valid / interesting / easy / clear / precise / agree.
c. Number 2 means less good / less valid / less interesting / less easy / less clear / less appropriate / less agree.
d. Number 1 means bad / very invalid / very unattractive / very uneasy / very unclear / very inappropriate / strongly disagree.

To strengthen the results of data validation, researcher develops the levels of qualification criteria for the validity. This determination is based on the opinion of Arikunto (2002) which states that if a questionnaire consists of 3 aspects with 10 questions in each aspect, then all aspects contain 30 questions. If the score on each item is at least 1 and the maximum is 3, then the score will be obtained for each subject as low as 30 and as high as 90. In this study, the assessment scale to be used is 1 to 4 where the lowest score is 1 and the highest score is 4. The determination of the range can be known through the highest score range minus the lowest score range divided by the highest score. Based on the determination of the range obtained a range of 0.75. The average validity criteria used can be seen in table 3.1

Table 3.1. The Validity Criteria

Average	Validation criterion
3,26-4,00	Valid and no revision needed
2,51-3,25	Quite valid and no revision needed
1,76-2,50	Less valid, some book contents need revision
1.00-1,75	Invalid and needs total revisions

(Arikunto, 2002)