CHAPTER III

RESEARCH METHODOLOGY

3.1. Time and Location of Research

This research conducted at SMA Negeri 1 Perbaungan which is located at Jalan Mayjend H. Rizal Nurdin, Batang Terap, Serdang Bedagai. The research time will be done in April-May 2017/2018 academic year

3.2. Population and Sample of Research

The population in this study is all students of class XI IPA in SMA Negeri 1 Perbaungan academic year 2017/2018 consisting of 4 science classes and each class consists of 30-45 students.

The sample in this study was taken by purposive sampling technique. Samples obtained are the students of grade XI IPA Unggulan in SMA Negeri 1 Perbaungan.

3.3. Development Model

The development of Student Worksheet Based Android using research and development methods. According Sugiyono (2011: 297) research and development is a research method with the aim to produce the product certain, and test the effectiveness of the product. Another opinion was expressed by Endang Mulyatiningsih (2011: 161) namely "research and development aims to produce new products through the development process ". In general, research and development is a research aims to produce new products and test the effectiveness of the product.

3.4. Development Procedures

This research procedure adapts the ADDIE development model, namely a development model consisting of five stages consisting of Analysis, Design, Development, Implementation and Evaluating. But inside this research is only up to the implementation stage only.

3.4.1. Analysis Stage

a. Analysis of student needs which include needs and characteristics students who will be targeted by users of Android-based Student Worksheets and hardware and software.

b. Competency and instructional analysis which includes analysis of Competency Standards (SK) and Basic Competencies (KD) that will published in this Student Worksheet.

3.4.2. Design Stage

Based on the results of the analysis, the next stage is done phase product design which includes the following stages:

a. **Making Media Design (storyboard)**

Storyboard is an overview of instructional media all of which will be loaded inside the app. Storyboard works as a guide like map to ease the manufacturing process media.

b. **Set Material**

At this stage the basic elective subjects are proposed chemistry about Acid and Bases as it is in accordance with the author's competence. Other than that, there are difficulties in the lack of media usage learning and many teachers are still using the method conventional or lecture in chemistry teaching.

c. **Preparation of Questions and Answers**

Questions and discussion of answers to be included in the Student Worksheet this is a material about acids and bases. The preparation of materials, questions, and discussions in this Student Worksheet is made from various references.

3.4.3. Development Stage

a. **Making Student Worksheet Products Based on Android**

At this stage learning media products are made accordingly with a predetermined format that is using Eclipse software.

b. **Validation by Material Expert, Media Expert, and Chemistry Teacher**.

The validation process was carried out by media experts, material experts, and three chemistry teachers. The results are product quality, suggestions, and comments that can be used as a basis for analyzing and revising the media developed and as a basis for product testing on student.

3.4.4. Implementation Stage

This implementation phase of the product will be tested to 31 students from SMAN 1 Perbaungan. At this stage also shared questionnaire to measure and find out the motivation and self-learning of participants students on Android Student Work Sheets. If necessary then will be revised based on suggestion from students. However, in this revision will be considered input and suggestions from the validator before so as not to conflict with the improvements previous.
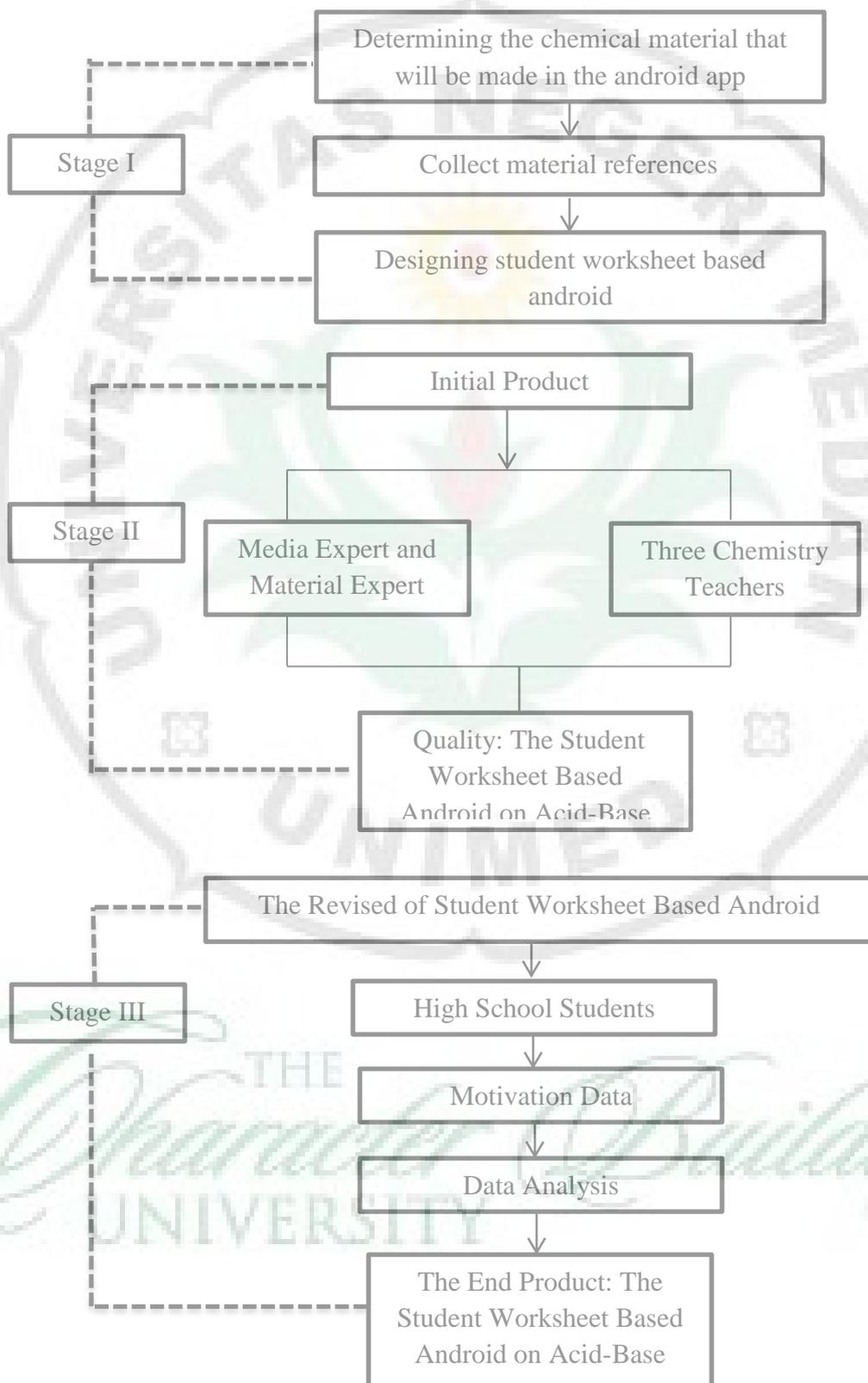
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                              ┌─────────────────────────────────┐
                              │  Determining the chemical        │
                              │  material that will be made in    │
                              │  the android app                 │
                              └─────────────────────────────────┘
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        ┌───────────┐         ┌─────────────────────────────────┐
        │ Stage I   │         │  Collect material references     │
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                              ┌─────────────────────────────────┐
                              │  Designing student worksheet      │
                              │  based android                   │
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Determining the chemical material that will be made in the android app

Stage I

Collect material references

Designing student worksheet based android

Initial Product

Stage II

Media Expert and Material Expert

Three Chemistry Teachers

Quality: The Student Worksheet Based Android on Acid-Base

The Revised of Student Worksheet Based Android

Stage III

High School Students

Motivation Data

Data Analysis

The End Product: The Student Worksheet Based Android on Acid-Base

Figure 3.1. Research Procedures

3.5. Data Type

The data obtained in this development research is descriptive data in the form of:

a. Data on the quality of product feasibility of validator assessment results, ie media expert, material expert, and three chemistry teachers. Initial qualitative data with very good category (VG), good (G), enough (E), less (L), very less (VL). The data is then converted into discrete quantitative data, ie the nominal data obtained by calculating the average score of each criterion calculated based on the validator. Furthermore this score is compared with the ideal score to know the quality of Student Worksheet generated. The data collected in this study is intended to know the quality of Student Worksheet based android on Acid-Base material.

b. Data on the student motivation of trial results assessment, ie high school students. Initial qualitative data with very agree (VA), agree (A), doubtful (D), disagree (DA), very disagree (VDA). The data is then converted into discrete quantitative data, ie the nominal data obtained by calculating the average score of each criterion. Furthermore this score is compared with the ideal score to know the student motivation of Student Worksheet. The data collected in this study is intended to know the student motivation to Student Worksheet based android on Acid-Base material based on assessment of trial result to high school students.

3.6. Data Collection Instruments

The quality and motivation rating data "Student Worksheet Based on Android in Acid-Base Material" is obtained from the assessment instrument, ie a questionnaire in the form of checklist (√) for media expert, material expert, three chemistry teachers, and high school student. Questionnaire assessment is used to determine the quality product and

student motivation of the product covering aspects of the criteria that have been determined.

Aspects assessed in this development study are as follows:

a. Aspects of truth of concept
b. Aspects of breadth and depth of concept
c. Aspects of material and matter
d. Aspects of language structure
e. Aspect of student worksheet display
f. Aspect of software engineering
g. Aspects of implementation

3.7. Data Analysis Technique

1.7.1. Data of Product Development Process

Data process of product development is descriptive data. The product development process data is obtained from material experts, media experts, and three chemistry teachers in the form of corrections and suggestions. Such corrections and suggestions are used as reference for product revisions.

1.7.2. Data of Product Quality and Data of Student Motivation

Data of product quality is obtained from the analysis of assessment instruments filled by media expert, material expert, and chemistry teacher. Data of student motivation is obtained from the analysis of assessment instrument filled by high school student. The type of data collected in the form of qualitative data is converted into quantitative with the steps as follows.

1. Convert the qualitative value obtained from the high school students into a quantitative value with a Likert scale.

Table 3.1. Rating by Likert Scale (Donald, 2004: 278).

Value Scale	Quality
1	VL (Very less)
2	L (Less)
3	E (Enough)
4	G (Good)
5	VG (Very Good)

2. Calculate the average score of each criteria aspect indicator for the Student Worksheet based android by using the formula:

$$\overline{X} = \frac{\sum X}{n}$$

Explanation:

$\overline{X}$ = average score of each indicator

$\sum X$ = sum score of each indicator

n= sum of reviewer

3. Calculate the average score of each criteria aspect for the Student Worksheet based android by using the formula:

$$\overline{X} = \frac{\sum X}{n}$$

Explanation:

$\overline{X}$ = average score of each aspect

$\sum X$ = sum score of each aspect

n= sum of reviewer

4. Change the average score of each indicator and criteria aspect in the form of quantitative data into qualitative categories. How to change the average score into a qualitative category, which compares the average score with the criteria of the assessment

of each ideal indicator and criteria aspects with the provisions described in the table. (Widoyoko, 2012)

Table 3.2. Score Range

Num.	Score Range (i)	Quality
1.	$\overline{X} > Xi + 1{,}8\ SBi$	VG (Very Good)
2.	$Xi + 0{,}6\ SBi < \overline{X} \leq Xi + 1{,}8\ SBi$	G (Good)
3.	$Xi - 0{,}6\ SBi < \overline{X} \leq Xi + 0.6\ SBi$	E (Enough)
4.	$Xi - 1{,}8\ SBi < \overline{X} \leq Xi - 0{,}6\ SBi$	L (Less)
5.	$\overline{X} \leq Xi - 1{,}8\ SBi$	VL (Very Less)

Explanation:

$\overline{X}$: Average final score

Xi : The ideal rate, calculated using the formula:

$$Xi = \frac{1}{2} x \ (\text{The highest score} + \text{lowest score})$$

SBi: Ideal Standard deviation, calculated using the formula:

$$SBi = \frac{1}{6} x \ (\text{The highest score} - \text{lowest score})$$

Where:

Highest score = Σ item criteria x 5

Lowest score = Σ item criteria x 1

5. Determine the percentage idealization of the Student Worksheet Based Android for each indicator and criteria aspect with the following formula:

% each indicator= $\frac{average\ score\ of\ each\ indicator}{highest\ ideal\ score\ of\ ecah\ indicator}\ x\ 100\%$

% each aspect= $\frac{average\ score\ of\ each\ aspect}{highest\ ideal\ score\ of\ each\ aspect}\ x\ 100\%$

Explanation:

% of each indicator   : The percentage of each indicator

% of each aspect   : The percentage of each aspect

6. Determine the overall average score of the Student Worksheet based android by calculating the average score of all assessment indicators, then converted to qualitative categories. How to change the overall average score into a qualitative category, which compares the score with the ideal scoring criteria, so as to obtain the quality of Student Worksheet Based Android that has been developed.

7. Determine the percentage idealization of the Student Worksheet based android with the following formula.

Percentage of ideality $= \frac{overall\ average\ score}{overall\ highest\ ideal\ score} x100\%$