CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Method

The research method that being used in this research is descriptive research. According to Fraenkel et al, (2013) descriptive research is meticulously and carefully described how a phenomenon of affairs state is happening. It can describe the behavior and preference of pupils, teacher, and even administrators or staffs in school.

Descriptive research is identifying the situation by examining the real condition of current state given. It involves the identification of characteristics and attributes of a certain phenomenon that observe by observational based, and also the correlation of two or more phenomenon being explored. The method that being used is a survey method that requires a questionnaire as an instrument to collect the data that can be explored not by judging or interpreting (Carrie, 2007). This research method is suitable and appropriate with the objectives of the research which is to develop and validate how mobile learning based on Arduino projects in Junior High School students.

3.2 Research Design

The researcher created mobile learning in form of Android application in dynamic electricity topic based on Arduino. Final paper supervisors then supervised the mobile learning application before the experts that expertize in content (Physics), language (English), and design (IT) assess it. After a sequence of suggestions and revisions until the final assessment, the mobile learning application was brought to science teachers and students to be reviewed.

3.3 Population and Sample

The subject of this study were three experts in each aspect: science content, language, and design for mobile learning application validation. Those experts that already have a background based on what they expertize of are assessed these aspects. For mobile learning application impression, Junior High School students are assessed the media.

The location of this research is Private Secondary School "X" in Bogor. The school uses English as the communication and delivery language in teaching-learning process. The curriculum that applies in this school are National Curriculum which is Curriculum 2013 and Cambridge International Syllabus. These curriculums are applied for all grade of secondary school in both lower and higher secondary school.

This school was chosen because it has been accredited "A" by Indonesia Ministry of Education and also because of the facilities that supported students to do mobile learning. Most of the students come from average to the higher family background which facilitates the students to have devices such as mobile phone to provide them with supportive teaching-learning process and environment. The population in this research was the students of this Junior High School in Bogor. The sample is 22 students from Junior High School in Bogor whom chosen through simple random sampling.

Simple random sampling is one of random sampling in which each and all population has the same probability and chance to be selected. This sampling can help to gain sample representative of the population of interest which has an equal and independent chance of being selected. There will be no bias in selecting process of the sample because simple random sampling itself is ensured in producing a representative sample (Fraenkel et al., 2013).

Louis et al, (2007) stated that simple random sampling is used to reflect the population value of a particular variable which is depend on the population size and heterogeneity. This sample is assure that the member of the population was unaffected by the selection of other members of the population.

3.4 Operational Definition

In order to avoid misconception in this research, some operational definitions are explained in this research. Those terminologies are explained as follow:

1) Mobile Learning

Mobile learning is the learning that takes place with the support of mobile devices. It was developed by using Android OS that runs in smartphone gadget. The application was created by a platform called Android Studio. The content, language, and design of the mobile learning application was assessed by the rubric of experts' judgment and the readability of mobile learning application that was answered by students and science teachers' questionnaire.

2) Dynamic Electricity Topic based on Arduino Project

The dynamic electricity materials are consist of electrical quantities, electrical components, and an electrical circuit. These concepts applied to Arduino projects which is the traffic light project, LCD display project, and temperature sensor project. Arduino is a microcontroller that contains a processor core, memory, and programmable input or output peripherals. This microcontroller board can be used to control the electrical component that proceeds by a specific software with programming language.

3.5 Research Instrument

The instruments are used to obtain or gain the data in this research. In order to measure the suitability of mobile learning application and how its design met students' actual necessity of comprehension in learning dynamic electricity topic, the instruments that used are experts' judgment rubric and questionnaire for students and science teachers.

1) Likert Scale and Ratings

The rubric that used in this research is the Likert scale and ratings. The rubric was including two aspects: the techniques of making mobile learning application and

characteristics of it. The characteristics are the content, whether it is the electricity topic or the Arduino projects, the language, and design of mobile learning itself. The scale is 1 to 4 to determine if the points in mobile learning application were met the intention, goal, and expectations.

Table 3.1
Likert Scale for Experts' Judgment Rubric

Scale	Criterion	Point
SD	Strongly Disagree	1
D	Disagree	2
A	Agree	3
SA	Strongly Agree	4

The Likert scale and ratings are also used for students and teachers' questionnaire. There was a 4-rating scale to determine whether the mobile learning application is compatible and suitable for Junior High School level or not. The elaborated scoring for the rating is in the form of a questionnaire.

2) Written Review

The rubric and questionnaire were the extensions of the scales, it is consist of blank space for suggestions, opinions, or comments about the overall of a mobile learning application.

3.6 Instrument Validation

Before the instrument was reviewed and used, there were some analysis that judged by supervisors. The analysis is aimed to make sure whether both of instrument is appropriate or not. The test's quality has to meet the standard of what was measured before it is used by the experts, students, and science teachers.

3.7 Data Collection

In order to gain the data by using the instruments as declared before, some different ways were taken for each subject in this study described as follow:

1) Experts

The rubric was given directly to each expert based on the aspects that was judged. The sample of mobile learning application was installed in researcher mobile phone or the expert asked to installing the application on their own phone. After the mobile learning application had been examined, the rubric's result was returned. The data collected from the experts were in the form of ratings and suggestions or comment.

2) Students and Teachers

First, students are given the explanation of the topic, show the demonstration of the projects and the tutorial on how to installed and used the application. After that, the questionnaire was given to students. For the teachers, the application was installed in the mobile phone and then the questionnaire was given to be examined. Both of the data was collected from students and teachers were in form of ratings and opinion or comments impression.

3.8 Data Analysis Technique

After all the data was collected by using the instruments, the results are analyzed in a descriptive way regarding to each variable's reference. The data analysis techniques are described as follow:

1) Likert Scale and Ratings

The experts' judgment rubric was analyzed by a quantitative measurement, adapted from (Riduwan, 2010). Then, comparing the result with the total amount of highest score and the result is converted to a percentage.

$$\% = \frac{Na}{Nx}\ x\ 100\%$$

(Riduwan, 2010)

Arikunto (2000) stated that the media that is mobile learning application can be elaborated with the category of percentage range and descriptive criteria of the program. The category is described as follow:

Table 3.2
Percentage Range and Descriptive Criteria of Program

No.	Interval	Criterion
1	76%< score ≤100%	Very Good
2	51%< score ≤75%	Good
3	26%< score ≤50%	Fair
4	0%< score ≤25%	Poor

On the other hand, the students and teachers' questionnaire use the overall rating that gets from an average of all rating. The explanation of rating is the same as the criterion in Table 3.1.

2) Written Review

The written review is analyzed descriptively which the first thing that has to do is analyze the input, then grouping the analysis result and the last step is comparing the result to literature (Creswell, 2011). The descriptive analysis is separated based on the respondent, which is the experts, students, and teachers that included the aspects evaluated.

3.9 Research Procedure

In order to make this research systematically arranged, there are three stages of the procedure includes preparation, implementation, and completion. The research plot can be seen in Figure 3.1. The steps in preparation stage which are, first, identification of the problem that was investigated, formulating the research objectives, analysis the literature review about mobile learning, Arduino UNO projects, and dynamic electricity topic. Then, constructing the instruments which are the media of mobile learning application, experts' judgment rubric, and readability questionnaire for students and science teachers of Junior High School, designing the storyboard of mobile learning application, and the last step is designing the mobile learning by using application maker software by technician.

The second stage is the implementation stage which includes some steps which are, first, investigate the instrument by the experts (expert judgment). The things that was validated content, language, and design (artwork and IT related), and then revising the instrument based on expert judgment and analysis, construct readability by trying the mobile learning application to several students and science teachers are needed for further step. Then, collecting the research data, calculate and analyze the data.

The last procedure in conducting this research is the completion stage which includes some steps such as, first, making a result and discussion, then, making a conclusion based on data analysis. Lastly, reporting the result.

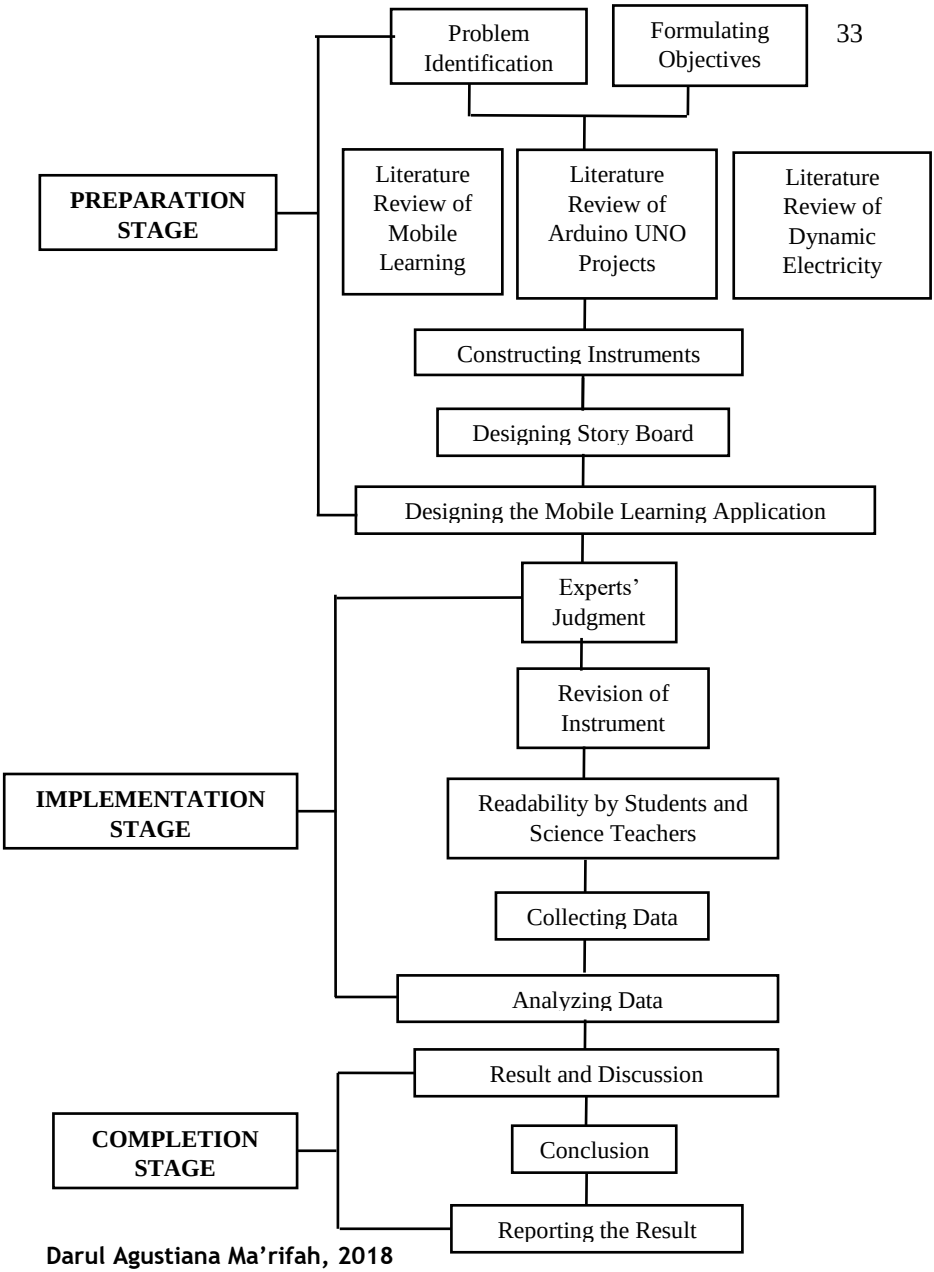
Problem Identification
Formulating Objectives
PREPARATION STAGE
Literature Review of Mobile Learning
Literature Review of Arduino UNO Projects
Literature Review of Dynamic Electricity
Constructing Instruments
Designing Story Board
Designing the Mobile Learning Application
Experts' Judgment
Revision of Instrument
IMPLEMENTATION STAGE
Readability by Students and Science Teachers
Collecting Data
Analyzing Data
Result and Discussion
COMPLETION STAGE
Conclusion
Reporting the Result

Figure 3.1 Research Plot