

## CHAPTER III

### RESEARCH METHODOLOGY

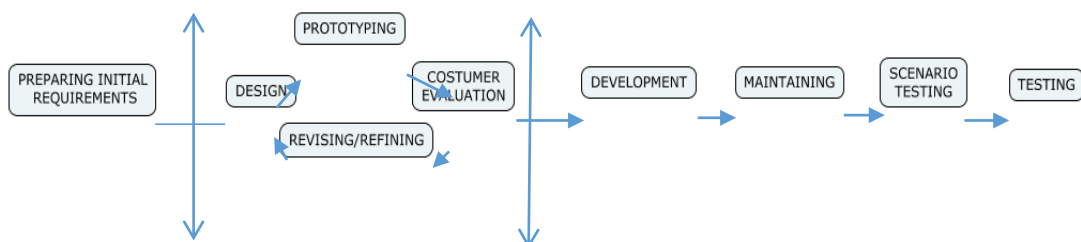
#### 3.1 Research Method

The method use in this research is developmental research method. The method can describe the development process of instrument and application in this research, and analyze the readability of the application later on. Developmental research facilitates the study of new model, tools, and procedures. The method several stages where each stage involves reporting and analyzing data. The stages consists of sub-studies to analyze and define the instructional problem, to specify the content, to determine instrument reliability and validity, and to make a summative evaluation (Gravemeijer, 1998).

This research method is suitable and appropriate with the objectives of the research, which is to develop a collaborative problem solving assessment tool on the earth layer topic, because the research focuses on development process of both instrument and application rather than merely gathering data.

#### 3.2 Research Design

Based on the developmental research method, in order to make this research systematically arranged, a development model was used. The development model used in this study is called the Prototyping Development Model. Prototyping development model is a model where prototype of the end product is first developed, tested and refined as per customer feedback repeatedly till a final acceptable prototype is achieved which forms the basis for developing the final product. The flow of the model is shown in Figure 3.1 as follow:



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Figure 3.1

The Flow of Prototyping Development Model

*(Source: Processed Data from the researcher)*

Based on the Prototyping Development Model Flow, the initial design of the android learning application will be explained as follows:

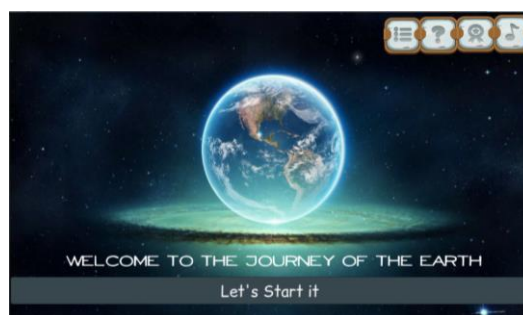


Figure 3. 2

Opening page on the application

*(Source: Processed Data from the researcher using Unity software)*

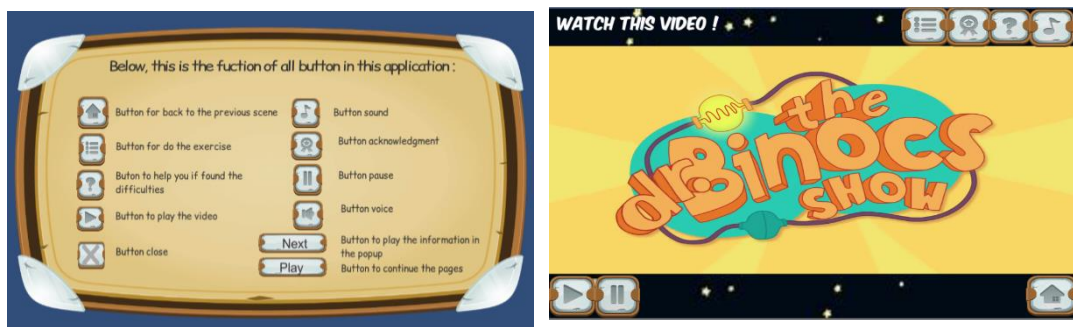


Figure 3. 3

Instructions for using the application

(Source: Processed Data from the researcher using Unity soft

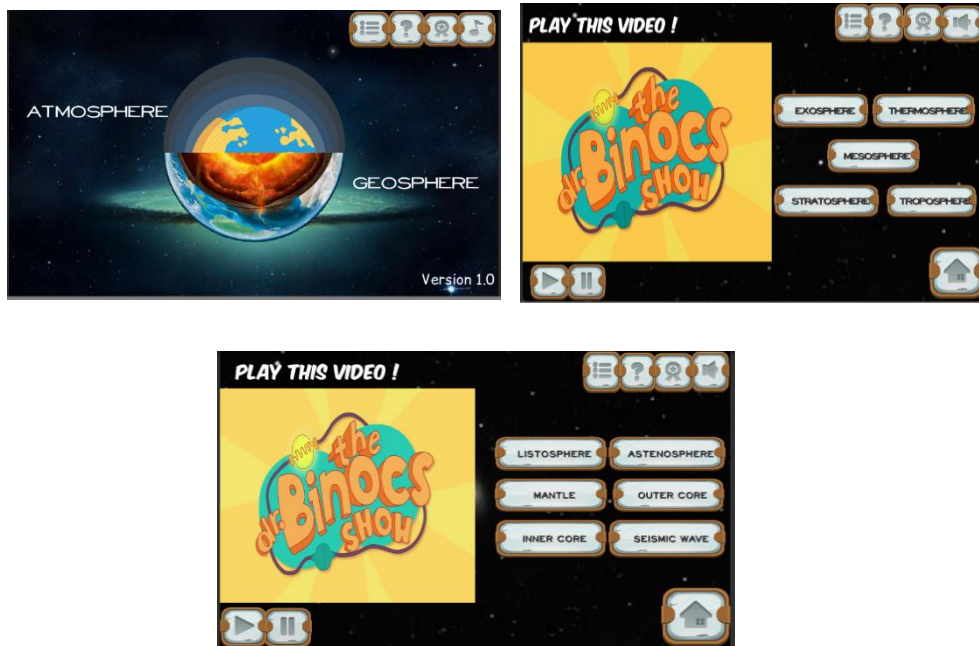


Figure 3. 4  
Main Scene

(Source: Processed Data from the researcher using Unity software)



Figure 3. 5  
Atmosphere layer  
(Source: Processed Data from the researcher using Unity software)





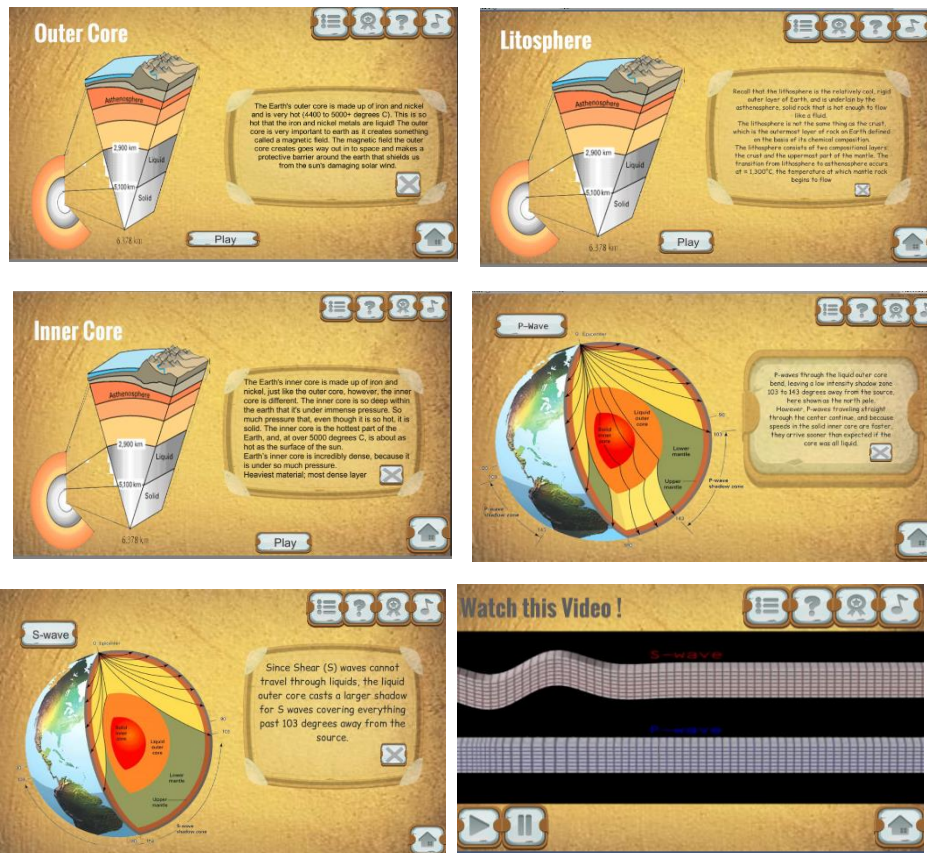


Figure 3. 6

Geosphere Layer

(Source: Processed Data from the researcher using Unity software)

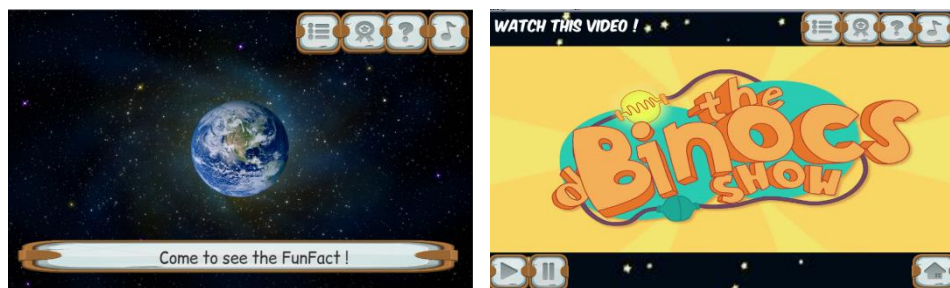


Figure 3. 7

Watch the funfact

(Source: Processed Data from the researcher using Unity software)

What is the characteristics of the ionosphere ?

Layer where most meteors up upon entry

Many ionized atoms, electrically charged and ions can help transmit radio waves

The last layer and the air is quite thin

Layers that help absorb harmful UV rays from the sun

Next

The last layer and the air is quite thin here and all of it runs up to 6200 miles from the surface of the earth called layers...

Exosphere

Thermosphere

Ionosphere

Troposphere

Next

What is the name of the layer that is shaped like a solid ball made of iron and nickel ?

Crust

Outer Core

Inner Core

Mantle

Next

Let's Answer Dr. Binocs Questions !

What is the name of the layer of the earth that is used as the place where humans live?

Inner Core

Outer Core

Crust

Mantle

Next

Below several hundredsmile of mantle made up of ....

Very high region rocks

Super hot solid rocks

Thick, solid, and rocky substances

Very solid and sturdy rock materials

Next

What is the name of the layer where the weather occurs?

Thermosphere

Troposphere

Mesosphere

Stratosphere

Next

Which layer that regulates the temperature & pressure of the earth with the help of water vapor and carbon dioxide?

Asthenosphere

Thermosphere

Troposphere

Exosphere

Next

What is the name of the layer that consists of super hot liquid called lava?

Outer Core

Mantle

Inner Core

Crust

Next

What is the name of the layer where the ozone layer is located ?

Ionosphere

Troposphere

Stratosphere

Exosphere

Next

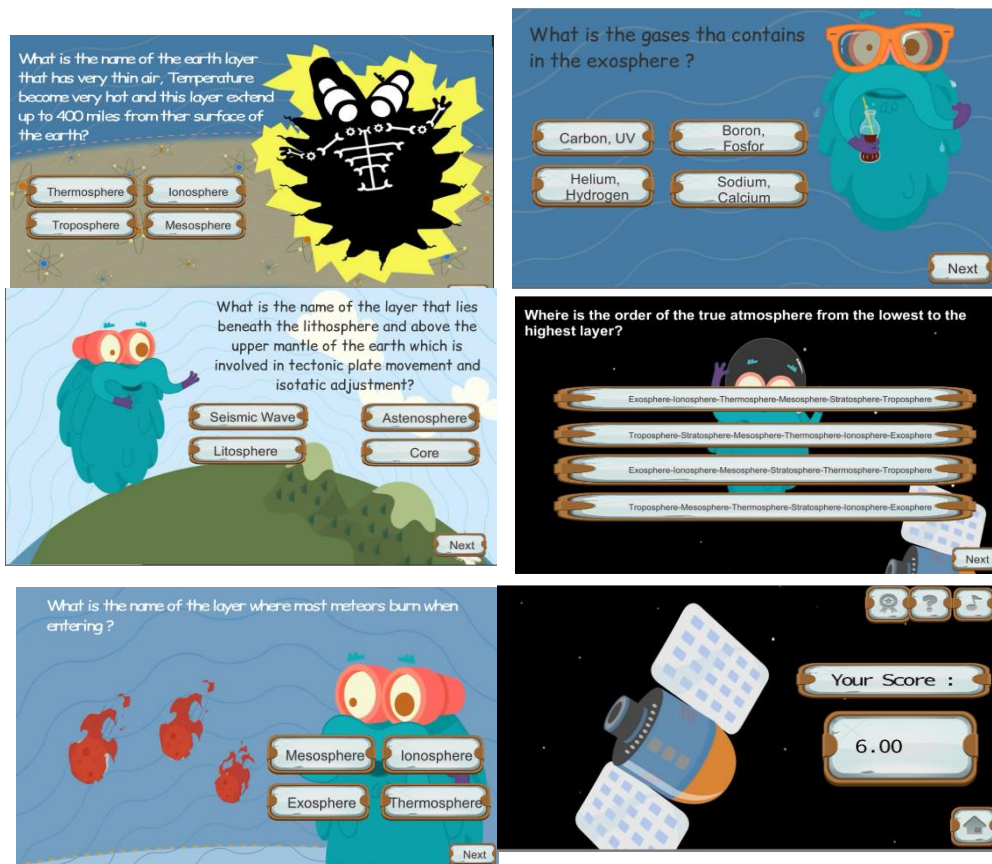


Figure 3. 8  
Quiz (Questions)

(Source: Processed Data from the researcher using Unity software)



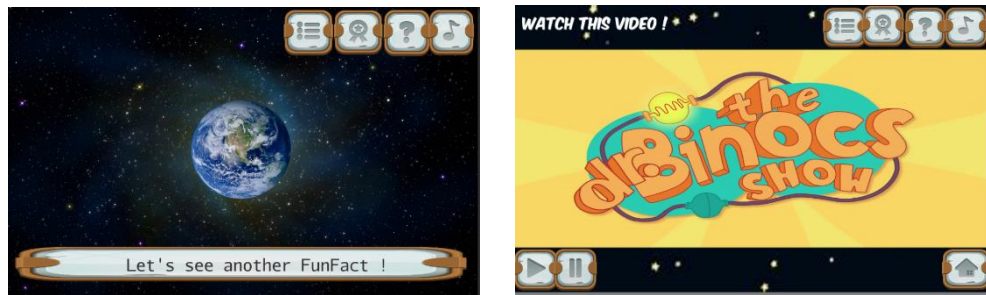


Figure 3. 8  
Quiz (Questions)

*(Source: Processed Data from the researcher using Unity software)*

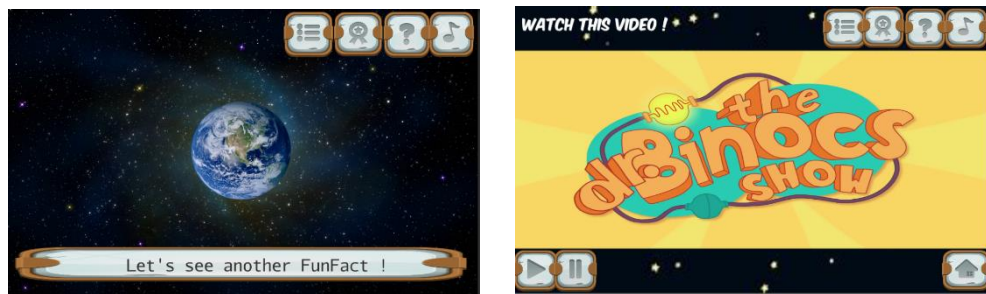


Figure 3. 9  
Watch the funfact

*(Source: Processed Data from the researcher using Unity software)*

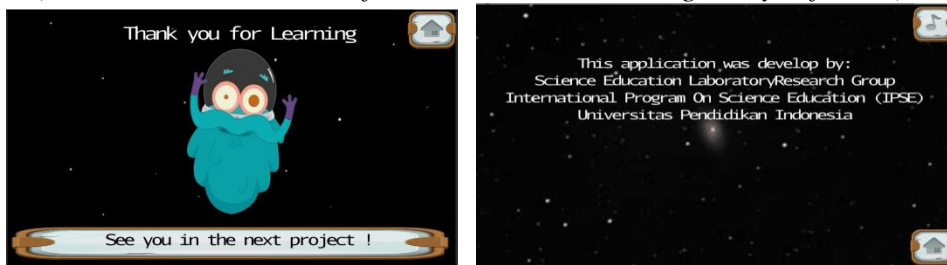


Figure 3. 10  
Closing

*(Source: Processed Data from the researcher using Unity software)*

### 3.3 Population and Sample

In this study three experts will be rated from different aspects. These aspects include: the fields of content science, language, and design (ICT) to validate mobile learning applications. The experts have a background based on their expertise in assessing these aspects. For mobile learning application impression, Junior High School students will assess the media.



In this research the population was all 7th grade students at Ar- Rafi' Drajat Junior High School in Bandung. The school uses bilingual language which is English and Indonesia as the communication and delivery language in teaching-learning process. The curriculum that applies in this school are National Curriculum which is Curriculum 2013. These curriculum is 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 the Indonesian Ministry of Education and also because of facilities that support students to conduct mobile learning. Most students come from an average to a higher family background which facilitates students to have devices such as cellphones to give them a teaching-learning process and a supportive environment. This school also facilitates students with a variety of sophisticated learning tools to support student learning, such as ChromeBook. ChromeBook is used by all students, where each student and teacher is equipped with ChromeBook for teaching and learning activities inside and outside the classroom. The population in this study were junior high school students in Bandung. The sample will be 30 students from junior high school in Bandung who will be selected through purposive sampling.

The purposive sampling technique, also called judgment sampling, is a deliberate choice of an informant because of the quality the informant has. This is a non-random technique that does not require basic theory or several informants. Simply put, researchers decide what needs to be known and determined to find people who can and are willing to provide information based on knowledge or experience (Bernard 2002, Lewis & Sheppard 2006). Bernard 2002, GarGarcia 2006, Gustad et al. 2004, Jarvis et al. 2004, Lyon & Hardesty 2005 states that Purposive sampling is specifically exemplified through key informant techniques, where one or several individuals are asked to act as cultural guides. Key informants are observant, reflective members of interested communities who know a lot about the culture and are both able and willing to share their knowledge (Bernard 2002, Campbell 1955, Seidler 1974, Tremblay 1957).

### **3.4 Operational Definition**

To avoid misunderstandings in this research, here are the terminology of the operational definitions described in this research:

#### **3.4.1 Android Mobile Application**

The Android mobile application is learning that takes place with the support of mobile devices. It was developed using an Android OS that runs on a smartphone or gadget. This application was created by a platform called Unity. For content, language and design (ICT) in mobile learning applications in this study will be assessed by the expert assessment rubric and the readability test for mobile learning applications that will be answered by the rubric of students and science teachers. This application is equipped with a variety of features that support the advantages of this application, namely the existence of two languages, voice guidance, assessment for users, also equipped with video, animation and text neatly packaged in accordance with the design of the making. The material presented in this application is earth layer material on the topic of atmospheric layers and geosphere layers. The center is adapted using the 2013 curriculum for 7th grade students. This application is expected to help students make it easier to learn the material layers of the earth in a fun way but students are still able to understand the material presented well.

#### **3.4.2 Interactive Multimedia**

Interactive multimedia is a technology that is implemented in software packages contained in this application. Interactive multimedia has a positive impact on making this application more attractive when used by users. Interactive multimedia in this application is equipped with animation, video, sound and video. Students and teachers as users can provide suggestions and input to improve the characteristics of interactive multimedia in this android learning application. The results of this are needed to remedy the deficiencies in making this application from the perspective of someone other than us as makers and designers.

### 3.5 Research Instrument

In this research to obtain data using this instrument. To measure the appropriateness of mobile learning applications and how their designs meet the understanding needs of actual students in studying the topic of the earth layer, the instruments will be used in this research this rubric for expert judgment. Expert judgment is divided into 3 categories including in the field of science, language, and ICT content. Each categories will consist of 3 experts, so the total number of all experts is 9 experts.

#### 3.5.1 Likert Scale and Ratings

To measure the rubric that will used in this research is by using a Likert scale and ratings. Rubrics include two aspects, namely the technique of making cellular learning applications and their characteristics. The characteristics are content about the topic of the earth layer, language, and cellular learning design itself. The scale is between 1 and 5 to determine whether the points in the cellular learning application are filled with intentions, goals, and expectations. Tabe 1 will explain the linkert scale for experts' judgment rubric.

Table 3. 1  
Likert Scale for Experts' Judgment Rubric

Scale	Criterion	Point
SD	Strongly Disagree	1
D	Disagree	2
N	Neutral	3
A	Agree	4
SA	Strongly Agree	5

(Boone & Boone, 2012)

The Likert scale and ratings are also used for students and teachers' questionnaire. There was a 5-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.

### 3.5.2 Written Review

Rubrics and questionnaires are places for extension of the scale, consisting of empty spaces for suggestions, opinions or comments on the whole of the Android mobile learning application.

#### 3.5.2.1 Rubric for Content

Contents aspects that will be assessed in the rubric in this study will use LORI. LORI (Learning Obstruction Review Instrument). The results of the assessment along with the aspects contained in the LORI standard will be explained in Table 3.2.

Table 3. 2  
Rubric for Content

No	Category/ Aspect	Assessment Gradient					Comment
		1	2	3	4	5	
1	<b>Content Quality</b>  (Veracity, accuracy, balanced presentation of ideas, and appropriate level of detail)						
2	<b>Learning Goal Alignment</b>  (Alignment among learning goals,						



No	Category/ Aspect	Assessment Gradient					Comment
		1	2	3	4	5	
							activities, assessments, and learner modeling)
3	<b>Feedback and Adaption</b> (Adaptive content or feedback driven by differential leraner input or learner modeling)						
4	<b>Motivation</b> (Ability to motivate and interest an identified population of learners)						

No	Category/ Aspect	Assessment Gradient					Comment
		1	2	3	4	5	

5 **Presentation Design**  
(Design of visual and auditory information for enhanced learning and efficient mental processing)

(Adoption by Nesbit & Li, 2004)

### 3.5.2.2 Rubric for language

The aspects assessed by linguists in the rubric are the use of spelling and grammar, display text on each application page, selection of dictionaries, and audio. The results of expert assessments of languages are explained in Table 3.3.

Table 3.3  
Rubric for Language

No	Category/ Aspect	Assessment Gradient					Comment and Suggestions
		5	4	3	2	1	
1	Spelling and Grammar	There are no errors in spelling, punctuation or grammar in the final draft of the application	There are 1-3 errors in spelling, punctuation or grammar in the final draft of the application	There are more than 5 errors in spelling, punctuation or grammar in the final draft of the application	There are many errors in spelling. Punctuation or grammar in the final draft of the application	There are almost a lot of errors in spelling, punctuation or grammar from the end application	

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2	Text	Easy to read and understandable, all materials are well delivered	Easy to read but less understandable	Not easy to read because there are several explanations that are not in accordance with the material	Not easy to read the explanation	The explanation text are not understandable
3	Diction	Diction is well applied and support the comprehension of materials	Diction is well applied but not support the comprehension of materials	There are many different dictionaries but still understandable	There are many dictionaries which cause user confusion	Diction is not well applied so the materials are not well delivered
4	Audio	The narration in the video is clear, use standard accent, and use understandable pronunciation	The narrator in the video is clear, but does not use a standard accent but the pronouns are understandable	The narration in the video is clear but not understandable and not use standard accent	The narration in the video is not clear because it uses a different accent	The narration in the video is not clear and the pronunciation is incorrect

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(Adoption by Saß, Schütte, & Lindner, 2017)

### 3.5.2.3 Rubric for Media (IT)

Contents aspects that will be assessed in the rubric in this study will use LORI. LORI (Learning Obstruction Review Instrument). The results of the assessment along with the aspects contained in the LORI standard will be explained in Table 3.4.

Table 3. 4  
Rubric for Media

No	Category/Aspect	Assessment Gradient					Comment and Suggestion
		1	2	3	4	5	
1	Accuracy						
2	Balanced Presentation of ideas						
3	Educational significance of knowledge						
4	Selection of font and color						
5	Writing style						
6	Legibility of text						
7	Other production value						
8	Alignment among learning goals						
9	Activities						
10	Assessment						
11	Learner characteristics						
12	Feedback obtained from different inputs and models of learning						
13	The ability to motivate and attract many populations and learners						
14	Visual design and sound to enhance						



- 
- the learning and mental processes efficiently
  - 15 Ease of navigation
  - 16 Proportional display interface
  - 17 The quality of the interface feature help
  - 18 Ease of access
  - 18 Control design and presentation format to accomodate disabled and mobile users
  - 20 Ability to be able to be used and developed again
  - 21 Compliance with international standards and specifications
  - 22 Accuracy
  - Balanced Presentation of ideas
- 

(Adoption by Nesbit & Li, 2004 )

### 3.6 Instrument Validation

There are several analyzes that must be assessed by the supervisor before the instrument is reviewed and used. The analysis aims to ascertain whether the instruments are appropriate or not. The quality of the test must meet what standards are measured before being used by experts, students, and science teachers.

### 3.7 Data Collection

To obtain data using an instrument as stated previously, several different ways are taken for each subject in this study which are explained as follows:

#### 3.7.1 Experts

The rubric is given directly to each expert based on the aspects to be assessed. The sample mobile learning application is installed on mobile researchers or experts who are asked to install the application on their own mobile. After the cellular learning application is checked, the results of the rubric are returned. Data collected from experts is in the form of ratings and suggestions or comments.

#### 3.7.2 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:

#### 3.8.1 Likert Scale and Ratings

The experts' judgment rubric was analyzed by a quantitative measurement, adapted from (Riduwan, 2010).

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

Then, comparing the result with the total amount of highest score and the result is converted to a percentage.

#### 3.8.2 Written Review

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

Table 3. 5  
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.

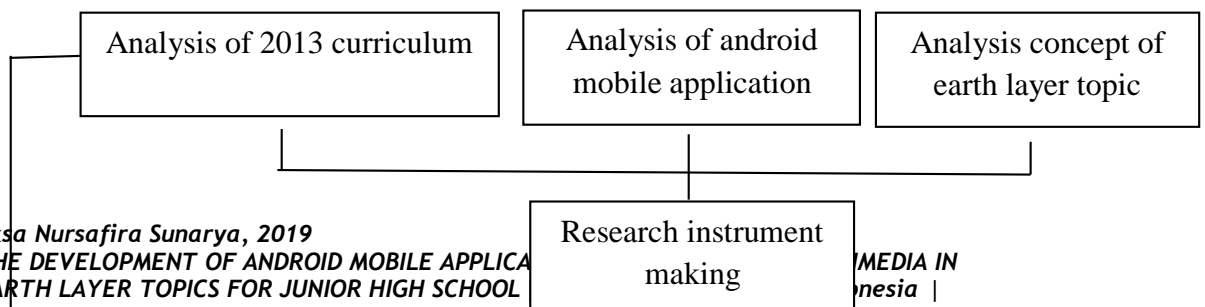
### 3.9 Research Procedure

To make this research systematically organized, there are three stages of the procedure including preparation, implementation, and completion. The research plot can be seen in Figure 3.1. The steps in the preparation phase are, first, analysis of 2013 curriculum, analysis of android mobile application, and the topic of the earth layer. Then, build an instrument which is a mobile learning application media, expert assessment rubrics, and readability questionnaire for students and science teachers in junior high school, designing android mobile learning application storyboards, and the final step is designing mobile learning using application maker software by technicians.

The second stage is the implementation stage which includes some steps which are, first, investigate the instrument by the validation experts (expert judgment). The things that will be 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 android 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 res





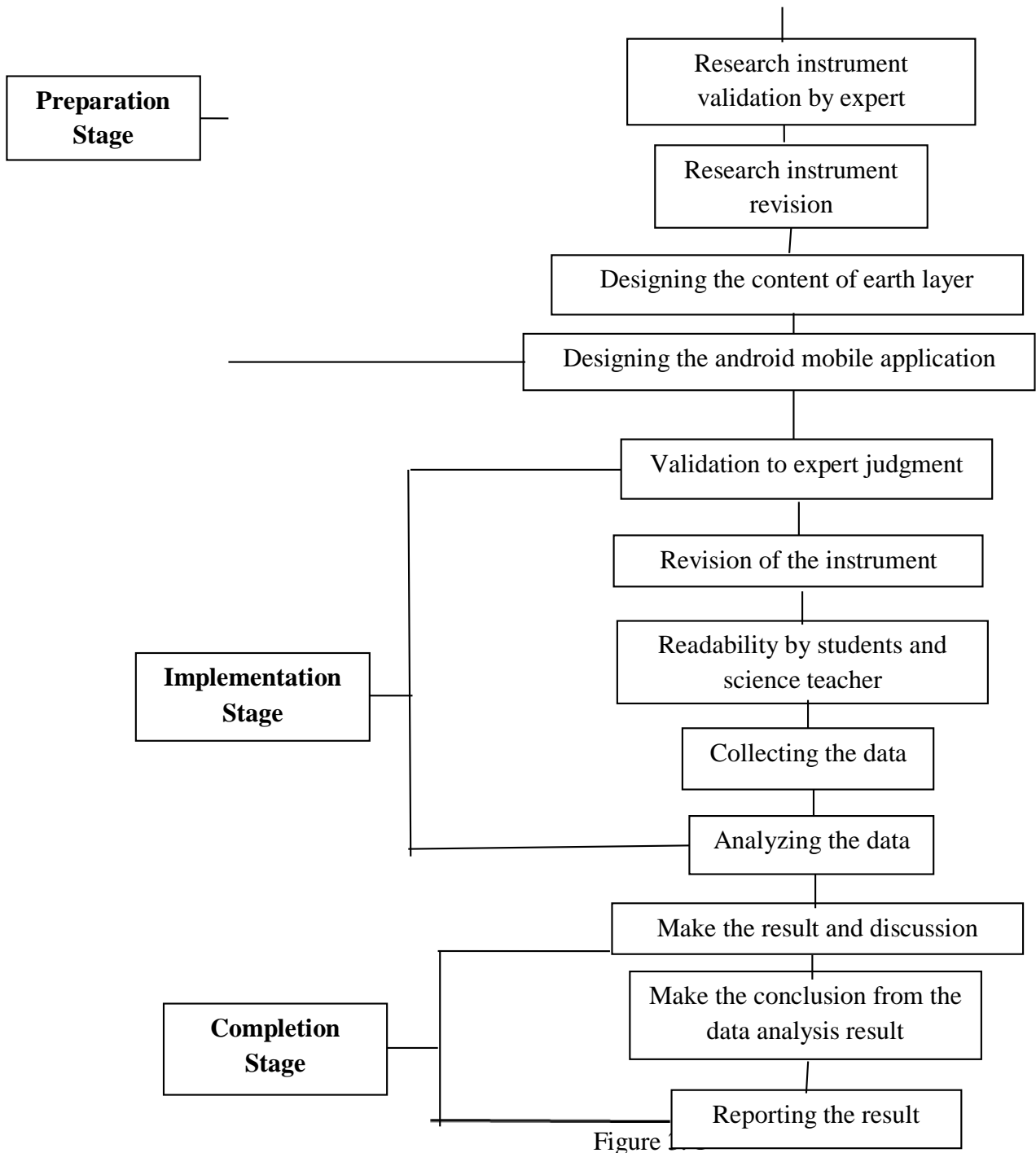


Figure  
Research Plot

