CHAPTER III
METHODOLOGY

3.1. Research Method

The method used in this research is pre-experimental method. There is no control group or comparison groups in pre-experimental method (Dawson, 2007). Pre-experiments can be a cost-effective technique to see if a possible answer is worth investigating further. This research has used pretest and posttest design.

The method to assess in this research by developing the multimedia. The development model used to develop interactive multimedia products is the ADDIE model. ADDIE Model is an instructional design process. To ensure effective learning, instructional design aspires for a learner-centered approach to education rather than the traditional teacher-centered approach. This means that the learning outcomes, which were defined following a comprehensive examination of the learners' needs, drive every aspect of the education (Bhushan, 2006). This model consists of five stages, which is Analyse, design, develop, implement and evaluate. This design want to know the student understanding or test hypotheses about the presence or absence of the effect of the action after implement the application. After the multimedia is validated by material experts and multimedia experts, the multimedia is ready to be implemented into the learning process. It is expected that after using the interactive multimedia learning multimedia the learning outcomes obtained by students increase and the multimedia can be said to be effective. Then it will distribute the question pretest and postest, questionnaires and review from experts regarding multimedia content. This is also in accordance with the purpose of this study to improve the impact of interactive foodivity as an interactive medium on students' understanding of food nutrition topics.

3.2. Research Design

The research design utilized in this study is one groups pretest and posttest, which is a research design that includes a pretest before treatment and a posttest after treatment. There was no control variable in this study, and the sample was chosen at convinience. As a result, the therapy's outcomes may bepredicted more

precisely because it can be compared to the condition before treatment (Dawson, 2007).

Table 3.1
One Group Pretest-Posttest Design

Pretest	Treatment	Posttest
O_1	X	O_2

(Gerbing, 1984)

Based on Table 3.1, The first thing in the implementation of the experiment using a single sample design is done by giving a test to the sample that has not been treated called a pre test (O_1) to get an initial score on students' understanding of food nutrition. After getting the score result, then treatment (X) with provide foodivity interactive applications as interactive multimedia. After the treatment is done, another test is given to measure the level of students' understanding after being subjected to treatment (X), in the post test data will be obtained from the experiment where students' cognitive understanding increases or there is no change at all. Compare O1 and O_2 to determine how much difference there is, if any, as a result of the treatment. Then the data were analyzed using t-test (William & Hita, 2019).

3.3 Population and Sample

The population in this study were 8th graders in West Java. The research are located in Sukabumi and Kuningan. In accordance with the 2013 National Curriculum, the topic of Food Nutrition is taught by 8th grade students. The population is the object by determining the population, then the researcher will be able to perform data processing.

Sampling that will be used is convinience sampling technique and the number of grade 8th students or respondents is 53 students which consist of 30 female and 23 male. Students are drawn from several 8th grades in the school. The convenience sampling strategy was utilized in this research. According to (Farrokhi & Mahmoudi, 2012), convenience sampling is the collection of data from individuals of the population who consent to supply it. Thus, anyone who agrees to submit the required information to qualified researchers, directly or indirectly, might be included in this study as a sample if the respondent is an acceptable source of data. Sampling depending on the availability and accessibility of items. At excess

of this sample, the sample is taken / chosen because it is in the proper location and time. The sample is used to facilitate data processing, the author will take part in the number and characteristics possessed by the population. By using samples, researchers will find it easier to process data and the results are more credible.

3.4 Operational Definition

In order to avoid misinterpretation in this study, the following operational definitions will be presented:

1. Interactive multimedia

Interactive multimedia in this study uses construct 2 software to create foodivity interactive in implementing construct 2. The Foodivity interactive was 2Dimension design. The material presented in this application is material with the topic of Food Nutrition. This is adapted to the 2013 curriculum for 8th grade students. This application is expected to help students learn more easily. An expert judgment rubric determined the application's quality. The data instrument used a material expert validation sheet, media expert validation, and teacher validation. while a student questionnaire determined the application's readability. Researchers used a questionnaire with a Likert scale in the form of a checklist.

2. Students Understanding

Understanding of students included in this study based on bloom taxonomy indicators consisting of C1 (Remembering),C2 (Understanding), C3 (Applying), C4 (Analyzing), and C5 (Evaluating). Students' understanding was analyzed using an objective test consisting of 20 multiple choice questions related to the topic of the material. Data collection was done by pretest and posttest.

3. Expert Judgement

Expert assessment assesses the quality of interactive multimedia In this study, the expert assessment rubric was prepared based on the adaptation of the Learning Object Review Instrument (LORI) from (Nesbit et al., 2009). Content quality, learning alignment goals, motivation, adaptability and feedback, presentation and design, usability, accessibility, and standard compliance are the eight indicators in this rubric. This rubric uses an assessment in the form of

a Likert scale 5. The rubric also consists of blank spaces for suggestions, opinions, or comments.

4. Students Respond

Students responses were carried out to analyze the readability of interactive multimedia. Student responses were analyzed using a questionnaire. Questionnaire indicators include mobile interface, material, improve understanding, and motivation,. This instrument also uses a Likert scale. 5 scales are consisting of strongly disagree, disagree, neutral, agree, and strongly agree.

3.5 Assumption

Based on the study literature of some researcher, the assumption of this research stated as follow:

1. Foodivity interactive is an interactive multimedia can improve the learning outcomes in the cognitive level aspect on the topic of food nutrition.

2. Multimedia learning has many benefits, such as having more effective conditions, motivating students to learn more deeply, and tracking student progress by looking at student scores through exercises stored in multimedia (Anwariningsih, 2013).

3.6 Hypothesis

The following are the hypotheses that will be tested in this study:

H_0: There is no significant difference in students understanding after implementing foodivity interactive as an interactive multimedia at Food nutrition topic.

H_1: There is a significant difference in students understanding after implementing foodivity interactive as an interactive multimedia at Food nutrition topic.

3.7 Research Instrument

A research instrument is a tool that is used to gather, examine, and investigate information about a problem. Research instruments can also be thought of as a tool for gathering, processing, analyzing, and presenting data systematically and objectively in order to solve a problem or test a hypothesis. In this study, there are three types of instruments used which are Expert judgment, Students

questionnaire and students understanding. The detailed explanation will be described below:

3.7.1 Expert Judgement

This research to obtain data using the instrument to measure the appropriateness of interactive media and how their designs will affect the student's understanding of Food nutrition topics. The instruments will be used on the rubric for expert judgment. The rubric was adopted from LORI (Learning Object Review Instrument).

Table 3.2

The Indicator and Aspect for Expert Judgement

Indicator	Aspect
Content Quality	Accuracy, balanced presentation of ideas, appropriate level of detail, and reusability in contexts
Learning Goal Alignment	Alignment among learning goals, activities, assessments, and learner characteristics
Feedback and Adaptation	Adaptive content or feedback driven by differential learner input or learner modeling
Motivation	Ability to motivate and interest an identified population of learners
Presentation Design	Design of visual and auditory information for enhanced learning and efficient mental processing
Interaction Usability	Ease of navigation, predictability of the user interface, and quality of the interface help features
Accessibility	Design of controls and presentation formats to accommodate disabled and mobile learners
Standards Compliance	Adherence to international standards and operability on commonly used technical platforms

(Nesbit et al., 2009)

Based on Table 3.2, expert judgment will assess indicators based on predetermined aspects. these aspects have represented the achievement of a media. A media can be said to be feasible to use if it has gone through a judgment process. In this study, media experts, content experts and teachers assessed by filling in according to a 5 Likert scale.

3.7.2 Students Questionare

Questionnaires are basically another way to collect data that is of interest, and they should be viewed as one of several options relevant to a given situation (Sinclair, 1975). So that the respondent may create, articulate, and relay the responses effectively, questions must be posed in a clear, and comprehensible. In broad terms, questionnaires are considered when it is desired to learn how individuals react to the world surrounding them, or how they could react to changes that are proposed. In this study, the questionnaire aims to see students' impression of using interactive foodivity as interactive multimedia. This questionnaire uses a Likert scale with a scale of up to 5. This questionnaire uses a Likert scale with a scale of up to 5. This questionnaire consists of several statements which will be grouped into several category. The following is an explanation of the questionnaire rubric in Table 3.3

Table 3.3

The Category and Statement for Students Questionnaire

Category	Statement
Mobile Interface	The interactive media design "Foodivity Interactive" used is attractive.
	The shape, model and size font of media used are simple and easy to read.
	The use of interactive media "Foodivity Interactive" is very easy.
Material content	The video on the interactive media "Foodivity Interactive" supports understanding the nutritional material.
	Animations in this interactive media easy to understand nutrition material.
	Games in this interactive media help to understand nutrition material.
	The content of the material in this interactive media is related to everyday life.
Improve Understanding	The material presented of interactive media is easy to understand.

| | Presentation of material in this media helps in answering questions |
| Motivation | The existence of interactive media can provide motivation to learn nutrition material |

From the table, Each statement given to students consists of a scale level that is given a score of 1 to 5. A score of 1 means strongly disagree, and a score of 5 means strongly agree. So that in this case the more students agree with the statement given, the higher the score given.

3.7.3 Students Understanding

The research instrument in this study is a test item question in the form of an objective test in the form of multiple choice with a total of 20 questions. The question is only used to measure the cognitive domain using Bloom's taxonomy measurement indicators C1 to C5.

Table 3.4

Blue Print of Cognitive Test Item

Concept	Cognitive Process Dimension and Number of Test Item					Total
	C1	C2	C3	C4	C5	
Nutrition	1	2	14	-	17	4
Diet Balance	-	7	16	-	9	3
Carbohydrate	-	-	20	8	-	2
Fat	-	5	10	13	-	3
Protein	-	4	19	-	-	2
Vitamin	3	-	-	11	18	3
Food Testing	-	6	12	15	-	3
Total	2	5	6	4	3	20

Based on Table 3.4, the test items are grouped into several concepts according to the cognitive level adopted based on the revised bloom taxonomy. The concept consists of Nutrition, diet balance, carbohydrates, fat, protein, vitamins, and food testing. The distribution of test items on C1 to C5 is a normal distribution. It means that at the low level, a few items are given and at the high level, only a few test items are given. While the rest at the intermediate level are more about the test items. Students obtain only C1-C5 through cognitive assessments because C5 (Evaluation) is one way for making a final evaluation tool for student learning outcomes, particularly activities conducted to determine whether or not the

program's objectives were met. Additionally to measure the extent of efficiency with which it is implemented. The purpose of the evaluaation is to determine whether or not the stated objectives have been met and whether or not the material delivered to or taught to students is accurate. C6 is not assessed cognitively in this study because it is associated with creation, and hence students are asked to create and design something. This is inconsistent with the software products.

A trial was conducted on students who had learned about food nutrition before the real data collection began. Instrument testing was carried out to establish the instrument's validity and reliability in retrieving the relevant data. A validity test, a reliability test, a power differential test, and a difficulty level test were used to test the instrument in this objective test. The trial was carried out in order to produce an instrument that complies for validity and reliability, so that it can be used to collect the data needed to solve the answer that have been presented. If an instrument possesses valid and reliable capabilities, it is said to be good as a measurement tool (Heale & Twycross, 2015). The following is a description of the technique of analysis:

3.7.3.1 Validity

Validity is the extent of the concept which accurately measured in a quantitative study (Heale & Twycross, 2015).The stage of testing the validity of the instrument is by measuring test items regarding food nutrition. The items were compiled and their validity tested whether the items were valid or invalid. Steps In conducting validity, the first is compiling items based on predetermined indicators. then the question is consulted with the experts, in this case the supervising so that it can be feasible in data collection, then the readability test of the items is carried out. To find out the results of the validity of using the SPSS version 23 program.

The results of the validity of each item can be determined through the validity interpretation. By looking at the correlation coefficient we can determine the category of validity. The validity interpretation are described below:

Table 3.5

Validity Interpretation

Correlation coefficient	Validity category
0.80-1.00	Very high

0.60-0.80	High
0.40-0.60	Enough
0.20-0.40	Low
0.20-0.00	Very Low

From the validity of the interpretation data, it can be concluded that the results are based on the information that will be explained below:

Table 3.6

Validity Result

Question Number	Validity Score	Interpretation	Validity Criteria	Decision
1	0.350	Valid	Low	Directly used
2	0.566	Valid	Enough	Directly used
3	0.471	Valid	Enough	Directly used
4	0.545	Valid	Enough	Directly used
5	0.500	Valid	Enough	Directly used
6	0.391	Valid	Low	Directly used
7	0.332	Valid	Low	Directly used
8	0.367	Valid	Low	Directly used
9	0.373	Valid	Low	Directly used
10	0.363	Valid	Low	Directly used
11	0.315	Valid	Low	Directly used
12	0.308	Valid	Low	Directly used
13	0.305	Valid	Low	Directly used
14	0.370	Valid	Low	Directly used
15	0.463	Valid	Enough	Directly used
16	0,328	Valid	Low	Directly used
17	0.428	Valid	Enough	Directly used
18	0.336	Valid	Low	Directly used
19	0.357	Valid	Low	Directly used
20	0.313	Valid	Low	Directly used

Based on Table 3.6 stated the results of the validity of 20 multiple choice questions, it turns out that all of them can be said to be valid and the questions can be used. However, some questions still need to be improved by revising the questions.

3.7.3.2 Reliability

The degree to which a test consistently assesses whatever it measures is defined as reliability. Random measurement errors impact reliability, whereas systematic or continuous errors have an impact on validity (Kimberlin & Winterstein, 2008). The purpose of an instrument reliability test is to assess how consistent a measuring instrument is. In this situation, a reliable instrument is one that produces the same results when used several times to measure the same data. The Alpha formula was employed to verify the instrument's reliability.

In this study, the reliability test was obtained by analyzing data from one test by calculating the Cronbach's Alpha value of the tested variables. The magnitude of the reliability index stretches from 0 to 1, the acceptable coefficient is at least 0.70 (Taber, 2018). The reliability coefficient is closely related to the standard error of measurement. Instruments declared reliable or unreliable are described as follows:

Table 3.7

Reliability Interpretation

Correlation Coefficient	Reliability Category
0.80-1.00	Very high
0.60-0.79	High
0.40-0.59	Average
0.20-0.39	Low
0.00-0.19	Very low

The instrument reliability test in this study was carried out with the help of the SPSS version 23 application. The results of the reliability of test item instrument can be seen in the table:

Table 3.8

Reliability Statistic Result

Cronbach's Alpha	N of Items
0.70	20

Based on the results of data analysis using SPSS 23, that the instrument was obtained with Cronbach's Alpha coefficient, it is known that r count = 0.70, so the instrument is said to be reliable in the high category and can be used for data

collection. This instrument can be used several times to measure the same object at different times and will produce the same data.

3.7.3.3 Difficulty Level

The proportion of people that properly answer a test item is used to determine the difficulty of an issue (Fraenkel & Wallen, 2012). Good learning outcome assessment has a balanced level of difficulty throughout the test items, which indicates that it is normally distributed. The smaller the amount, the more difficult or easy the test item. The proportions of students who correctly responded to an item are referred to as item difficulty.

In other words, it is the percentage of test participants who properly answer a question. Item difficulty is determined by an index that ranges from 0 to 1, with 0 being the difficult and 1 being the most easiest (Arikunto, 2006). The difficulty level of a good test item should be balanced. It may not be too easy or too difficult since a test that is too easy or too difficult will have the same score distribution, making it difficult to distinguish between students who did well and those who did poorly.

Following the discovery of the item difficulty index, the level of item difficulty is determined using the index. Based on the range scale of the index, the level of item difficulty decides whether an item is regarded difficult, moderate, or easy. Based on the rank scale, the following is a classification of item difficulty level:

Table 3.9

Diffilculty Level Interpretation

P	Interpretation
0.00-0.30	Difficult
0.31-0.70	Moderate
0.71-1.00	Easy

Based on the rank scale above, we can conclude the level of item difficulty by information in Table 3.10 below:

Table 3.10

Diffilculty Level Result

Question Number	Difficulty Score	Information	Question Number	Difficulty Score	Information
1	0.40	Moderate	11	0.63	Moderate
2	0.65	Moderate	12	0.42	Moderate
3	0.56	Moderate	13	0.60	Moderate
4	0.60	Moderate	14	0.60	Moderate
5	0.73	Easy	15	0.58	Moderate
6	0.29	Difficult	16	0.48	Moderate
7	0.63	Moderate	17	0.60	Moderate
8	0.23	Difficult	18	0.52	Moderate
9	0.77	Easy	19	0.67	Moderate
10	0.40	Moderate	20	0.31	Moderate

Based on the data, it can be seen that from a total of 20 questions, 2 questions are categorized as easy, which means that almost all students can answer the questions well. However, 2 questions are categorized into difficulty levels, this shows that many students still cannot answer the question. The remaining 18 questions are categorized with a moderate level of difficulty.

3.8 Data Analysis

This research used quantitative data analysis and the activity will be put after all data has been collected. In this analysis, data used descriptive statistical analysis. Descriptive statistics is the information presented to describe some basic features of the data such as the mean and standard deviation (Mishra et al., 2019). In the current study, the researcher decided to use the Likert-type format to allow subjects more flexibility and questionnaires to measure students' impressions toward interactive multimedia application in the learning processes. Questions and points on the questions to demonstrate understanding used statistical software (SPSS version 23 software, and Microsoft Excel) for statistical analysis results. The result will be described and explain further below:

3.8.1 Objective Test

The objective test was employed in the pretest and posttest to assess the application's effectiveness in student understanding. The objective test consists of 20 multiple-choice questions. The normality test and the N-gain test are two tests that can be used to examine the results of the pretest and pretest. SPSS version 23 was used to evaluate the results of the tests. Below is a more detailed explanation:

3.8.1.1 Normality Test

Normality test is used to determine whether the data obtained from the data collection of the independent variables (students understanding) and the dependent variable (Interactive media) are normally distributed or not. The Kolmogorov-Smirnov test is used when the sample size is larger than 50, and the Shapiro-Wilk test is used when the sample size is less than 50 (Mishra et al., 2019). The significance level utilized in this study was 0.05. When the significant value is greater than 0.05, the data is considered regularly distributed. First determine whether the data is normal, and then determine whether the mean is a representative value of the data. If applicable, means are compared using parametric tests. Otherwise, nonparametric approaches are employed to compare the groups using medians.

3.8.1.2 N-Gain Test

The N-gain test was used to measure the improvement in students' understanding between before and after using interactive multimedia in learning. This research use Microsoft Excel in processing calculations. To get the results of the calculation data is used by using syntax *=SUM(Postest-Pretest)/(Maximum Score-Pretest)*. The maximum score, post-test, and pre-test test scores could be used to describe an individual student or an average measure for a group. A group of students' average can be calculated by adding the g of each student in the group (Bao, 2006).

In addition, the N-gain is calculated and then converted to the criteria in Table 3.11 Below:

Table 3.11

N-Gain Interpretation

Score interval	Categorize
$0.7<g\geq1$	High
$0.3<g>0.7$	Medium
$0.0<g>0.3$	Low

(Nisa et al., 2018)

3.8.2 Likert Scale

There are numerous measurement tools or tests available. The measurement form or the Rating Scale test is frequently used to measure something that can be measured readily, conveniently, quickly, and consistently. Renis Likert rating scale is the most well-known (Abdul, 2010). The questions aren't excessively many, but they provide greater reliability than other rating scale types.

The percentage of students who chose strongly agree, agree, neutral, disagree, and strongly disagree on a Likert scale was used to examine the students' questionnaire. Then, based on Aiken V, the expert's judgment rubric result was utilized to examine the legitimacy of the application (Ramadhan et al., 2019). This is accomplished by instrument measurement, such as a test or questionnaire, which is legitimate proofed if the expert feels the instrument can measure mastery of a skill described in the domain tested.

3.9 Research Procedure

There are three stages to make this research systematically well structured. The stage consists of the preparation stage, implementation stage, and the Stage of completion. The details will be shown as follows:

1. Preparation Stage

    The steps in the preparation phase are:

    a. Analysis and collecting the information about Food nutrition topic based on national curriculum 2013.

    b. Explore and analyze the existing interactive multimedia.

    c. Build an instrument which is expert assessment rubrics, and questionnaire for student's respond.

    d. Designing flowchart and storyboards of foodivity interactive as an interactive multimedia.

    e. Build the multimedia by using construct 2

    f. Validating the instruments to the experts

    g. Validating the instruments to the students who have learned about the related topic which is the Food nutrition topic

    h. Revising the instruments based on validation previously

2. Implementation Stage

At this stage, the researcher will begin to conduct the research, the data needed for the analysis itself. The Detailed will be shown as follows:

a. First meeting, conducting Pre-test for the students by giving question through google form (https://forms.gle/hRXS4Miv2P5M3cDA7)

b. Second meeting, Given the link to download the application for testing multimedia of foodivity Interactive and they explore independenly

c. Third meeting, conducting Post-test for the students by giving question through google form (https://forms.gle/G4ytrFQYgxXvh84H8)

d. After fill the post test, giving the questionnaire for students responds

3. Completion Stage

At this stage, the researcher does some stage, which is:

a. Collecting the data

b. The data is analyzed based on result and discussion

c. Reporting the result.

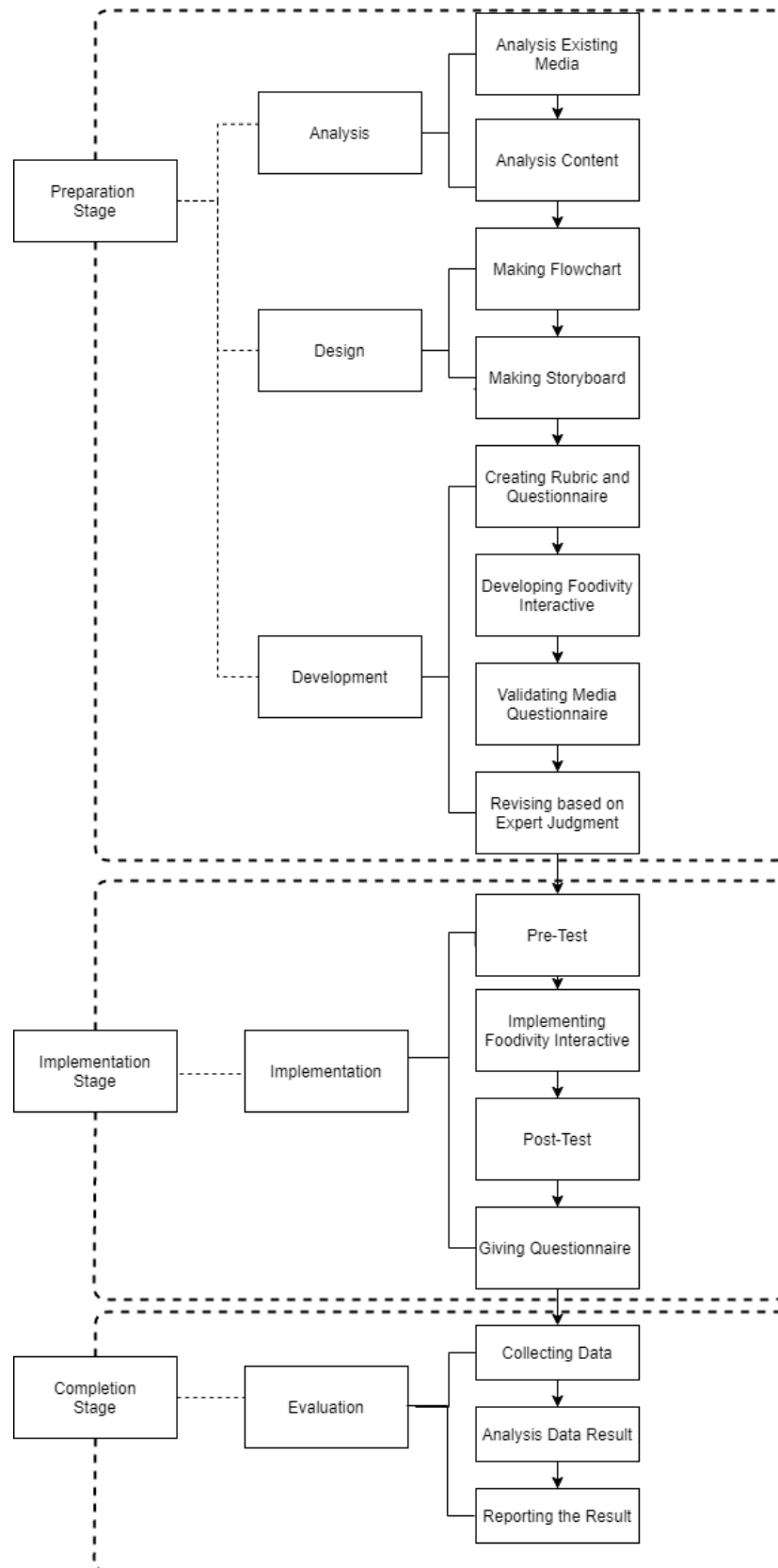All of the process involved in the procedure of research is simplified into the scheme that shown in Figure 3.1.

Figure 3.1 Research Procedure