CHAPTER III
RESEARCH METHODOLOGY

3.1 Research Method

Descriptive research will be used for this research method. According to Fraenkel, Wallen, & Hyun (2013), Descriptive surveys portray the situation as completely and closely as feasible. In educational research, the most popular reflective methodology is the study, as when scientists grossly oversimplify the features (skills, opinions, habits, etc.) of people or organizations or (occasionally) physical settings (such as colleges).

Descriptive research aims to describe the existing circumstances without evaluating the interaction between the factors and identifies the problem by investigating the actual condition of the situation. It includes the identifying of the features and characteristics of a certain occurrence that is observed by observation, as well as the connection of two or more phenomena being investigated. This research method is appropriate and suitable for the objectives of the research. Which are, to develop, validate, and the perception respond of the website education use interactive media for integrated science.

3.2 Research Design

The researcher created web-based learning in the form of a website that develops on HTML 5, it can be accessed from a browser on a mobile phone or personal computer and use the internet connection. Final paper supervisors then supervised the website education before the experts that expertize in the content (Physics and Biology), language (English), and media or design (IT) assess it. After getting suggestions and revisions until the final assessment, the website will be brought to science teachers and students to be reviewed.

3.3 Research Subject

The website education will be judged by three experts in each aspect: science content, language, and media (IT) for the website education. Those experts already have a background based on what they expertise of, and will assess for the website education validation and impression, also the science teachers and students of Junior High School will assess the media to know their perception.

The location of this research is Private Secondary School of "Pelita Nusantara School" in Bandung. The school utilizes English as a communication tool in the teaching-learning process. The curriculum that relates to this college is the Curriculum 2013 of the National Curriculum. These curricula are applicable to all grades of middle 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 open the website education on their browser of mobile phone. Most of the students come from average to the higher family background which facilitates the students to have devices such as mobile phone and also the school facilitate the students that they can access the computer that has connected to the internet and to browse the website education and also provide them with supportive teaching-learning process. The population in this research are all of the students (grade 7^{th}, 8^{th}, and 9^{th}) Pelita Nusantara Bandung Junior High School.

3.4 Operational Definition

In attempt to prevent misunderstanding in this study, certain operational definitions are clarified in this study. Those terminologies are explained as follow:

3.4.1 The Stages of The Development of The Website Education

Web-based learning is the learning that takes place with the support of the website that locates to the internet that maintains learning materials content. While to develop the website education, it will be followed as:

1. The stages of development of the website education

The process to develop the website education consist of several steps: (1) content analysis; (2) user analysis; (3) software necessity analysis; (4) hardware necessity analysis; (5) learning materials design; (6) flowchart design; (7) storyboard design; (8) interface construction making; (9) coding construction making. The website education was developed by using HTML 5 that supported by new version of notepad++ 7.7 that able to run on the personal computer and personal tablet devices for windows, ios, and android or others system operations. The interactivity content will be used to deliver the material that will consist of the picture with gif format, video, colorful content, and a game quiz to make the content of the website education become more interesting to use.

The student will operate the web with the flow of the web will go as follows:

a. The student opens the link of the website and operate the website by any devices as long as the devices have a browser and can connect to internet access.
b. In the start of web operation, the student will open the home page of the website and they can choose the page that will guide the students by inquiry learning first to ask student or user prior knowledge.
c. The student plays the game of Airplane to find the keywords to learn levers in simple machine materials.
d. The student learns the materials of levers in simple machine.
e. The student plays true or false quiz of levers in the simple machine to measure their understanding after learning levers in simple machine materials.
f. The student plays Maze Chase to find the keywords to learn levers in the human body materials.
g. The student learns the materials of levers in the human body.
h. The student plays multiple choice quiz of levers in the human body to measure their understanding after learning levers in the human body materials.
i. The student as the user gives their feedback and comment on the contact button.

2. Levers in the human body as the content for the website education

Integrated science is applied to the curriculum of 2013, it means that there is a material that consists of two or more subjects. The content website education will deliver levers in the human body material. Levers are one type of simple machine as a Physics part, the concept of levers in the simple machine can be applied to the human body. In Biology part, the human body has relations with the tendon, ligament, and muscle works on the skeletal system topic, and it can be applied how levers in the human body work.

3.4.2 The Experts Judgment Validation Towards The Website Education

The website education will be implemented for the science teachers and students. While, the content of the items must be carefully evaluated and the determination of the content validity evidence is often judged by expert judgment (Kalpan & Dennis, 2009). Therefore, the experts judgment will judge the content (Physics and Biology), language, and media or design (IT) towards the website education whether it can be rejected, accept or there is a revision, and should be revised based on the comment and suggestion from the experts with the rubric that has been prepared.

3.4.3 The Science Teachers' and Students' Perception Respond Towards The Website Education

The students and science teacher gave the perception respond after using the website education, and it is called a readability test. The readability level of the website education can exert an influence on the science teacher and students perception respond result, e.g. difficulty in reading the website education content or the clearness of the website education might distract from the purpose of a test (Cohen, Manion, & Morrison, 2011). The readability of science teachers' and students' perception respond will be assessed by the questionnaire use Technology Acceptance Model (TAM) and Five-Dimensional of Interactivity, and it will be measured by Five-Likert scale, written review and the internal consistency to choose the five-Likert scale also will be measured.

The internal consistency of the scale refers to the degree to which those objects can be said to measure a certain thing. This can be evaluated merely by

searching at the products and compare their contents with prior conceptual reports of the approach in obvious problem. For example that two items can be assumed to be measuring the same attitude if those who agree with one item also tend to agree with the other that is if the answers to these products are strongly linked. And the key indicator of internal consistency in the Likert scale is the ' alpha coefficient, ' which is based on the discrepancies of each pair of items in the scale. A less satisfying characteristic of this instance scale is that it is not balanced (Johns, 2010).

3.5 Research Instrument

The instrument is used to obtain or gain the data in this research. In order to measure the suitability of website education for web-based learning and how its design met students' actual necessity of comprehension in levers in the human body topic, the instruments that used are experts' judgment rubric using accept, reject and revise, and for the questionnaire was using TAM and Five-Dimensional Interactivity with 5-Likert scale and the written review for science teachers and students.

3.5.1 Rubric for Expert Judgment Validation

The rubric was given directly to the experts of content (Physics and Biology), language and design (IT). The rubric for the expert judgment was given in the same aspect and indicator, there are not differentiated for judging the materials' content, language and IT. The reason is for knowing the experts perspective between all of the indicators and aspects. Then, the website link has been already published by the researcher, the expert can open the website link individually by experts' device, or researcher brings devices to open the website, or attach the printing screenshots of the website education content. After the website education use an interactive content had been examined by the experts, the rubric result was returned. The data will be collected from the expert were in the form of checklist on reject, accept, and revise from the indicator and aspect of the rubric, and fill the suggestion or comment. After that, revise the content or delete the content if rejected by the experts. The meaning of each checklist of judgment on the rubric, it can be showed on table 3.1.

Table 3.1
Expert Judgment Cheklist on the Rubric

Reject	: Delete inappropriate content or design
Accept	: Content or design is received
Revise	: Re-examined the content or design

(Augustine et al., 2012)

The table will be shown the results' total of the experts that choose or checklist on the option of reject, revise, and accept of the indicator and the aspect. **First**, for the reject, it will show the total of experts judgment suggests to delete the content indicator of the website education. **Second**, for the accept, it will show the total of the experts judgment that accepts the content indicator on website education and there is no revision, **Third**, for the revise, it means there was a revision for the website education and shows the total of expert judgment that gives a suggestion of the indicator whether in a language, content, or the design to make a better website education and make more valid.

The rubric is specified with indicators that proposed by research will be adopted for learning goals alignment aspect with the indicator of the significance of learning guidance and it exists on the rubric Stanford Center for assessment, learning, and equity (2015). In another hand, there is two aspects that needs for the content judgment which is the relevance of the item and the balance of coverage of the items in the website education content that is adopted from the article with the title "Assessing Content Representativeness of Performance Assessment" (Crocker, 1997). The content requires two gathering evidence, and it will apply for the web and its website education validation content rubric by experts will be explained by table 3.2.

Table 3. 2
Experts' Judgment on Content Validation Rubric

Aspect	Indicator	Checklist (✓)			Comment
		Reject	Revise	Accept	
Learning Goal Alignment	The content is in line with learning goals The learning goals are clear are significant				
The relevance of the item content	The topic is delivered clearly The combination of the relations between physic and biology subject is relevance The figure / video / caption was appropriate and relevance with the topic				
The balance of coverage of the items in relation of the content	The content and the design of web is balance and there is no barrier each other Follows the norms and conventions of scientific writing accurate each other				

Second, the grammar assessment should be recognized both in large-scale and classroom-based contexts (Purpura, 2013). The rubric for the language is specified with indicators that proposed by research that apply for the test grounded in Lado's skills-and-elements conceptualization of L2 proficiency is the Comprehensive English Language Test (CELT) (Harris, Palmer, Liao, 2009). The grammar subtest assessed five structures, and it will apply for the website education validation rubric focuses on language, it can be contextual spelling, grammar, punctuation, sentence structure. The rubric on language by experts will be followed as table 3.3.

Table 3. 3
Experts' Judgment on Language Validation Rubric

Aspect	Indicator	Checklist (✓)			Comment
		Reject	Revise	Accept	
The Arrange of The Word and Sentence in The Website	The choice of the verb from the web is appropriate				
	The form and choice of nouns, pronouns, adjectives, and adverbs from the web are appropriate				
	The word order from the web is appropriate				
	The choice of prepositions from the web is appropriate				
	The formation of tag questions and elliptical responses from the web are appropriate				

Third, the rubric is specified with indicators that proposed by research to have well-designed for website with the title "Games, Learning and Assessment" (Shute & Ke, 2012). The website validation on media/design (IT) rubric by experts will follow as table 3.4.

Table 3. 4
Experts' Judgment on Media Validation Rubric

Aspect	Indicator	Checklist (✓)			Comment
		Reject	Revise	Accept	
Motivation	The ability to motivate and attract many users of the web				
Presentation Design	Visual design and sound of the web can enhance interactive for the users				
	All of the hyperlink / button works smoothly				
Interaction Usability	The web has ease navigation The web has proportional Display Interface The web has a good quality of the interface features help the user understand				

3.5.2 The Readability Questionnaire of Science Teachers' and Students' Respond

The website education will be applied to students and science teacher in junior high school. While the readability for students and science teacher will be collected from students and teachers respond towards the questionnaire that has been filled. And it will be explained as follow:

1. The questionnaire for science teachers' and students' respond

The questionnaire for the students' and science teachers' respond used Technology Acceptance Model, TAM has been applied extensively for studying information technology due to its effectiveness in assessing the degree of users'

acceptance on behavioral intention. Proposed by Davis and colleagues, TAM will be adopted by 2 aspects including perceived ease of use and perceived usefulness to know user's behavioral intentions as a result. Besides the acceptance of the website education, student and science teacher questionnaire will combine with the five-dimensions of interactivity that fulfills the communications need and engage the student motivation to operate and use the website education, it is proposed by L. Ha, James, Lomicky, & Salestrom.

2. The Likert scale of the questionnaire for science teachers' and students' respond

The scale that will be used in this research is 5-Likert scale because a few researchers have reported higher reliabilities for five-point scales. The questionnaire was including the characteristic of the website. The characteristics are the content of levers in the human body, the language, and design of mobile learning itself. The scale is 1 until 5 to determine if the points of the website education for web-based learning were met the intention, goal, and expectations.

Table 3.5
Likert Scale for the Readability of Science Teachers' and Students' Perception Respond

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

(Warmbrod, 2014)

The Likert scale is used for science teachers and students. There was a 5-rating scale to determine whether the website of web-based learning is interactive, compatible and suitable for Junior High School level or not.

3. The written review of the questionnaire

The written review exists on the questionnaire, it was on comment coulomb its function is for suggestions, opinions, or note about the overall of a website for integrated science. The questionnaire for the readability students' and science teachers' respond will be shown in table 3.6.

Table 3. 6
The Readability Questionnaire for Science Teachers' and Students' Perception Respond

Construct	Item	SD	D	N	A	SA	Comment
Perceived ease of use	The WEB is easy to use.						
	The WEB can provide clear guidance.						
	The WEB is useful to assist me in learning lever in human body topic.						
Perceived usefulness	The WEB can increase my efficiency to more understand for learning lever in human body topic.						
	The WEB can provide useful media like the picture, video, and its explanation for learning lever in human body topic.						
	Using WEB is a good idea to learn lever in the human body.						
Playfulness	The content and the game of the WEB made me satisfy.						
	The content and the game of the WEB made me have fun when using the web.						
	The content and the game of the WEB made me curious to know more about the topic.						
Choice	The WEB provides a choice of links or button.						

Construct	Item	SD	D	N	A	SA	Comment
	The choice button in the start (home) help me to operate the WEB.						
	The choice of navigation button is useful to guide me to operate the WEB.						
Connectedness	The hypertext or the button help me to operate the WEB.						
	The navigation button of the WEB has a relationship with each other.						
	The navigation button of the WEB is working smoothly.						
Information collection	The WEB asks my prior knowledge, it helps me to assist my previous understanding before I learn lever in human body topic.						
	The WEB content about lever in the human body adds my insight.						
	The WEB content is useful to help me learn lever in human body topic.						
Reciprocal communication	The WEB provides a link button to giving feedback and comment.						
	The contact page of the WEB helps me to give comment.						
	The contact page of the WEB helps me to give feedback.						

4. The internal consistency of the science teachers' and students' respond

The questionnaire for science teachers and students will be measured that indicates an acceptable level of internal consistency for a short research survey with non-homogenous items of this kind (Fraenkel et al., 2013). The reliability for the internal consistency of the students and science teacher questionnaire was measured

and evaluated by Cronbach's alpha. In general, the minimum acceptable value of Cronbach's alpha is 0.6 (Warmbrod, 2014).

3.6 Instrument Validation

The instrument will be reviewed and used. Before that one, there was some analysis that judged by supervisors. The analysis is aimed to make sure whether both instruments is appropriate or not. The qualities of the test have to meet the standard of what was measured before it is used by experts, students, and science teachers.

3.7 Data Collection

The data will be gained by using the instruments as declared before, some different ways were taken for each subject in this study described as follow:

3.7.1 Experts Judgment Validation

The rubric was given directly to each expert based on the aspects that will be judged. The sample of the website education can be opened by any devices from the expert as long as it connects to internet or from the researcher and it could be online or offline, or the printing screenshots of the website content. After the website education had been examined, the rubric result was returned. The data collected from the experts from every indicators and aspect that were a checklist on accept, reject and revise, and then suggestions or comment as a note.

3.7.2 The Readability of The Students' and Science Teachers' Perception Respond

First, the developers do not need to explain about topic, just ask the student to open browser of the devices and open the link of the website. Second, show the example how to operate the web and tell some part of the web, for example, the navigation button, and the flow how this website works by the learning goals. Third, after the students operate the website education, the questionnaire was given to students. For the teachers, the phase is the same as the student. Both of the data was collected from students and teacher were in the form of the questionnaire used 5-Likert scale and opinion or comment impression.

3.8 Data Analysis Technique

The website education will be applied to science teachers and students to get the data as a perception respond. After all the data was collected by using the instruments, the results are analyzed in a descriptive way regarding each reference. The data analysis techniques are described as follow:

3.8.1 Likert Scale

The questionnaire for science teachers and students was using 5-Likert scale, the questionnaire was analyzed by quantitative measurement. Then, comparing the result with the total amount of the highest score and the result is converted to a score format. For more explanation of how to determine the result step by step, as follow:

$$Total\ Score = T\ \times Pn$$

….. (1)

$$Y = The\ highest\ likert\ scale\ \times The\ number\ of\ panelist$$

….. (2)

$$Score = \frac{Total\ Score}{Y}$$

….. (3)

Note:

T = The total number of panelists who voted

Pn = Choice of Likert scale numbers

Adopted from Darmadi (2011), Page 102

After determining the score, there is an interval and the interpretation of the score, so it can be elaborated with the category of a score range and descriptive criteria of the program that use 5-Likert scale. The category is described as follow:

Table 3.7
The Score Range and Descriptive Criteria of Program

No.	Interval	Criterion
1	0 < score ≤ 19,99	Poor
2	20 < score ≤ 39,99	Fair
3	40 < score ≤ 59,99	Neutral
4	60 < score ≤ 79,99	Good
5	80 < score ≤ 100	Very Good

On the other side, learners and educators have used the general ranking out of the median of all ratings. Rating reasoning shall be just like the criteria set out in Table 3.7.

3.8.2 Written Review of The Questionnaire

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.

3.8.3 The Internal Consistency of The Students' and Science Teachers' Questionnaire Respond

The students and science teacher gave the respond to the questionnaire. After that, it needs to be evaluated by Cronbach's alpha to measure reliability. Cronbach's alpha is most commonly used to assess the internal consistency of a questionnaire or survey, that is made up of multiple Likert-type scales (this study use 5-Likert scale) and items and the minimum acceptable value of Cronbach's alpha is 0.6. To measure the Five-Likert scale using Cronbach's alpha, it will be used SPSS application.

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)

3.9.1 Preparation Stage

The steps in the preparation stage which are,

1) Identification of the problem.
2) Formulating the research objectives.
3) Analysis of the basic competences of 2013 Curriculum.
4) Analysis of web content and design.
5) Analysis of game attributes and game elements.
6) Designing the flowchart of the website education.
7) Designing the storyboard of the website education.
8) Constructing the web using HTML by notepad ++ 7.7.

3.9.2 Implementation Stage

The step of implementation stage which are,

1) Content validation by experts' judgment.
2) Grammar validation by experts' judgement.
3) Design/Media validation by experts' judgment.
4) Revising the game and website education on experts' judgment.
5) Final revision.
6) Testing students' readability.
7) Testing teachers' readability.
8) Collecting, calculate and analyze the research data.

3.9.3 Completion Stage

The step of completion stage which are,

1) Making result and discussion, along with the conclusion.
2) Reporting the result.

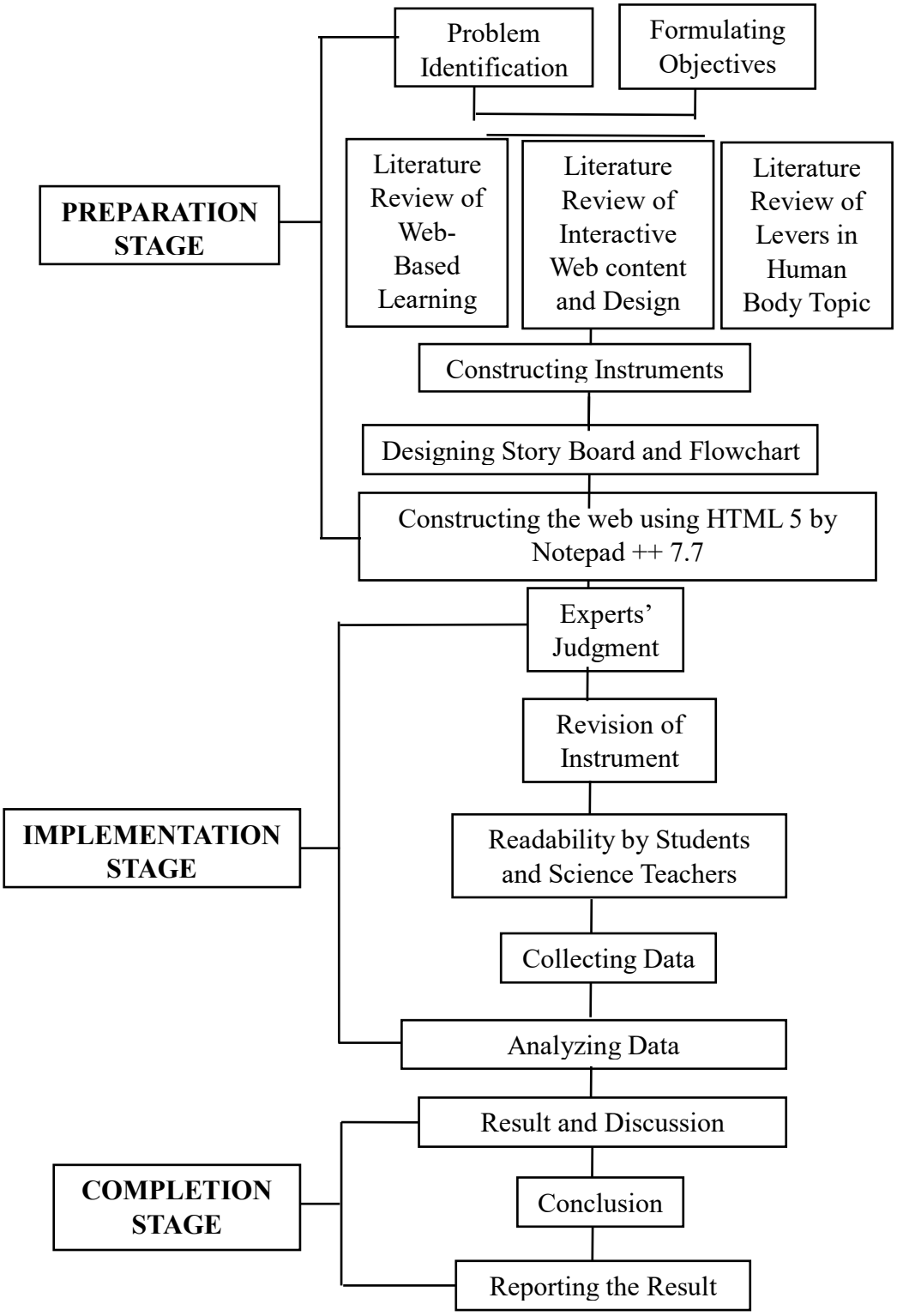

Figure 3. 1. Research Plot