

## CHAPTER III

### RESEARCH METHODOLOGY

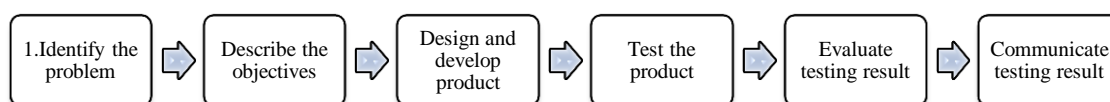
#### A. Research Method and Research Design

##### 1. Research Method

The research has purpose to develop a STEM-based sound and wave module as an instructional material, the methodology that being used in this research is Design and Development Research or DDR. According to Richey and Klein (2009) Design and Development Research consists of two main categories, namely: (a) product and tool research, and (b) research models. The research in the category of product development stages is analysis, design, development, and evaluation. While the development of tools is basically the same as product development but it is more focused on (1) tool development, and (2) tool use. The research model includes stages (1) development, (2) validation, or (3) use of the model.

Generally, there are six procedures to develop STEM-Based module which based on Peffers et al. (2007) as follow:

1. Identify the problem
2. Describe the objectives
3. Design and develop product
4. Test the product
5. Evaluate testing result
6. Communicate testing result



**Figure 3.1. Design and Development Research Process (Peffers, et al., 2007)**

## B. Participants

The participants were three experts, three science teachers, four 9<sup>th</sup> grade students as validators and implement the STEM-based module that has been revised to 31 8<sup>th</sup> grade students of Public Junior High School “X” in Bandung. To know the development of students’ creative thinking, pre-test was given before implementing STEM-based module on learning activity and post-test was given after implementing STEM-based module on learning activity. Then, students have to make STEM product which is their own loudspeaker to measure student’s creative product.

## C. Operational Definition

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

1. The developed STEM-based module was following the outline criteria to fulfil the needs of developing good STEM learning material based on 8 steps of science and engineering practices from Bybee (2011) namely ask questions and define problems, develop and use models or examples, plan and conduct an investigation, analysis and interpretation of data, using mathematical and computational thinking, develop explanations and design solutions, engaging in argumentation and evidence. The eligibility of STEM integrated teaching materials is measured by a review of material aspects, presentation, language, and graphics. The eligibility test instrument was developed by adapting the eligibility assessment of textbooks from the Ministry of National Education. The eligibility test instrument is in the form of a "Yes" and "No" questionnaire with a scale of 1 and 0. The number of scores obtained in each aspect is then converted to a percentage.
2. Creative thinking is the ability to see a variety of possible solutions to a problem, which is a form of thought which until now still lacks attention in formal education. Creative thinking skills that measured include aspects of fluency, flexibility, originality in thinking, the ability to elaborate (develop, enrich, detail) and evaluation. The measuring instrument used to assess

students' creative thinking skills in this study is essay questions. Essay questions are prepared to assess aspects of fluency, flexibility, originality in thinking, the ability to elaborate (develop, enrich, detail) an idea and evaluation.

3. The term of creative product in this case is not limited on commercial product, but involve the variety of the object or idea. The creative product can be grouped in to three categories, those are novelty, resolution, also elaboration and synthesis. Students' creativity product in this research is measured that will use Rubric of Creative Product Analysis Matrix (CPAM) as the instrument.

#### **D. Research Instrument**

In this research, instrument is necessary to be used for gaining data. There are three types instrument that are used in this research which are creative thinking test, students' creativity product rubric and questionnaire for STEM-based sound wave module. Those instruments are described below:

##### **1. Creative Thinking Test**

This test is an instrument to get the quantitative data that was gained in this research. In order to measure the improvement of student creative thinking, pre-test was given before implementing STEM-based module on sound wave topic and post-test was given after implementing STEM-based module on sound wave topic. The STEM-based module on sound wave topic contains some instructions that requires the students for more explore their thinking and also requires the students to use the technology they have and the materials and tools around them. Creative thinking skills that measured include aspects of fluency, flexibility, originality in thinking, the ability to elaborate (develop, enrich, detail) and evaluation based on Munandar (1999). The measuring instrument used to assess students' creative thinking skills in this study is essay questions. The rubric of creative thinking aspect is shown in the table below:

Table 3.1. Students' Creative Thinking Rubric

No.	Aspek Berpikir Kreatif	Indikator Berpikir Kreatif	Rubrik	Skor	No. Soal
1.	Keterampilan berpikir lancar (fluency)	Memberikan banyak kemungkinan jawaban atau gagasan atas pertanyaan yang diajukan.	Siswa dapat menjawab soal dengan lancar dan jawaban tepat	5	2
			Siswa dapat menjawab soal dengan lancar dan jawaban kurang tepat	3	
			Siswa dapat menjawab soal dengan lancar tetapi jawaban salah.	1	
2.	Keterampilan berpikir Luwes (flexibility)	Menghasilkan jawaban yang bervariasi dengan sudut pandang yang berbeda.	Siswa memberikan jawaban bervariasi dengan sudut pandang yang berbeda dengan jawaban yang tepat.	5	4
			Siswa memberikan jawaban bervariasi dengan sudut pandang yang berbeda dengan jawaban yang kurang tepat.	3	
			Siswa memberikan jawaban bervariasi dengan sudut pandang yang berbeda dengan jawaban yang tidak tepat.	1	
3.	Keterampilan berpikir orisinal (originality)	Dapat memberikan jawaban atau pertanyaan yang diberikan menurut	Siswa menjawab soal dengan bahasa dan caranya sendiri dengan tepat	5	1

No.	Aspek Berpikir Kreatif	Indikator Berpikir Kreatif	Rubrik	Skor	No. Soal
		<i>pemikirannya sendiri</i>	<i>Siswa menjawab soal dengan bahasa dan caranya sendiri namun jawabannya kurang tepat</i>	3	
			<i>Siswa menjawab soal bukan dari bahasa atau caranya sendiri dan jawaban tidak tepat.</i>	1	
4.	<i>Keterampilan memperinci/meng elaborasi (elaboration)</i>	<i>Dapat memperinci suatu gagasan atau jawaban sehingga lebih jelas.</i>	<i>Siswa dapat menjawab soal dengan rinci dan jawabannya tepat</i>	5	5
			<i>Siswa dapat menjawab soal dengan rinci dan jawabannya kurang tepat</i>	3	
			<i>Siswa menjawab soal tidak rinci dan jawabannya tidak tepat</i>	1	
5.	<i>Keterampilan menilai/mengevaluasi (evaluation)</i>	<i>Mampu menyimpulkan mengenai masalah yang dipecahkan.</i>	<i>Siswa dapat menjawab soal dengan sudut pandangnya sendiri dan jawabannya tepat.</i>	5	3, 6
			<i>Siswa menjawab soal dengan tepat namun dari sudut pandang orang lain.</i>	3	
			<i>Siswa menjawab dari sudut pandang orang lain dan jawabannya salah.</i>	1	

(Adapted by Munandar, 1999)

Then, the objective test or the creative thinking test consist of six essay questions to assess aspects of fluency, flexibility, originality in thinking, the ability to elaborate (develop, enrich, detail) an idea and the concept. The instrument questions were be analyzed with the following requirements:

a. Validity

According to Fraenkel (2011), There are some things that must be considered before choosing and preparing an instrument before doing research and the one of important idea to consider is validity. Validity has a point to the appropriateness, meaningfulness, correctness, and usefulness of the conclusions a researcher makes. Therefore, the data that is resulted from the test will valid with the variable that want to be measured and interpreted by using this validity test. The software ANATES will be used to determine the validity of the instrument in this study.

The validity of each test item will be measured by using formula of correlation which has stated by Pearson (in Kaplan and Saccuzzo, 2012), which is called as product moment correlation formula as follows:

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

Note:

$r$  : correlation coefficient between x and y

$N$  : amount of student

$X$  : total score in test item

$Y$  : total score of student

Minium et al (1993) describes that the correlation coefficient between x and y interpretation is divided into some distinct categories as shown on the following table:

**Table 3.2 Interpretation of validity**

<b>Value <math>r</math></b>	<b>Interpretation</b>
$0.80 < r \leq 1.00$	Very high
$0.60 < r \leq 0.80$	High
$0.40 \leq r \leq 0.60$	Enough
$0.20 < r \leq 0.40$	Low
$0.00 < r \leq 0.20$	Very low

(Minium et al., 1993)

## b. Reliability

According to Crocker and Algina (2006), the test users want some assurance that the results can be replicated if the same individual each time the test is given and tested again under the same conditions. The desired consistency (or reproducibility) of the value of such tests can be called reliability. .

According to Kaplan and Saccuzzo (2012), the standard deviation of the scores was observed and the reliability of the test is used to estimate the standard error of measurement. The task of researchers in reliability analysis is to estimate how many of researcher make the mistake of using a score from short test as an estimate of a person's true ability. The formula for calculating the reliability of a test in which the items are dichotomous, scored 0 or 1 (usually for right or wrong), is known as the Kuder-Richardson 20, or KR20 or KR20. The formula came to be labeled this way because it was the 20th formula presented in the famous article by Kuder and Richardson (in Kaplan and Saccuzzo, 2012), as follows:

$$KR_{20} = r = \left( \frac{N}{N-1} \right) \left( \frac{S^2 - \sum pq}{S^2} \right)$$

Notes :

$KR_{20}$  : the reliability estimate ( $r$ )

$N$  : the number of items on the test

$S^2$  : the variance of the total test score

$p$  : the proportion of the people getting each item correct (this is found separately for each item)

$q$  : the proportion of people getting each item incorrect. For each item,  $q$  equals  $1-p$ .

$\sum pq$  : sum of the products of  $p$  times  $q$  for each item on the test

**Table 3.3 Reliability Interpretation**

Value $r$	Interpretation
$0.80 < r \leq 1.00$	Very high
$0.60 < r \leq 0.80$	High
$0.40 \leq r \leq 0.60$	Enough
$0.20 < r \leq 0.40$	Low
$0.20 < r \leq 0.40$	Very low

(Minium et al, 1993)

c. Difficulty level

For a test that measures achievement or ability, The difficulty of test items determined by the number of people who get certain stuff right. The test items should have different levels of difficulty for a good test discriminates at various levels. (Kaplan and Saccuzzo, 2012).

Boopathiraj and Chellamani (2013) stated that item difficulty may be defined as the proportion of the examinees that marked the item correctly. Item difficulty is the percentage of students that correctly answered the item. The range is from 0% to 100%, the higher the value, the easier the item. P values above 0.90 are very easy items and might be a concept not worth testing. P-values below 0.20 indicate difficult items and should be reviewed for possible confusing language or the contents needs re-



instruction. Optimum difficulty level is 0.50 for maximum discrimination between high and low achievers. Generally, items of moderate difficulty are to be preferred to those which are much easier or much harder. The following formula is used to find difficulty level based on Boopathiraj and Chellamani (2013):

$$DL = \frac{R_u + R_l}{N_u + N_l}$$

Where,

$R_u$  : the number students in the upper group who responded correctly

$R_l$  : the number students in the lower group who responded correctly

$N_u$  : Number of students in the upper group

$N_l$  : Number of students in the lower group

Arikunto (2013) stated that index of difficulty is how easy certain questions is and the amount that indicates a difficulty. The range that owned by difficulty index is ranging from 0.00 to 1.00. The criteria of the difficulty index are shown in the table 3.3 below:

**Table 3.4 Difficulty Index**

Value	Criteria
0,00– 0,30	Difficult
0,00– 0,30	Middle
0,71 - 1,00	Easy

(Arikunto, 2013)

#### d. Distractor

Distractor meaning based on Kaplan and Saccuzzo (2012) is alternatives exist on multiple choice exams that are not true or that no

credit is given. which is required to determine the number of alternatives is "true" when taking a multiple choice examination. the wrong choice is called a distractors.

Arikunto (2013) stated that the scheme of the choice answer can be determined whether the distractor works well or not. He also stated that distractor is not good or bad is the distractors that are not be chosen at all. According to Arikunto (2013), the distractor can be threatred using following methods:

- 1) accepted, because it's good
- 2) rejected, because it's bad
- 3) rewritten, because it's not really good.

## 2. Students Creativity Product

The creativity of students can be seen by their result of their product which is the loudspeaker for handphone. The students' creativity of making product can be measured using Rubric of Creative Product Analysis Matrix (CPAM) which is proposed by Basemer and Treffinger (1981). The product of simple loudspeaker is assessed into some criteria which was available in the rubrics. The students' creativity can be measured based on the result of loudspeaker. This kind of creativity test can be assessed by giving checklist on the rubric if there is sub indicator that appears in students' creative product. The rubric of Creative product Analysis Matrix (CPAM) blueprint is shown in following table below :

**Table 3.5. Students' Creativity Rubric**

Creativity Dimension	Indicators	Measured Aspects	Score			
			3	2	1	Final Score
1. Novelty	1. <i>Original</i> Being rare and out of the usual product that ever made	Materials & Tools				
		Product				
	2. <i>Surprising</i> Gives surprise as a general in first impression	Product				
	3. <i>Germinal</i>	Product				

Creativity Dimension	Indicators	Measured Aspects	Score			
			3	2	1	Final Score
	Trigger ideas for further original product					
2. Resolution	1. <i>Valuable</i> Solving problem that stated at project mission	Product				
	2. <i>Useful</i> products can be applied and provide benefits to everyday life that can be directly implemented.	Product				
3. Elaboration and Synthesis	1. <i>Organist</i> Clearance of how the product is made	Product Design				
	2. <i>Elegant</i> The appearance of the product looks elegant and attractive and the benefits are far greater than it looks	Product				
	3. <i>Understandable</i> The materials and features in the product and their functions can be clearly understood by the user and do not cause confusion in usage.	Product				
	4. <i>Artistic</i> Product neatness, effort in making product excellence and daring to be different in product appearance	Product				
4. Concept	1. Suitability of product results with existing concepts and theories	Product				

(Adapted by Basemer and Treffinger, 1981)

### 3. STEM-based Module on Sound Wave Topic

The STEM based sound and wave module was developed based on the newest Indonesia curriculum (Kurikulum 2013). Instructional material which is module contains STEM concepts in sound and wave topic for 8th grade of junior secondary school students. There are science section that talks about the relationship of sound and wave with human hearing mechanism, technology

section that talks about product of science which is related with sound and wave, engineering section that challenge students to conduct STEM activity based on engineering design process, and mathematics section that talks about mechanical advantages of the product. For assessment purposes, instructional material contains a series of content, students' activity worksheet, worksheet to make simple loudspeaker, pretests and posttests that measure students learning growth and creative thinking before and after reading STEM based sound and wave module. In order to know the development of STEM based sound and wave module, the questionnaire is made by researcher to be fulfilled by students. Every Yes answer will be scored 1 and every No answer will be scored 0. The right statement of main idea will be scored 1 and the wrong statement of main idea will be scored 0. The questionnaire is shown in the table below:

**Table 3.6. Questioner of STEM-Based Module on Sound Wave  
Topic for Students**

<b>Page</b>	<b>Question</b>	<b>Answers</b>
1	Do you understand the passage?	Yes or No
	What is the main idea?	
2	Do you understand the instruction?	Yes or No
	Can you do the instruction?	Yes or No
3	Do you understand the passage?	Yes or No
	What is the main idea?	
4	Do you understand the passage?	Yes or No
	What is the main idea?	
5	Do you understand the passage?	Yes or No
	What is the main idea?	
6	Do you understand the passage?	Yes or No
	What is the main idea?	
	Do you understand the passage?	Yes or No

Page	Question	Answers
7	What is the main idea?	
8-9	Do you understand the passage?	Yes or No
	Do you understand the instruction?	Yes or No
	Can you do the instruction?	Yes or No
10	Do you understand the passage?	Yes or No
	What is the main idea?	
11	Do you understand the passage?	Yes or No
	What is the main idea?	
	Do you understand the instruction?	Yes or No
	Can you do the instruction?	Yes or No
12	Do you understand the passage?	Yes or No
	What is the main idea	
13	Do you understand the questions?	Yes or No
	Can you do the practice?	Yes or No
14	Do you understand the passage?	Yes or No
	What is the main idea?	
15	Do you understand the passage?	Yes or No
	What is the main idea?	
16	Do you understand the instruction?	Yes or No
	Can you do the instruction?	Yes or No
17	Do you understand the passage?	Yes or No
	What is the main idea?	
18	Do you understand the instruction?	Yes or No
	Can you do the instruction?	Yes or No
19	Do you understand the passage?	Yes or No
	What is the main idea?	

Page	Question	Answers
20	Do you understand the instruction?	Yes or No
	Can you do the instruction?	Yes or No
21	Do you understand the passage?	Yes or No
	What is the main idea?	
22	Do you understand the passage?	Yes or No
	What is the main idea?	
23	Do you understand the passage?	Yes or No
	What is the main idea?	
24-31	Do you understand the passages and instructions?	Yes or No

## E. Research Procedures

In order to have a good sequence systematically of the research, the research procedure is arranged in three stages that have been done. Those of three stages are preparation stage, implementation stage, and completion stage.

### 1. Preparation Stage

In this stage, researcher focused on all of the preparation to conduct and support the research. Here are the steps of preparation stage.

- a. Formulate problems to be investigated.
- b. Determine the focus of variable research
- c. Conduct literature review of DDR method
- d. Conduct literature review of STEM learning.
- e. Conduct literature review of Development of STEM-based module.
- f. Conduct literature review of students' creative thinking.
- g. Conduct literature review of students' creativity product.
- h. Conduct literature review of sound wave topic.
- i. Arrange the research proposal which is including chapter I, chapter II and chapter III which is presented in proposal seminar.

- j. Revise of research proposal after having suggestions and critics from the lecturers.
- k. Design the blueprint to create the instrument.
- l. Make the STEM-based module on soundwave topic
- m. Construct research instrument in the form of objective test items that is composed of 7 questions of students' creative thinking on sound wave topic.
- n. Test the validity, reliability, difficulty level, and discriminating power.
- o. Report and make the validation of the module and other research instruments to the experts, students and science teachers.
- p. Revise the instrument after having validated.
- q. Prepare research license to schools.
- r. Determine research subject which are determined by science teacher which the participants are from 8<sup>th</sup> grade students in public junior high school "X" in Bandung

## 2. Implementation Stage

This is the process of data collecting in the school, when the treatments to students' are implemented

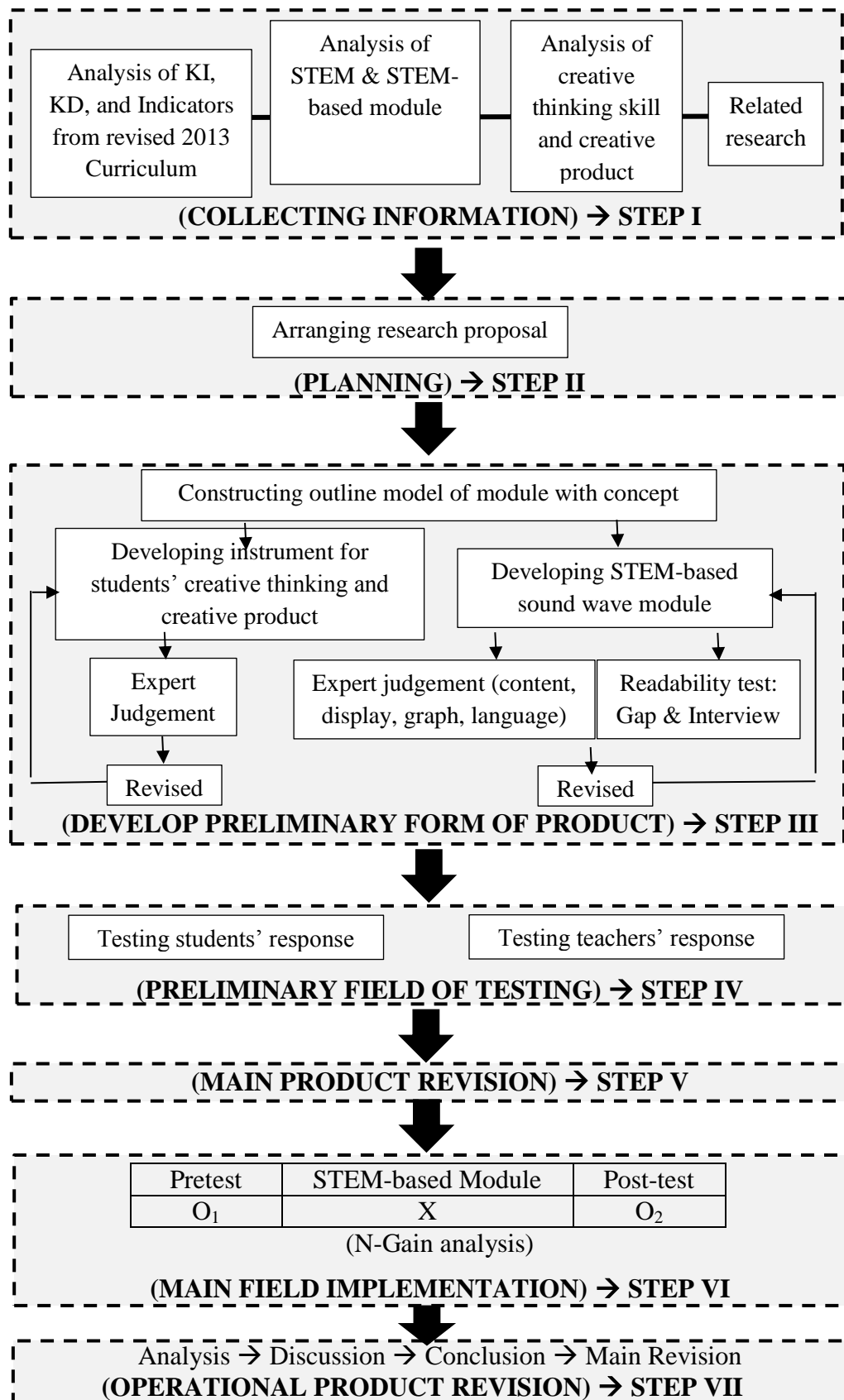
- a. Determination of class
- b. Pretest of creative thinking test was given to the students to know the students prior knowledge and students' initial condition.
- c. Processing pretest result
- d. Conduct research activity by implementing STEM-based module on sound wave topic as teaching material with teaching using STEM approach by the researcher.
- e. Assessing students' creativity product in making simple loudspeaker.
- f. Posttest was given to the students to know the improvement of students' creative thinking.

## 3. Completion Stage

This is the final stage of research design; the step that is conducted in this stage is explained as the following steps:

- a. The whole data of the research were analyzed.
- b. Discuss and conclude the data analysis result.
- c. Arrange the research report.





**Figure 3.2. Research Procedure**

## F. Instrument Analysis Result

### 1. Recapitulation of Students' creative thinking

The objective test in form of seven questions as the instrument is given to the students for measuring students' creative thinking. The validity, reliability, discriminating power, and difficulty level of the instruments was tested. The test was given to 36 students which have learned about the chapter or the topic that is learned in the research. This following table is shown the recapitulation of the test item analysis.

#### Test item recapitulation:

Reliability Test : 0.91 ( Very high degree)

**Table 3.7. Recapitulation of Test Item for Students' Creative Thinking**

Question Number	Discriminating Power	Validity	Difficulty Level	Status
1a	Excellent	High	Medium	Accepted
1b	Moderate	High	Medium	Accepted
2a	Excellent	High	Easy	Rejected
2b	Excellent	High	Medium	Rejected
3a	Moderate	High	Medium	Accepted
3b	Moderate	Enough	Medium	Accepted
4a	Excellent	Enough	Medium	Accepted
4b	Excellent	High	Easy	Accepted
5	Excellent	High	Medium	Accepted
6a	Excellent	High	Medium	Accepted
6b	Excellent	High	Medium	Accepted
6c	Excellent	High	Medium	Accepted
7	Excellent	High	Medium	Accepted

The test item has been tested in term of validity, reliability, discriminating power, and difficulty level also judged by some experts then revised so that it is adequate to be used as research instrument to obtain the

data of students' creative thinking. The following table is the blueprint of objective test as the research instrument to determine students' creative thinking

**Table 3.8 Objective Test (Pretest and Posttest) Item Specification and Recapitulation.**

Indicator	Creative Thinking Aspect				
	Fluency	Flexibility	Originality	Elaboration	Evaluation
	Number of Question				
Explain the requirements for occurrences of sound and sound characteristics based on the propagation medium			1		
Calculates sound propagation and frequency of sound waves.	2				
Analyze resonance cases in real life.					3
Explain the benefits of technology that uses sound waves.		4			
Explain the effects of sound reflection in everyday life.				5	
Analyze the use of sound waves to make life easier.					6
<b>Total</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>

## 2. Instrument Non-Test Requirements

In this research, there are two kinds of instrument that is not in form of test in order to get qualitative data. Rubric and observation sheet are used. The students' creativity of making loudspeaker is assessed using Rubric of Creative Product Analysis Matrix. Several criteria that available are existing in the rubric. The way of observer to measure the students' creativity product are by fulfilled the rubric. The observer gave the checklist on the rubric if there is sub indicator that appears in students' creative product.

Meanwhile, in order to know the development of STEM based sound and wave module, the questionnaire is made by researcher to be fulfilled by students. There are some questions in the questioner that must be answered by students which the answers is yes or no answer and also students' knowledge. This data was obtained after all the learning process is done.

## **G. Data Processing**

There are three different data which are obtained from both quantitative data and qualitative in this research. Quantitative data is obtained from the pre-test and post-test of students' creative thinking. The qualitative data is obtained from the Rubric of Creative Product Analysis Matrix (CPAM) and students' questionnaire. Explanation of data processing techniques are obtained as follows:

### **1. Quantitative Data Processing**

The quantitative data was process using Microsoft Excel calculation to determine the score of pre-test and post-test. The value of quantitative data is gained by the result of normalized gain. The calculating process of data is explained as follow:

#### **a. Score of Test Item**

In this research, the improvement of students' understanding is measured using the data of test scores. The 6 test items is used in this research to test the students' creative thinking. Each essay question correct answers are given 5 score and the other scores are explained in the rubric that has been shown in the instrument session.

#### **b. Calculation of Gain Score and Normalized Gain**

The data of the test item score after its' obtained are needed to be processed by calculating the gain score and normalize score. Gain is needed to be calculate to determine the differences between pre-test and post-test score to know the improvement of learning and it can be seen clearly. It could be assumed as the effect of the treatment. After the actual

Gain is gotten, then Normalized Gain (N-Gain) can be gotten. Normalized gain calculations are supposed to determine the categories of the achievement of students' improvement.

According to Hake (1999), Gain can be calculated by the following formula.

$$G = S_f - S_i$$

Description:

G : Gain score

$S_f$  : Post test score

$S_i$  : Pre test score

(Hake, 1999)

The effectiveness of the treatment by the teacher in teach sound wave to increase students' creative thinking can be seen from the result of the normalized gain that achieved by students during the learning process. The meaningful improvement can be shown from Normalized Gain rather than actual Gain because the improvement of higher and lower achiever students can be shown clearly. The formula of N-Gain is shown as follow.

$$\langle g \rangle = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}}$$

Description:

$\langle g \rangle$  : Normalized Gain

$S_{post}$  : Post-test score

$S_{pre}$  : Pre-test score

$S_{max}$  : Maximum score

(Hake, 1999)

Then, the Normalized Gain value is determined based on criteria below:

**Table 3.9 Criteria of Normalized Gain Value**

Value $\langle g \rangle$	Classification
$\langle g \rangle \geq 0.7$	High
$0,7 > \langle g \rangle \geq 0.3$	Medium
$\langle g \rangle < 0.3$	Low

(Hake, 1999)

## 2. Qualitative Data Processing

The qualitative data is gained from creativity rubrics of students' simple loudspeaker for handphone. The analysis of rubrics is done by converting the raw score into form of percentage. The technique of converting score into percentage is used formula as follows:

$$P = \frac{R}{MS} \times 100\%$$

Noted:

P : percentage

R : raw score

MS : maximum score

(Arikunto, 2010)

The percentage of students' creativity can be interpreted and categorized into certain criteria according to Arikunto (2013) as shown in Table 3.10 as follows:

**Table 3.10 Percentage Interpretation of Creativity**

Percentage (%)	Criteria
87.68-101.01	Very Good
74.34-87.67	Good
61.00-74.33	Enough
46.67-60.00	Lack
33.33-46.66	Very lack/ Failed

(King and Minium, 2003)

Then, for categorize the creative thinking of students, the percentage of students' creative thinking also can be interpreted and categorized into certain criteria according to Arikunto (2013) as shown in Table as follows:

**Table 3.11. Percentage Interpretation of Creative Thinking**

Percentage (%)	Criteria
83-103	Very good
62-82	good
41-61	Enogh
20-40	Lack

(King and Minium, 2003)

The other instrument besides from the rubric, the data that is analyzed qualitatively is from questionnaire of the STEM-based module. The qualitative analysis describes how effective the module is to be implemented in the learning process. The Yes answer and right answer in stating main idea will be scored 1 and No answer and wrong answer in stating main idea will be scored 0.