# CHAPTER III
# RESEARCH METHODOLOGY

## 3.1 Research method

Many educational research use methods. This research method used in this research was pre-experimental (Amaral, 2013). Creswell (2014) stated that this design does not have a control group to compare with the experimental group. Design of the pre-experimental used pre-test and post-test design. This is related for analyzing student's concept mastery and creativity through digital storytelling video in learning food additives.

## 3.2 Research design

The design used a weak experimental. The design is one group pretest-posttest design. the instrument included a pretest and posttest followed by a treatment for a single group and no control class. The implementation of this research design was the students was given pretest before they got treatment then they conducted posttest.

First, they did a pretest. Then, students made digital storytelling video as a treatment, and they learned food additives topic. Last, students conducted post-test. The pre-test and post-test will be used by the *Bookwidget* application. Typical of test item was multiple choices to analyze students' concept mastery. Research design shows in Table 3.1

Table 3.1
One Group Pretest Posttest Design

| | | |
|---|---|---|
| O | X | O |
| Pretest | treatment | posttest |

(Creswell, 2014)

## 3.3 Population and sample

This research conducted in a private junior high school. It is located in Cianjur, West java. The curriculum used curriculum 2013, English and Indonesian are used in the teaching and learning process. The participants consisted of VIII grades. All VIII grades students participated in this research. Sample used purposive sampling.

## 3.4 Operational definition

1) Digital storytelling video

   Digital storytelling video was used for creating the story from the food additives topic. Making stories, collect the digital images sound and other multimedia elements, then edit them into video via software program (for example: *Kinemaster*). It focused on digital storytelling encompasses students' concept mastery and creativity. Digital storytelling video was used as tool. So, the students involved in constructing digital storytelling video.

2) Student's concept mastery

   Students' concept mastery that used in this research based on the cognitive domain by Bloom's Taxonomy is remembering (C1), understanding (C2), applying (C3), analyzing (C4), Synthesis (C5), and Evaluation (C6). This competence was measured by objective test, which consisted of the multiple-choice questions (pre-test, before treatment, applied treatment on students and post-test, after treatment).

3) Student's creativity

   Students' creativity is a process of making the product. The dependent variable was to measure students' skills through the product of digital storytelling video. CPSS rubric was used as an instrument to evaluate student's product.

## 3.5 Assumption

According to the literature review, it could be assumed that:

1) Digital storytelling video would become a useful learning product for students master the concept to get better score results in final test.
2) Digital storytelling video would become a helpful learning product to trigger students to make creative product.

## 3.6 Hypothesis

To analyze hypothesis more significant by using pretest and posttest, the hypothesis for this research is:

1) $H_0$: There are no significant differences in students' concept mastery and creativity to make digital storytelling video in learning food additives.

2) $H_1$: There are significant differences in students' concept mastery and creativity to make digital storytelling video in learning food additives.

### 3.7 Research instrument

In this research, data must be collected by using method for conducting this experiment. There are three types of instruments to be used in this study, including objective test items, CPSS rubric, and lesson plan.

#### 3.7.1 Objective test

The objective test was a multiple-choice question to measure concept mastery of students in pre-test and post-test. There are 30 multiple choices consist by blooms' taxonomy from (remembering) (C1), understanding (C2), applying (C3) and analyzing (C4), Synthesis (C5), Evaluation (C6) and 3 concepts of food additives. Table 3.2 shows objective test has been validated by expert judgements.

Table 3.2
Objective Test Item

| No | Sub topic | Cognitive level domain | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | C1 | C2 | C3 | C4 | C5 | C6 | % |
| 1 | Food additives types | 1,6,7, 12,13, 20,25, 26,27 | 2,4,5, 10,14 | 3 | | | | 50 |
| 2 | The effect of food additives | | | 11, 15,16, 21 | 18, 23, 28, 30, 22 | 9 | 8, 24 | 40 |
| 3 | Human effort to reduce the food additives | | | 17 | 19 | 29 | | 10 |
| | TOTAL | 9 | 5 | 6 | 6 | 2 | 2 | |
| | % | 30 | 16 | 20 | 20 | 7 | 7 | 100% |

### 3.7.2 Instrument analysis

1) Validity

For checking validity of instrument, the objective test is reviewed to ensure content of instrument is appropriate or revised. Checking the accuracy and clarity of content are necessary (Kline, 2005; and Hulse, 2006). The tool for measuring validity is using Rasch Model Analysis. The criteria is Outfit Mean Square (MNSQ), Z-Standard Outfit (ZSTD), and Point Measure Correlation (Pt Mean Corr) (Yasin, Yunus, and Ismail, 2018). The validity of items is calculated in this section, when MNSQ OUTFIT is in range of 0.5 <MNSQ <1.5. The aim of the MNSQ OUTFIT is to check the objective test has been made to achieve its purposes. If MNSQ value is 0.5 <MNSQ <1.5, it is accepted or used. Conversely, if value above 0.5 and 1.5, it is said item cannot use so, objective test item should be revised (Napitupulu, 2017).

2) Reliability

Reliability is the ability of a research instrument to provide similar results when used similar conditions. Reliability indicates accuracy, stability and predictability of a research instrument: the higher reliability, the higher the accuracy of an instrument. Based on Rasch Model Measurement to measure item reliability in item infit (MNSQ).

Table 3.3
The Reliability Interpretation

| No | Infit MNSQ | Criteria |
|---|---|---|
| 1 | 0.80 - 1.00 | High |
| 2 | 0.70 – 0.80 | Good |
| 3 | 0.60 – 0.70 | Fair |
| 4 | 0.0 – 0.60 | Bad |

*(*Cronbach, 2017*)*

3) Difficulty item

Difficulty item is the determination on particular test items to participants, which is focused on answers. It is especially effective for large-scale testing a wide range of capabilities can be expected. A test must be conceived that allows researcher to cover this wide range of capabilities; hence it must include a few easy items to some difficult ones.

Wright map is same as difficult item. It is difficult and easy analysis items in objective test (Latif, 2016). Objective test consisted 30 items that are presented difficult and easy item. The items are plotted in difficulty and easy item computed using Winstep Rasch. A "logit" scale is used to express item difficulty on a linear scale that extends from negative to positive. For many analyses, item difficulties will range from −3 logits to +3 logits.

Table 3.4

Difficulty Item Interpretation

| No | Difficult value | Criteria |
|---|---|---|
| 1 | (above logit 0.82) | High |
| 2 | (Between logit 0.82 into logit 0.00) | Moderately high |
| 3 | (Between logit 0.00 to logit -1.18) | Moderately Low |
| 4 | Below logit -1.18 | Low |

*(*Latif, 2016*)*

4) Distractors

Distractors consisted of multiple-choice items to provide a measure how well wrong choices contributes to multiple-choice items' quality. Information analysis is usable as a review of objective test items. Table 3.5 shows distractors interpretation.

Table 3.5
Distractors Interpretation

| No | Distractor option | Average measure | Criteria |
|---|---|---|---|
| 1 | Correct option (score 1) | highest positive point-biserial | High ability respondents |
| 2 | Almost correct distractor (score 0) | somewhat positive point-biserial | Almost competent respondents |
| 3 | Mostly wrong distractor (score 0) | zero to negative point-biserial | Slightly component respondents |
| 4 | Completely wrong distractor (score 0) | highly negative point-biserial | Ignorant respondents |

(Linacre, 2015)

5) Student creativity analysis

Students' creativity was measured for score product that assessed by Creative Product Semantic Scale (CPSS) consists of indicators. The calculation to get score through formula as follows:

$$NP = \frac{R}{SM}\ x\ 100\%$$

NP = Percentage

R = Raw score

MS = Maximum score

(*Purwanto, 2017*)

Table 3.6
Creativity Interpretation

| No | Value | Criteria |
|---|---|---|
| 1 | 86% - 100% | Very high |
| 2 | 76% - 85% | High |
| 3 | 60% - 75% | Medium |
| 4 | 55% - 59% | Low |
| 5 | ≤ 54% | Very low |

(*Purwanto, 2017*)

### 3.7.3 Creativity Product Semantic Scale Rubric

Student's digital storytelling video was measured by CPSS rubric. CPSS is the rubric to measure creativity and it is consisted of novelty, resolution and elaboration and synthesis (O'Quin and Besemer, 1989). It is consisted of ten indicators and using Likert-scale. The result of students' digital storytelling video was assessed from other teachers and researcher. Table 3.7 shows creativity product semantic scale (CPSS) rubric.

Table 3.7
Creativity Product Semantic Scale

| No | Creativity Dimension | Criteria | Element | Level | | |
|---|---|---|---|---|---|---|
| | | | | High (3) | Medium (2) | Lower (1) |
| 1 | Novelty: The extent of the newness of the digital storytelling video and the effects of the video in future creative video | Germinal | The ability of the product to give rise to other creative product | The design of video is revolutionary, progressive and relevant | The design of video is not revolutionary, progressive and good example for other products. | The Design of product is average and unprogressive and not good example for other product |
| | | Surprising | The product is shock experienced before the evaluation begins from the first eye contact with the product | The design of video is eye-opening, shocking and uncommon | The design of video is eye-opening but no shocking and common | The design of video is unexpected and common |

| No | Creativity Dimension | Criteria | Element | Level | | |
|---|---|---|---|---|---|---|
| | | | | High (3) | Medium (2) | Lower (1) |
| 2 | Resolution: the ability of students to make decision making of ideas to create the product | Logical | The product or solution follows the accepted and understood rules for the discipline | The product of the video relates to food additives story | The product of the video does partly relate to food additives story | The product of the video does not relate to food additives story. |
| | | Useful | The product has a clear, practical application | The product can be used for next media learning | Their own product is able to learn by themselves | The product is not appropriate for media learning or media learning by themselves |
| | | Valuable | The product is judged worthy by users, listeners, or viewers because it fills some of the concepts | The video of digital storytelling contains more than 2 science concepts (Definition, Types, Impacts, etc) | The video of digital storytelling contains 1-2 science concepts (Definition, Types, Impacts, etc) | The video of digital storytelling contains 0 science concept |

| No | Creativity Dimension | Criteria | Element | Level | | |
|---|---|---|---|---|---|---|
| | | | | High (3) | Medium (2) | Lower (1) |
| 3 | Elaboration and Synthesis: The degree which the video combined unlike elements into refined, develop, and coherent whole statement or unit. | Complex | The product or solution contains many elements at one or more levels. | There are more 3 multimedia elements (picture, record, music, video, etc) used in producing the product | 2 different multimedia elements used (picture, record, and animation) in producing the product | Only use 1 multimedia elements (picture) in producing the product |
| | | Elegant | The product is expressed in a refined understand way | The design of video is elegant and attractive | The design of video is elegant but not attractive | The design of video is un elegant and unattractive |
| | | Understandable | The product is easy to understand by seeing the product | The video is understandable clearly (speak clearly the no mispronounced words) | The video is understandable enough (speaks clearly and (some mispronounced words) | The video is hard to understand (often mumbles, and many mispronounced words) |

| No | Creativity Dimension | Criteria | Element | Level | | |
|---|---|---|---|---|---|---|
| | | | | High (3) | Medium (2) | Lower (1) |
| | | Organic | The product has a sense of wholeness or completeness about it | The product of video is complete of concepts in video | The product of video is partly complete of concepts in video | The product of the video is incomplete concepts in video |
| | | Well-crafted | The product has been worked and reworked with care to develop it to its highest possible level for that point in time | Students take effort to give an interesting product | The video is done well | The video is not done well |

(Source: O'Quin and Bessemer, 1989)

### 3.7.4 Lesson Plan

Lesson plan used for a planning structure or program created by the researcher. The researcher conducted this research for three weeks. First, teacher should determine the topic to be taught in online classes such as Google meets and *Whatsapp* application. After deciding the topic, researcher listed activities for week I, week II, and week III. Week I, researcher gave pre-test. Week II, researcher gave materials about food additives and gave assignments for students to make digital storytelling video. Week III, researcher gave the posttest.

## 3.8 Instrument Analysis result

### 3.8.1 Objective test item recapitulation

This method aims to report students' concept mastery in food additives topic. Participants of this research were 70 students of VIII and IX grades in one of the private schools. The students consisted of 30 boys and 40 girls. All students had studied food additives topic. Instrument consists of 30 multiple choices questions and topic of the instrument is food additives. The concepts are food additives types, the effects of food additives and human effort to reduce food additives. Cognitive domain based on the assessment of the revised Bloom's taxonomy. Data analyzes by using the Rasch Model in 4.4.5. version.

Table 3.8
Objective Test Recapitulation

| No | Validity | Reliability | Difficulty item |
|---|---|---|---|
| 1 | 1.03 (Used) | 1.02 (High) | Logit -1.7 (Moderately low) |
| 2 | 1.42 (Used) | 1.27 (High) | Logit 0.9 (High) |
| 3 | 1.15 (Used) | 1.11 (High) | Logit -1.7 (Moderately low) |
| 4 | 1.05 (Used) | 1.04 (High) | Logit 0.1 (Moderately high) |
| 5 | 1.06 (Used) | 1.02 (High) | Logit -2.3 (Low) |
| 6 | 1.09 (Used) | 1.07 (High) | Logit 0.6 (Moderately high) |
| 7 | 0.76 (Used) | 0.89 (High) | Logit -2.5 (Low) |
| 8 | 0.89 (Used) | 0.89 (High) | Logit 0.1 (Moderately high) |
| 9 | 1.03 (Used) | 1.03 (High) | Logit -1.9 (Low) |
| 10 | 1.55 (Revised) | 1.15 (High) | Logit 1.6 (High) |

| No | Validity | Reliability | Difficulty item |
|---|---|---|---|
| 11 | 0.98 (Used) | 0.99 (High) | Logit -1.5 (Moderately low) |
| 12 | 0.80 (Used) | 0.81 (High) | Logit 0.1 (Moderately high) |
| 13 | 0.70 (Used) | 0.83 (High) | Logit -1.9 (Low) |
| 14 | 0.74 (Used) | 0.84 (High) | Logit -1.8 (Moderately low) |
| 15 | 0.90 (Used) | 0.94 (High) | Logit -1.5 (Moderately low) |
| 16 | 1.12 (Used) | 1.06 (High) | Logit 1 (High) |
| 17 | 1.07 (Used) | 1.06 (High) | Logit -1.1 (Moderately low) |
| 18 | 1.01 (Used) | 1.03 (High) | Logit -1.1 (Moderately low) |
| 19 | 1.68 (Revised) | 1.19 (High) | Logit 1.9 (High) |
| 20 | 0.96 (Used) | 0.99 (High) | Logit –1.1 (Moderately low) |
| 21 | 1.05 (Used) | 1.03 (High) | Logit 2.5 (High) |
| 22 | 1.07 (Used) | 1.08 (High) | Logit 0.7 (Moderately high) |
| 23 | 1.02 (Used) | 1.08 (High) | Logit 1.7 (High) |
| 24 | 1.17 (Used) | 1.14 (High) | Logit 0.7 (Moderately high) |
| 25 | 0.51 (Used) | 0.75 (Fair) | Logit -2.5 (low) |
| 26 | 0.79 (Used) | 0.88 (High) | Logit -1.9 (low) |
| 27 | 1.07 (Used) | 1.06 (High) | Logit -1.6 (Moderately low) |
| 28 | 0.81 (Used) | 0.86 (High) | Logit -1.7 (Moderately low) |
| 29 | 0.84 (Used) | 0.87 (High) | Logit -1.1 (Moderately low) |
| 30 | 0.77 (Used) | 0.83 (High) | Logit -1.3 (Moderately low) |

The objective test for measuring students' concept mastery consisted of 30 questions has been tested in term of validity, reliability, and difficulty level. Before test item would be given to students, the researcher validated to the experts then, tested to 70 students from VIII and IX grades class. The result of validity, and reliability and wight test have shown in Figure 3.1, 3.2, 3.3, 3.4, and 3.5. The analysis based on Rasch Model Measurement it can be shown in Figure 3.1.

SUMMARY OF 70 MEASURED Person

| | TOTAL SCORE | COUNT | MEASURE | MODEL S.E. | INFIT MNSQ | INFIT ZSTD | OUTFIT MNSQ | OUTFIT ZSTD |
|---|---|---|---|---|---|---|---|---|
| MEAN | 57.6 | 70.0 | .41 | .43 | .99 | .04 | 1.00 | .03 |
| SEM | .5 | .0 | .09 | .00 | .03 | .14 | .04 | .14 |
| P.SD | 4.4 | .0 | .76 | .02 | .22 | 1.12 | .34 | 1.14 |
| S.SD | 4.4 | .0 | .76 | .02 | .22 | 1.13 | .34 | 1.15 |
| MAX. | 64.0 | 70.0 | 1.66 | .50 | 1.58 | 2.90 | 2.04 | 2.58 |
| MIN. | 47.0 | 70.0 | -1.43 | .40 | .65 | -1.87 | .56 | -1.74 |

| | | | | | |
|---|---|---|---|---|---|
| REAL RMSE | .45 TRUE SD | .61 | SEPARATION 1.37 | Person RELIABILITY | .65 |
| MODEL RMSE | .43 TRUE SD | .62 | SEPARATION 1.45 | Person RELIABILITY | .68 |
| S.E. OF Person MEAN = .09 | | | | | |

Person RAW SCORE-TO-MEASURE CORRELATION = 1.00

CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .69 SEM = 2.44

Figure 3.1 Students' Reliability

The effect of instrument reliability to examine student concept mastery shown in Figure 3.1 indicates it is equal standard. This research finds Cronbach-α 's reliability was 0.69 which is medium. The reliability of the person reliability is 0.65 which means low since most students can answer the questions. Figure 3.1 shows person-separation is 1.37, it indicates students are not good in cognitive skills because they controlled only in one skill and it may be another factor because the number of students is too small. If the division of the person is high, cognitive ability of the subject must be graded in high, medium and small. Good separation item quality is greater than 2.0, which implies classification of questions is categorized into easy, medium and hard.

Mean square value in the parameters (0.5 < Outfit MNSQ <1.5) and a standard Z outfit value (-2.0<ZSTD<+2.0) are used. Based on Figures 3.1 Mean Square values (0.5<1<1.5), a Z-standard Outfit value (-2.0<0.01<+2.0) indicates characteristics are sufficient for students conducted item. The next test is from item reliability, it can be seen on Figure 3.2

SUMMARY OF 30 MEASURED Item

| | TOTAL SCORE | COUNT | MEASURE | MODEL S.E. | INFIT MNSQ | INFIT ZSTD | OUTFIT MNSQ | OUTFIT ZSTD |
|---|---|---|---|---|---|---|---|---|
| MEAN | 41.0 | 70.0 | .00 | .28 | .99 | .05 | 1.00 | .01 |
| SEM | 2.5 | .0 | .19 | .01 | .02 | .20 | .04 | .23 |
| P.SD | 13.7 | .0 | 1.01 | .03 | .12 | 1.08 | .24 | 1.25 |
| S.SD | 13.9 | .0 | 1.03 | .03 | .13 | 1.10 | .24 | 1.27 |
| MAX. | 60.0 | 70.0 | 2.39 | .36 | 1.27 | 3.03 | 1.68 | 2.98 |
| MIN. | 10.0 | 70.0 | -1.58 | .25 | .75 | -2.10 | .51 | -2.03 |
| REAL RMSE | .29 | TRUE SD | .97 | SEPARATION | 3.31 | Item | RELIABILITY | .92 |
| MODEL RMSE | .29 | TRUE SD | .97 | SEPARATION | 3.39 | Item | RELIABILITY | .92 |
| S.E. OF Item MEAN = .19 | | | | | | | | |

Figure 3.2 Item Reliability

Figure 3.2 results show that the reliability of item is (0.92) shown good because item-reliability have excellent variable. Mean square value in the parameters (0.5<Outfit MNSQ<1.5) and standard Z outfit value (-2.0<ZSTD<+2.0) are used. Mean Square values (0.5<0.99<1.5), a Z-standard Outfit value (-2.0<0.05<+2.0) indicates the values are good in item. Next test is from difficulty item in Figure 3.3.

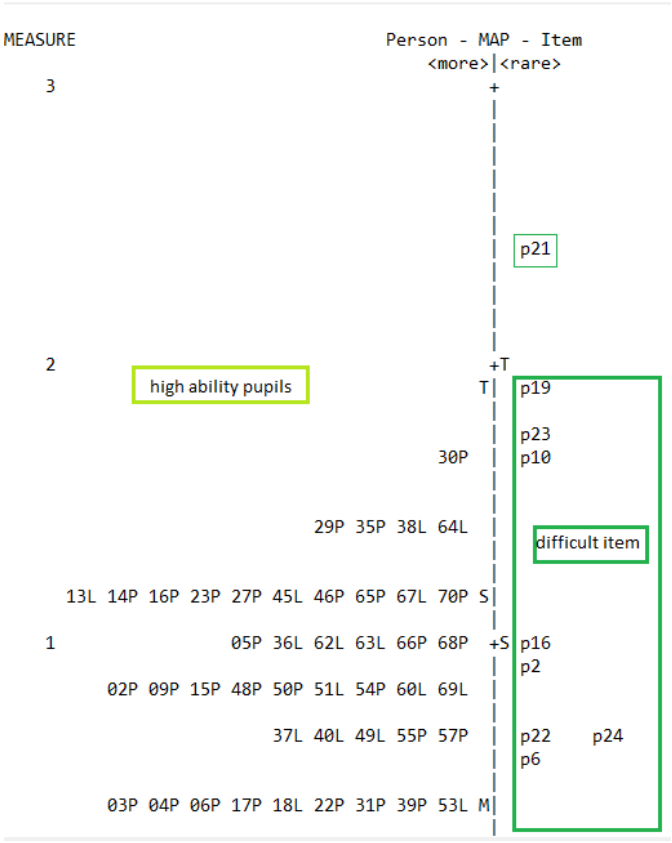


Figure 3.3 Wright Maps of High Ability Student

Figure 3.3 shows same scale for distribution of 70 students and difficulty item distribution. It shows highest ability is from student code (30P) and has a logit value is 2. The logit value is 1 indicates student's good ability. Moderate student is above 0 logit. Difficulty item is P21. P21 item has high level of cognitive ability, it is C3 (Executing) as capable of utilizing ideas which are obtained in new situation. The difficulty items are p19, p23, and p10 because logit value is above 1 logit other hard items are p19, p23, p10, p16, p2, p22, p24, p6, p12, p4, p8 because logit is above 0 logit. Next test is result from item test of low ability students in figure 3.4.

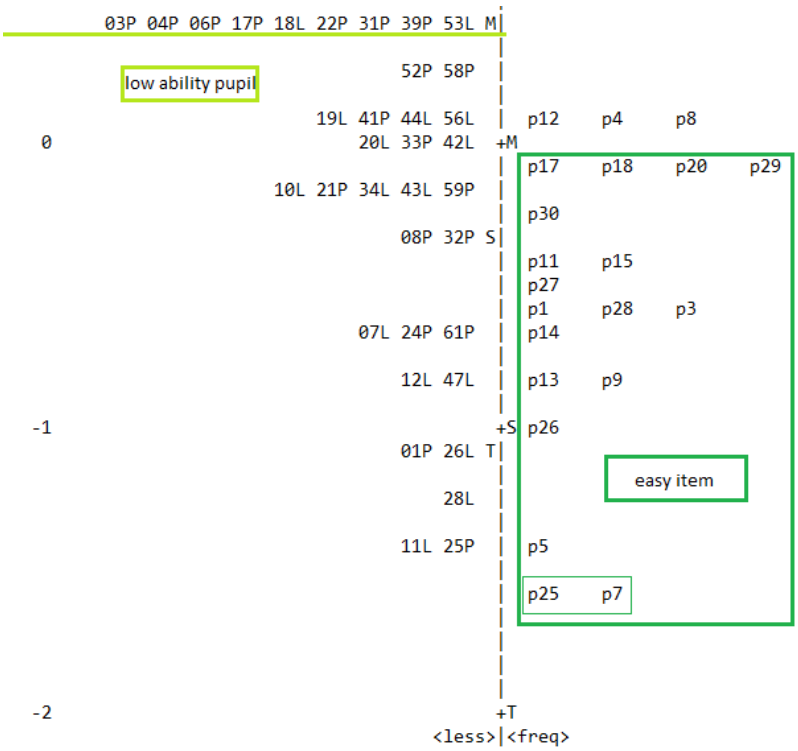


Figure 3.4 Wright Maps of Low Ability Pupils

Figure 3.4 shows student's lowest ability is (11L) and (25P) are -1 logit. easiest items are p25 and p7 since the item is from C1 (Remembering) because item ability to capture knowledge without understanding it. Easy items are p17, p18, p20, p29, p30, p11, p15, p27, p1, p28, p3, p14, p13, p9, p26, p5 because value is below 0 logit. Third test of item was checked for validity in Figure 3.5

| ENTRY NUMBER | TOTAL SCORE | TOTAL COUNT | MEASURE | MODEL S.E. | INFIT MNSQ | INFIT ZSTD | OUTFIT MNSQ | OUTFIT ZSTD | PTMEASUR-AL CORR. | PTMEASUR-AL EXP. | EXACT MATCH OBS% | EXACT MATCH EXP% | Item |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 14 | 70 | 1.96 | .31 | 1.19 | 1.11 | 1.68 | 2.25 | A | -.09 | .24 | 80.0 | 80.0 | p19 |
| 10 | 17 | 70 | 1.69 | .29 | 1.15 | 1.10 | 1.55 | 2.24 | B | -.01 | .26 | 75.7 | 75.7 | p10 |
| 2 | 27 | 70 | .96 | .26 | 1.27 | 3.03 | 1.42 | 2.98 | C | -.06 | .31 | 48.6 | 65.1 | p2 |
| 24 | 31 | 70 | .69 | .25 | 1.14 | 1.72 | 1.17 | 1.57 | D | .15 | .33 | 52.9 | 63.9 | p24 |
| 3 | 50 | 70 | -.60 | .28 | 1.11 | .84 | 1.15 | .91 | E | .20 | .34 | 68.6 | 74.1 | p3 |
| 16 | 26 | 70 | 1.02 | .26 | 1.06 | .75 | 1.12 | .88 | F | .21 | .31 | 64.3 | 65.6 | p16 |
| 6 | 33 | 70 | .56 | .25 | 1.07 | .95 | 1.09 | .87 | G | .24 | .33 | 51.4 | 63.9 | p6 |
| 22 | 32 | 70 | .63 | .25 | 1.08 | 1.03 | 1.07 | .74 | H | .23 | .33 | 57.1 | 63.8 | p22 |
| 23 | 16 | 70 | 1.78 | .29 | 1.08 | .59 | 1.02 | .18 | I | .17 | .26 | 77.1 | 77.1 | p23 |
| 17 | 43 | 70 | -.09 | .26 | 1.06 | .60 | 1.07 | .60 | J | .27 | .35 | 65.7 | 68.2 | p17 |
| 5 | 59 | 70 | -1.46 | .34 | 1.02 | .18 | 1.06 | .29 | K | .26 | .30 | 84.3 | 84.3 | p5 |
| 27 | 49 | 70 | -.53 | .28 | 1.06 | .49 | 1.05 | .36 | L | .27 | .34 | 72.9 | 73.2 | p27 |
| 4 | 40 | 70 | .11 | .26 | 1.04 | .44 | 1.05 | .49 | M | .30 | .35 | 68.6 | 66.3 | p4 |
| 21 | 10 | 70 | 2.39 | .35 | 1.03 | .21 | 1.05 | .27 | N | .15 | .21 | 85.7 | 85.7 | p21 |
| 1 | 50 | 70 | -.60 | .28 | 1.02 | .21 | 1.03 | .26 | O | .31 | .34 | 74.3 | 74.1 | p1 |
| 9 | 53 | 70 | -.85 | .30 | 1.03 | .21 | 1.03 | .21 | o | .30 | .33 | 77.1 | 77.1 | p9 |
| 18 | 43 | 70 | -.09 | .26 | 1.03 | .37 | 1.01 | .16 | n | .31 | .35 | 65.7 | 68.2 | p18 |
| 11 | 48 | 70 | -.45 | .27 | .99 | -.01 | .98 | -.07 | m | .36 | .34 | 71.4 | 72.3 | p11 |
| 20 | 43 | 70 | -.09 | .26 | .99 | -.05 | .96 | -.27 | l | .37 | .35 | 65.7 | 68.2 | p20 |
| 15 | 48 | 70 | -.45 | .27 | .94 | -.44 | .90 | -.65 | k | .43 | .34 | 74.3 | 72.3 | p15 |
| 7 | 60 | 70 | -1.58 | .36 | .89 | -.40 | .76 | -.70 | j | .43 | .29 | 85.7 | 85.7 | p7 |
| 8 | 41 | 70 | .04 | .26 | .89 | -1.19 | .89 | -1.06 | i | .48 | .35 | 70.0 | 66.9 | p8 |
| 26 | 55 | 70 | -1.03 | .31 | .88 | -.65 | .79 | -.91 | h | .48 | .32 | 82.9 | 79.3 | p26 |
| 29 | 43 | 70 | -.09 | .26 | .87 | -1.35 | .84 | -1.42 | g | .52 | .35 | 71.4 | 68.2 | p29 |
| 28 | 50 | 70 | -.60 | .28 | .86 | -1.02 | .81 | -1.18 | f | .52 | .34 | 80.0 | 74.1 | p28 |
| 14 | 51 | 70 | -.68 | .29 | .84 | -1.14 | .74 | -1.52 | e | .55 | .34 | 78.6 | 75.0 | p14 |
| 13 | 53 | 70 | -.85 | .30 | .83 | -1.15 | .70 | -1.56 | d | .57 | .33 | 80.0 | 77.1 | p13 |
| 30 | 45 | 70 | -.23 | .27 | .83 | -1.67 | .77 | -1.87 | c | .57 | .35 | 75.7 | 69.6 | p30 |
| 12 | 41 | 70 | .04 | .26 | .81 | -2.10 | .80 | -2.03 | b | .58 | .35 | 75.7 | 66.9 | p12 |
| 25 | 60 | 70 | -1.58 | .36 | .75 | -1.11 | .51 | -1.74 | a | .63 | .29 | 85.7 | 85.7 | p25 |

Figure 3.5 Validity Result

Figure 3.5 shows validity result is used to analyze the item is good to use or not. Based on the Figure 3.5 shows tool for measuring validity is using Rasch Model Analysis. The criteria is Outfit Mean Square (MNSQ), Z-Standard Outfit (ZSTD), and Point Measure Correlation (Pt Mean Corr) (Yasin, Yunus, and Ismail, 2018). The validity measured when MNSQ OUTFIT is in the range of 0.5 <MNSQ <1.5. MNSQ OUTFIT is to check objective test has been constructed to achieve good validity. If MNSQ value is 0.5 <MNSQ <1.5, it is accepted. If value above 0.5 and 1.5, it is mentioned item cannot be assessed for statistical analysis, and item should be revised.

## 3.9 Research procedure

To take out this research, there are several procedures. Those steps are divided into three sections. Steps are preparation stage, implementation stage, and completion stage. Flow chart is also made by the researcher to simplify procedure to be explained.

### 3.9.1 Preparation Stage

1) Conducting literature review and analysis of digital storytelling video, food additives, students' concept mastery, and students' creativity.
2) Designing the research instrument: CPSS rubric, objective test item and lesson plan.
3) Expert judgements
4) Research judgement revision
5) Validating instrument to students
6) Validating instrument result with Rasch Model.

### 3.9.2 Implementation Stage

1) Giving pre-test, giving treatment, and conducting posttest
2) Collecting research data

### 3.9.3 Completion Stage

1) Calculating and analyzing data
2) Making result and conclusion
3) Reporting result paper

The researcher made research flow chart in Figure 3.6. The stages are preparation stage, implementation stage and completion stage.

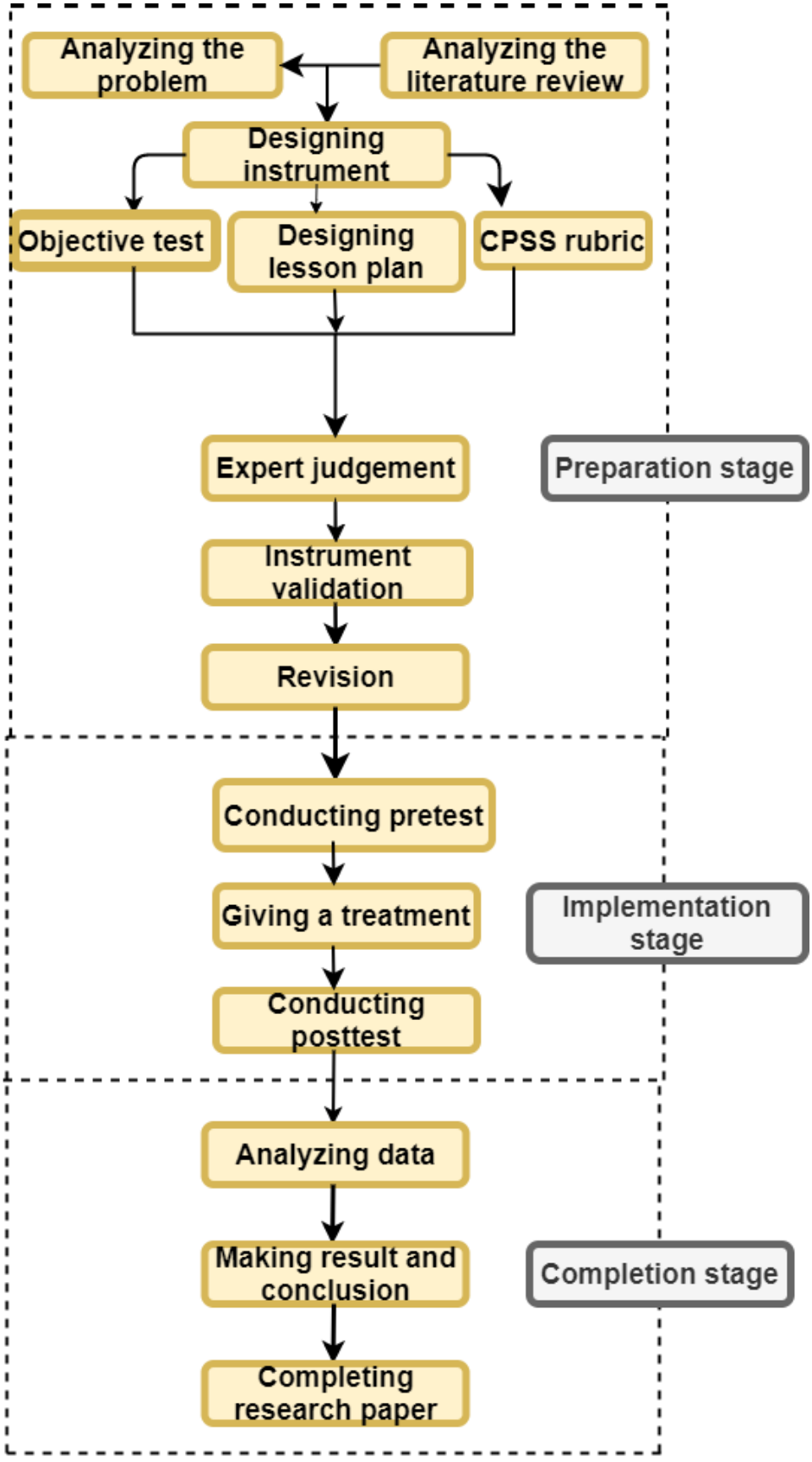


Figure 3.6 Research Flowchart

## 3.10 Instrument analysis result

### 3.10.1 Students' concept mastery

Researcher validated objective test item. Total objective test item is 30 multiple choices. The materials are food additives types, effect of food additives and human effort to reduce food additives. Participants conducted objective test item. Participant total is 70 students. Objective test item was measured by RASCH model measurement.

### 3.10.2 Data processing technique

The data processing technique is divided into two, quantitative and qualitative data explanation. For students' concept mastery, objective test item was assessed based on quantitative data explanation.

### 3.10.3 Students' concept mastery analysis

The objective test of this item, researcher analyzed by using SPSS (23 version) to get normality, Gain score, normalized Gain, homogeneity data, and T-test paired sample and Microsoft Excel 2010 to get minimum/ maximum score on pretest and posttest and average score of pretest and posttest.

### 3.10.4 Hypothesis test

To obtain hypothesis test, researcher used SPSS to get result that is significant from before conducted the pretest and after conducted posttest through students made digital storytelling video.

### 3.10.5 Normality test

Normality is statistical method assumed that data are from normal population. So, it is important to test normality of data. Normality test used by Shapiro-Wilk statistic test to use for testing normality of the data. If value of Shapiro-Wilk test is < 0.05, data is normal. If the data is above 0.05, data is non normal.

### 3.10.6 Homogeneity test

Homogeneity test is test to indicate proportions of elements belonging to different groups in two or more populations are similar or not. Null hypothesis ($H_0$) is the true category proportions are the same for all population. Alternative hypothesis is the true category are not the same for all populations. The value of significance value > significance level ($\alpha$) 0.05 to obtain the homogeneous data.

### 3.10.7 T-paired sample

T-paired sample t test to identify the difference two means is statically significant different. Data analysis showed the sig. 2 – tailed < 0.05 (α), indicate there is significant difference in performance of individuals before and after treatment. If the sig. 2 – tailed > 0.05 (α) indicates there is not significant difference between before and after treatment.

### 3.10.8 Normalized Gain and normalized score

Normalized gain and normalized score are average performance improvement separated by highest gain possible. To get <g> the formula is

$$< g >= \frac{\%G}{\%Gmax} = \frac{\%S_f - \%S_i}{100 - \%S_i}$$

Where,

<g> = Normalized gain

G = Actual gain

Gmax = Maximum gain possible

$S_f$ = Post - test score

$S_i$ = Pre - test score

The value of normalized gain that has been gained by interpreting using an interpretation table as follows:

Table 3.9

Normalized Gain Interpretation

| Value | Criteria |
|---|---|
| <g> ≥ 0.7 | High |
| 0.7 > <g> ≥ 0.3 | Medium |
| <g> < 0.3 | Low |

*(Hake, 1999)*

### 3.10.9 Student creativity

Students' creativity is judged by experts. The rubric is from adapted *(*O'Quin and Bessemer (1989). Some of aspects have been revised. The rubric is

for measuring product's creativity by student had already made it. The product is digital storytelling video.

### 3.10.10 Data processing technique

Students' creativity has been analyzed by using SPSS and students' creativity, CPSS (Creative Product Semantic Scale) was assessed based on the qualitative data explanation. The product of students' creativity is digital storytelling video.

### 3.10.11 Students' creativity

The rubric result is measured by Microsoft Excel 2010 to get creativity score and average score of 10 aspects in students' creativity on Creative Product Semantic Scale (CPSS) rubric.