

CHAPTER III

RESEARCH METHOD

This chapter presents detailed information about the research methodology used, starting from research design, population, sample, instruments, and data collection techniques, to the data analysis methods chosen to answer research questions and test hypotheses.

A. Research Design

This research is quantitative. According to Creswell (2018), quantitative research is an approach to testing objective theories by testing the relationships between variables. These variables can then be measured using instruments so that total data is obtained which is analyzed using statistical procedures. The design of this research is causal-comparative, according to Emzir (2014) Causal comparative research, also known as ex post facto research, is a systematic empirical research where the researcher cannot control/manipulate the independent variable because it has happened before or the variable cannot be manipulated. The data taken in this research are test scores on the degree of comparison material using the Quizizz assessment tool and paper-based assessment tools. These two values will be tested and then the results will be obtained, such as whether or not there is a difference between the cognitive learning outcomes in the two assessment tools used.

To conduct causal-comparative research, of course, steps are needed. There are several steps in designing a comparative study according to Ibrahim, et al (2018):

1. Selecting and Formulating the Problem to be Researched

The researcher has chosen to compare two assessment tool models to prove which is better used as an assessment tool in the degree of comparison material.

2. Conduct Literature Studies or Theoretical Studies

To increase the researcher's basic knowledge and depth of further analysis, the researcher collected as much reading material related to this research as possible in the form of books, journals, handouts, and previous research. Some reading materials and information related to this research have been explained in the previous chapter.

3. Formulate a Hypothesis

In this research, the researcher has formulated a hypothesis or temporary assumption based on the research statement. There are two hypotheses in this research which have been explained in the previous chapter.

4. Determine Population and Sample

At this step, the researcher has determined that the population of this study is all class X RPL students. Because the total population is less than 100, the researcher used the entire population as a sample (Arikunto, 2017). It is known that the entire sample consisted of 75 people who were divided into two classes.

5. Determine Research Instruments

The instruments in this research are test items that are tested for the validity and reliability of the data. Apart from the question items, there is also documentation to support this research.

6. Collect the Data

In this research, the data collection method or technique used is field research, which is carried out to collect data related to the problem. The data collection techniques in this research are test and documentation.

7. Analyze the Data

After the data was collected, the researcher analyzed the data using statistical and inferential data analysis techniques. The analysis begins with calculating the average value and standard deviation to determine between groups descriptively.

8. Compiling Research Reports

After obtaining and analyzing data regarding the comparison of two assessment tool models, namely Quizizz and paper-based tests, researchers summarized the data which was then reported in the form of a written document. The researcher will explain the methodology used in the research, the results of data analysis, as well as the conclusions and recommendations that can be given based on the research findings. In this context, a research report in the form of study completion is a thesis which is not only a requirement for obtaining a bachelor's degree, but also as a means of improving the ability to conduct research and write scientific papers.

B. Research Setting

The location of this research was carried out in class X RPL (*Rekayasa Perangkat Lunak*) Vocational High School 4 Banjarmasin, the address is Brig Jend. Hasan Basri street No.7, Sungai Miai, Kec. Banjarmasin Utara, Kota Banjarmasin, Kalimantan Selatan 70123. The researcher chose this place because previously the researcher had made initial observations and this research location was in accordance with the character of the problem the researcher posed, where some students still did not understand the degree of comparison material. Teachers try to innovate the teaching and learning process by using Quizizz. Researchers want to know whether there are differences in learning outcomes when students use two models of assessment tools.

C. Population and Sample

1. Population

Population is an area of generalization in research. This area includes objects or subjects from which conclusions can be drawn (Sugiyono,2019). According to Arikunto (2006), the population is the entire object of research that is studied and all forms that exist in the field are also recorded.

The population used was all students of class X RPL SMKN 4 Banjarmasin, totaling 75 students divided into two classes X RPL 1 and X RPL 2. Class X RPL 1 has used the paper based test and class X RPL 2 has used a Quizizz.

2. Sample

A sample is a small number that exists in a population and is considered representative of it (Sugiyono,2019). The sampling technique in this research is saturated sampling. Where a saturated sample is a sampling technique when all members of the population are sampled. This is done if the population is less than 100 people (Arikunto, 2006). Research using saturated samples aims to make generalizations with very small errors. Another term for a saturated sample is census because all members of the population are used as samples. (Sugiyono,2019).

Based on the explanation above, the sampling technique in this study used the entire population, namely class X RPL students at SMKN 4 Banjarmasin, totaling 75 students. Class X RPL is divided into 2 classes, namely class X RPL 1 which uses a paper based test with a total of 37 students. Meanwhile, class X RPL 2 uses the Quizizz assessment tool with a total of 38 students.

D. Data and Data Sources

1. Data

Data is all the facts and figures that can be used as material in compiling information, information itself is the result of processing data that is used for a purpose (Arikunto, 2006). There are two data extracted in this research, namely primary data and secondary data.

a. Primary Data

Primary data is a data source that directly provides data to data collectors. Data was collected by researchers directly from sources first or place where the object of research is carried out (Sugiyono, 2019).

- 1) Data related to student learning outcomes using the paper based test assessment tool on mastery of degree of comparison class X RPL 1 SMKN 4 Banjarmasin.
- 2) Data related to student learning outcomes using the Quizizz assessment tool mastery of degree of comparison class X RPL 2 SMKN 4 Banjarmasin.
- 3) Comparative data related to student learning outcomes using the Quizizz and paper based test assessment tools mastery of degree of comparison class X RPL SMKN 4 Banjarmasin.

b. Secondary Data

Secondary data to complement the main data. Secondary data is an indirect source of data providing data to data collectors, for example through other people or documents (Sugiyono, 2018). There are several secondary data in this research, namely:

- 1) List of attendance or absence of class X RPL students
- 2) ATP (Learning Objective Flow in the Independent Curriculum) created by the teacher and approved by the school principal.
- 3) Degree of comparison teaching materials used in the English teaching and learning process.
- 4) Students' daily test scores regarding the degree of comparison material

2. Data Source

- a. Respondents, namely students in class X RPL 1 and class X RPL 2 academic years 2023/2024 SMKN 4 Banjarmasin which was designated as research sample.
- b. Informants, namely several people who provide information about data obtained such as *TU*, English teachers for class X RPL 1 and X RPL 2 at SMKN 4 Banjarmasin.
- c. School documents, namely records, information, or relevant archives with research from both teacher and administrators.

E. Technique of Data Collection

Data collection techniques are a very important step in researching so that researchers can obtain data that is what is expected and what exists in the field. Data collection is one of the important stages in research. Data is collected from the source (data source), what is meant by source data is an object from which data is obtained (Kurniawan and Puspitanintyas, 2016). Because student learning outcome data is in the form of scores/test scores in the form of numbers, the type of data in this research is on an interval scale. The data collection techniques in this research are:

1. Test

Test is a technique or method used to carry out measurement activities, which include there are various questions, statements, or series of tasks that must

be done or answered by students to measure aspects of student behavior (Rahman and Nasryah, 2019). Before analyzing the research data, the researchers first analyzed the data from the daily test questions of class X RPL students who had used a multiple-choice test totaling 20 questions.

2. Documentation

Documentation is a method used to find out everything seen from notes or documents related to the object under study (Arikunto, 2017). Documentation is the collection of records of events that have occurred in the form of writing, images/photos, or monumental works from a person/agency (Sugiyono,2019). Researchers will look for data in the form of documents needed for research, such as data on daily test scores for degrees of comparison material in class X RPL, as well as ATP data, and teacher teaching modules and degrees of comparison material used by teachers, photos during research and also data during research.

F. Research Instrument

Research instruments are tools or facilities used by researcher in collecting data so that their work is easier and the results are better, in the sense that they are more accurate, complete, and systematic so that they are easier to process. The instruments used in the research are as follows:

1. Instrument Preparation

This test is used to compare the learning outcomes of students who use Quizizz as an assessment tool and those who use paper-based tests. The preparation of test instruments takes into account several things, namely:

- a. The questions refer to the Education Unit Level Curriculum
- b. Assessment is seen from the cognitive aspect
- c. The questions are in the form of multiple choice, true and false questions, and fill-in-the-blanks
- d. The questions are guided by the criteria for a good measuring instrument that at least meets validity and reliability.

The number of questions prepared was 45 questions, 25 questions consisting of multiple choices, 10 questions in the form of true-false questions, and 10 questions in the form of fill-in-the-blanks. The questions that will be tested can be seen in the Appendix.

2. Trial of Research Instruments

After obtaining the data, the instrument in this research measuring student learning outcomes includes validity and reliability tests. Validity and reliability tests are two important things that must be done in research, especially regarding the research instruments used. Test this validity and reliability to measure whether the questions are used in terms of fulfilling statistical requirements.

- a. Validity test

The validity of the items (questions) is calculated to identify the quantity measured by the measuring instrument. So that the instrument can be trusted, its validity and reliability must be tested. After the instrument has been tested for validity and reliability, it can be used to measure the variables that have been determined to be researched (Sugiyono, 2013). To test the suitability of the instrument used, in this study, the research instrument was tested first in class X *Kecantikan* at SMKN 4 Banjarmasin. After getting the results of the trials carried out previously. Next, test the validity using the correlation formula point biserial, namely:

$$r_{pbi} = \frac{M_p - M_t}{sDt} \frac{\sqrt{p}}{q}$$

r_{pbi} : Point biserial correlation coefficient

M_p : The average total score of those who answered correctly on question

M_t : Average total score

SD_t : Standard deviation of total scores

P: Proportion of students who answered correctly

q: Proportion of students who answered incorrectly

The researcher used the IBM SPSS Statistics 26 application to make it easier to calculate validity tests using the point biserial correlation formula.

After calculating r_{pbi} it is then compared with r_{table} with a significance level of 5%, if $r_{pbi} > r_{table}$ then it is said that the question is valid (Hartono,2015).

To test the validity of the degree of comparison material questions, the researcher prepared 45 questions with 30 students as test respondents. To determine r_{pbi} in the table $df = N - nr$ means $df = 30 - 2 = 28$. From the table of significant correlation coefficient values of 5%, it is known that the “r” table value is 0,361. From the instrument test calculations, the results of the validity test on the items tested on the degree of comparison material were obtained as follows. The calculation of the validity of the analysis test can be seen in the attachment, to make it easier to see the comparison of r_{pbi} and r table, the researcher made a table like Table 3.1 below.

Table 3.1 Validity Analysis of the Degree of Comparison Material Test.

Question Items	Test Result		Decision
	R pbi	R table	
1	0,579**	0,361	Valid
2	0,468**	0,361	Valid
3	0,631**	0,361	Valid
4	0,647**	0,361	Valid
5	0,776**	0,361	Valid
6	0,634**	0,361	Valid
7	0,563**	0,361	Valid
8	0,445*	0,361	Valid
9	0,563**	0,361	Valid
10	0,675**	0,361	Valid
11	0,404*	0,361	Valid
12	0,676**	0,361	Valid
13	0,455*	0,361	Valid
14	0,563**	0,361	Valid
15	0,619**	0,361	Valid
16	0,609**	0,361	Valid

Question Items	Test Result		Decision
	R pbi	R table	
17	0,756**	0,361	Valid
18	0,656**	0,361	Valid
19	0,483**	0,361	Valid
20	0,568**	0,361	Valid
21	0,560**	0,361	Valid
22	0,722**	0,361	Valid
23	0,655**	0,361	Valid
24	0,754**	0,361	Valid
25	0,680**	0,361	Valid
26	0,627**	0,361	Valid
27	0.100	0,361	Invalid
28	0,662**	0,361	Valid
29	0,508**	0,361	Valid
30	0,402*	0,361	Valid
31	0,388*	0,361	Valid
32	0,398*	0,361	Valid
33	0,184	0,361	Invalid
34	0,257	0,361	Invalid
35	0,571**	0,361	Valid
36	0,300	0,361	Invalid
37	0,481**	0,361	Valid
38	0,652**	0,361	Valid
39	0,838**	0,361	Valid
40	0,523**	0,361	Valid
41	0,743**	0,361	Valid
42	0,716**	0,361	Valid
43	0,554**	0,361	Valid
44	0,307	0,361	Invalid
45	0,686**	0,361	Valid

Source: Processed data 2024

Based on the table above, of the 45 questions, it appears that 40 questions are valid, and 5 questions are invalid. Furthermore, invalid questions were removed. The researcher only took 35 valid questions, 25 questions from multiple choice, 5 questions from true or false, and 5 questions from fill-in-the-blanks. This is done so that the total score is even, namely 100. Multiple choice questions are selected from 1-25 questions, 5 questions are true and false, while

in the fill-in-the-blanks section, there are also 5 questions. The questions chosen have a high validity value.

b. Reliability test

The reliability test of the research instrument is a test that is carried out to determine the reliability (level of trust) of a question item in measuring the variable under study. A research instrument can have a level of confidence high if the results of the instrument testing show relatively fixed (consistent) results (Kurniawan & Puspitaningtyas, 2016). Reliability testing was carried out using an internal consistency reliability approach that uses Cronbach's Alpha to identify how well the items in the instrument relate to the research. The following is the formula according to Khumaedi (2012).

$$\alpha = \frac{k}{k-1} \cdot \left(1 - \frac{\sum si^2}{st^2}\right)$$

α : Cronbach's Alpha Reliability

k : Number of items

$\sum si^2$: The total variance of the items

St^2 : Total score variance

Researcher used the IBM SPSS 26 application to make calculations easier. An instrument is said to be reliable if the Cronbach Alpha value is $> 0,60$ (Sugiyono, 2016). Interpretation criteria regarding benchmarks for interpreting reliability according to Creswell (2018) as follows:

Table 3.2 Instrument Reliability Category

Cronbach's Alpha Coefficient	Test Instrument Reliability Category
0,86-1,00	Very high
0,66-0,85	High
0,36-0,65	Low
0,20-0,35	Very low
0,00-0,19	Not reliable

The level of reliability of the instrument is determined based on its magnitude owned reliability coefficient. The higher the reliability coefficient the higher the reliability of the instrument. To see the reliability test results, can be seen at the reliability test results on IBM SPSS 26 which uses Cronbach's Alpha formula presented in Table 3.4

Table 3.3 Reliability Test Result

Reliability test	
Cronbach's Alpha	N of Items
<u>.952</u>	35

Based on the analysis that has been carried out on the 35 questions viewed from the Cronbach's Alpha value, the data reliability value was 0.952. Based on the interpretation table for the reliability of the test questions, it can be concluded that the questions meet the criteria for use in research with reliability criteria very high.

G. Data Analysis Technique

Data analysis is an activity after the data from all respondents or other data sources are collected. Data analysis techniques in quantitative research use statistics. There are two types of statistics used for data analysis in research, namely descriptive statistics and inferential statistics (Sugiyono,2013). Here's the explanation:

1. Descriptive Statistical Analysis

Descriptive statistics are statistics used to analyze data by describing or illustrating the data that has been collected as is without intending to draw any conclusions applied to the general public or generalizations (Sugiyono, 2013). Descriptive data comes from descriptive statistics compiled through frequency distribution tables. The steps in compiling a frequency distribution table are as below (Ananda & Fadhli, 2018):

- a. Sort data from the highest data value to the lowest data value.
- b. Calculates the range or range of values (R)
- c. Calculate the number of interval classes (k) using the Sturges formula:

$$k=1+3,3\log n$$

n = Lots of data

- d. Calculating the length of the class interval (I)

$$I = \frac{R}{K}$$

I = Class Interval

R = Value Range

K = Lots of classes

e. Calculating the mean (average value)

$$\bar{x} = \frac{\sum fi \cdot xi}{n}$$

\bar{x} = Mean

X_i = Mark

F_i = Frequency of class i

n = Lots of data

f. Calculate standard deviation

$$S = \frac{\sqrt{\sum f (X - \bar{X})^2}}{n - 1}$$

S = Standard deviation

f = Class frequency

X = Data values

\bar{x} = Average value

N = Lots of data

- a. Calculate the percentage (%) of the average value

$$P = \frac{F}{n} \times 100 \%$$

P = Percentage figure

F = Frequency to search for

n = Number of respondents

The criteria used in determining the cognitive learning outcomes of students in class X RPL are based on pre-observations carried out by the researcher and from the description of the English teacher of the class, there are several categories, among others low, sufficient, and high. How to formulate the categories of cognitive learning outcomes of students can be seen in Table 3.4 below:

Table 3.4 Category of Student Cognitive Learning Outcomes

< 70	Low
>70 – 90	Sufficient
> 90 - 100	High

Source: English Teacher, 2023

2. Inferential Statistical Analysis

Inferential Statistics namely statistics that learn or prepare withdrawal procedures conclusions regarding population characteristics, based on quantitative data obtained from research samples (Ananda & Fadhli, 2018). Statistics inferential statistics can be in the form of parametric statistics and non-parametric statistics (Sugiyono, 2013). This inferential statistical testing aims to obtain answers to the research hypothesis by first carrying out the following prerequisite tests:

a. Normality Test

Normality testing is carried out to determine normality whether or not a data distribution is present. This is important to know related to the accuracy of selecting statistical tests to be used because parametric statistical tests require the data to be normally distributed. If the data obtained is not normally distributed then it is recommended to test nonparametric statistics (Ananda & Fadhli, 2018). The normality test in this research used one Kolmogorov Smirnov sample which was processed from IBM SPSS version 26. To find out whether the data is normally distributed or not, you need to pay attention to the numbers in the significance column (Sig). The normality test criteria in this research are (Ananda & Fadhli, 2018):

- 1) If the significance value is > 0.05 then the data is declared to be normally distributed.

2) If the significance value is <0.05 then the data is declared not normally distributed.

b. Homogeneity Test

Homogeneity testing is carried out to test the equality of variances for each group of data. Homogeneity test requirements are necessary to perform inferential analysis in the test comparison. This homogeneity test is carried out using the Levene test, homogeneity testing using Levene test is carried out if there are only 2 (two) data to be tested a group or sample. The Levene test is carried out in this way to compare the largest data variance divided by the smallest data variance. The categories in the Levene test are as follows (Ananda & Fadhli, 2018):

1) If the significance number is > 0.05 then the variance of each sample is the same (homogeneous).

2) If the significance number is <0.05 then the variance of each sample is different (not homogeneous).

c. Hypothesis Test

Testing the hypothesis of this research is an independent samples t-test or a test of two unrelated samples. The aim is to determine whether there is a difference in the average between two unrelated sample groups (Sugiyono, 2013). The steps in testing the independent samples t-test are as follows (Ananda & Fadhli, 2018):

1) H₀: there is no difference between the use of the Quizizz assessment tool and the paper based test on student learning outcomes in mastering the degree of comparison.

H_a: there is a difference between the use of the Quizizz assessment tool and the paper based test on student learning outcomes in mastering the degree of comparison material.

2) Determine the level of significance

The significance level in this study uses $\alpha = 5\%$ or 0.05.

3) Calculate t count

The technique used to test the hypothesis is to use the t-test with the formula

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$\text{With } s = \sqrt{\frac{(n_1-1) s_1^2 + (n_2-1) s_2^2}{n_1 + n_2 - 2}}$$

t = Calculated t value

\bar{x}_1 = Average score of the experimental class

\bar{x}_2 = The average score of the control class

S = Combined standard deviation

n_1 = Number of experimental class subjects

n_2 = Number of control class subjects

4) Determine the t table

The t table can be seen in the t distribution table with $\alpha = 0.05$ and degrees of freedom (df) = $n-2$.

5) Testing criteria

If $t_{\text{count}} > t_{\text{table}}$ and significance < 0.05 then H_0 is rejected.

If $t_{\text{count}} < t_{\text{table}}$ and significance > 0.05 then H_0 is accepted.