CHAPTER III
METHODOLOGY

A. Research Design

This research used quantitative methods, it is a method used to evaluate objective theories by examining the relationship between variables or comparisons between groups (Creswell John and Creswell David, 2023). The data generated from this research were presented numerical form, which are then analyzed with statistical procedures to find patterns or significant relationships between the variables studied. The aim was to obtain more objective and measurable results, which can be used to test hypotheses or theories that had been proposed. The method use was experimental, According to Sugiyono experimental research is a type of research conducted through experiments. This research was included in the quantitative research category and aimed to determine the effect of the independent variable (treatment) on the dependent variable (outcome) under controlled conditions (Zyra et al., 2022). which aimed to test the effect of certain variables used standardized measuring instruments. The design used Quasi Experimental, which means there was a control group, but it cannot fully control external factors that can affected the experimental results. The type of design applied was nonequivalent control group design, where the results between the experimental group and the control group were compared

to see the difference in results after the experiment was carried out. The research design pattern of nonequivalent control group design was as follows:

Table 1. Pre-Test Post-Test Nonequivalent Control Group Design

Experiment	O1	X	O2
Control	O3	-	O4

Description:

E : Experimental group

K : Control group

X : Application Media

O1 : Pretest in experimental class

O2 : Posttest on the experimental class

O3 : Pretest in control class

O4 : Posttest on control class

B. Location and Time of Research

This research was conducted on students of class 7 Madrasah Tsanawiyah at Al-Um Islamic Boarding School of North Bengkulu which is located in Bukit Harapan Village, Pinang Raya sub-district, North Bengkulu Regency. The research was carried out based on a research permit that had been issued from the campus, namely on March 06 to April 06, 2025.

C. Population and Sample

1. Population

The next stage in the research procedure was to determine the subjects or students who will be the population in this research (Willie, 2024). Population was a cornerstone in research methodology, which summarized a set of individuals who exhibited the same characteristics within a defined geographic or institutional domain. population is an important part of research design because it determined the scope and limits of research results. In teaching and learning research, the population could come from a group of interest, such as students, teachers, schools, or educational programs (Ahmad et al., 2023).

From some of the opinion above could be conducted that the population was an important step in research because it was the basis for identifying who would be studied. A population included a group of individuals with certain characteristics in a particular area or institution. In educational research, the population can come from students, teachers, schools, or programs that you want to study. And the researcher taken by the population in the seventh grade students of Madrasah Tsanawiyah at Al-Um Islamic boarding school of north Bengkulu academic years of 2024/2025.

The population of this research consisted of 66

seventh grade students of Madrasah Tsanawiyah at Al-Um Islamic boarding school of north Bengkulu, consisting of three classes, namely class A totaling 22 students, class B totaling 21 students, and class C totaling 23 students. In this research, researcher chose class VII A as the experimental class with 23 students and VII B as the control class with 21 students to be used in the research, where the population was shown in the following table:

Table 2. Population of The Research

No	Class	Total
1.	VII A	22
2.	VII B	21
3.	VII C	23
Total		66

Source: Madrasah Tsanawiyah Al-Um, 2024

2. Sample

In this research, a portion of the population was selected to be the focus of research and used as a research sample. The sample was part of the population that has certain characteristics that are considered representative of the entire population (Suriani et al., 2023). so that through the sample, the researcher can draw conclusions about the population in general.

This research used purposive sampling technique, which was a sampling technique with certain considerations

or criteria. According to Sugiyono, purposive sampling is a sampling process carried out with certain considerations (Duka et al., 2020). The used of purposive sampling in this study was based on the researcher consideration, taking into account the condition of the students and the learning needs. The researcher chose classes that were considered suitable to be used as experimental and control classes, with the hope that the results obtained could reflect the effectiveness of the intervention provided. The sample in this research consisted of 43 students of class VII A and VII B at Madrasah Tsanawiyah boarding school Al-Um North Bengkulu. Class VII A was designated as the experimental class, while class VII B as the control class, as shown in the following table:

Table 3. Total Sample of The Research

Class	Subject of students	Men	Women	Number of students
VII A	Experimental group	9	13	22
VII B	Control group	8	13	21
Total				43

Source: Madrasah Tsanawiyah Al-Um, 2024

D. Operational Definition of Variables

A variable was something that could distinguish or change values (Sugiyono, 2003). A research variable was a characteristic, trait, or value of the individual or object under study, which could logically be grouped based on two or more characteristics. Independent variables are variables that affect the dependent variable, either positively or negatively (Marliana Susianti, 2024). This variable acts as a causal factor that can affect changes in other variables in the study. While the dependent variable was the dependent, endogenous, or consequent variable, is the variable that was the center of the researcher attention (Marliana Susianti, 2024). This variable is the result or effect that was influenced by the independent variable. Researchers observe the dependent variable to find out how changes in the independent variable affect the measured outcome. These variables have various characteristics or values, so they become the focus of the researcher attention to study them and make conclusions. These variables were as follows:

1. Vocabulary

   Christopher (1999:35) stated that vocabulary was a language components which contained all of information about meaning and using of words in language which are possessed by a speaker, a writer or a listener (Hariati, 2020).

2. Wordscapes

The Wordscapes app combined the best elements of word search games and crossword puzzles, creating a gaming experience that was not only entertaining but also challenged brainpower . This mobile app game was one of about 10 games developed by PeopleFun. PeopleFun started 10 years ago, with CEO Tony Goodman at the helm (Tak, 2021).

E. Data Collection Technique

Data collection was a process in research in which researchers interacted directly with the object of research to obtain the information or data needed (Sugiyono, 2003). In this research the researcher gave pre-test and post-test to all students, both in the control class and experimental class. Data were collected by giving tests to students. Collecting data was one of the important steps to determine the results of research. The data collection process was carried out through several stages. Data were taken from pre-test and post-test scores. The purpose of this study was to determine whether the wordscapes application was effective in improving students vocabulary at Al-Um boarding school north Bengkulu. then the pre-test and post-test scores were compared to see the difference. The researcher also looked at the students vocabulary ability before the test was conducted. here are three data collection techniques:

a. Test

Tests referred to measurement instruments used to assess various aspects such as personality, aptitude, intellectual level, interest, or individual achievement (Sahir, 2022).

a. Pre-test

This pre-test was used when the material would took place, with the aim of knowing the extent to which the material or material to be taught could already be mastered by students (Magdalena, Nurul Annisa, et al., 2021). In the research, the researcher gave 26 multiple choice pretest questions to students in the experimental and control classes. This pretest serves to determined students initial ability in vocabulary mastery before being given certain treatments. The purpose of this pretest was to measure the students initial level of knowledge, so that later it could be compared with the results after the treatment was given. Thus, researchers could assessed the extent of the influence of the used of Wordscapes application in improving students vocabulary mastery.

b. Post-test

This post-test was carried out at the end of the learning process of a material with the aimed of knowing the extent of students understanding of the material

(Magdalena, Nurul Annisa, et al., 2021). After the treatment was given, researcher gave 26 multiple-choice post-test questions to students in the experimental and control classes. This post-test served to measure students learning outcomes after they received treatment, in this case the used of Wordscapes application in the experimental class and conventional learning methods in the control class. The purpose of the post-test was to determine the improvement of students vocabulary mastery ability after being given the treatment and compared the results with the pretest scores with the assessment criteria of 1 for correct questions and 0 for incorrect questions. With this comparison, the researcher can assessed the effectiveness of using Wordscapes application in improving students vocabulary mastery significantly compared to the control class that did not use wordscapes application.

c. Treatment

In quantitative research, treatment referred to an action performed on the object or subject of research to study its effect (Sahir, 2022). The treatment in this research was given to students in the experimental class by using Wordscapes application as a learning media to improve English vocabulary mastery. Students in the experimental class were invited to learn vocabulary

through the game of arranging letters into words in the application. Meanwhile, the control class was not given the same treatment and continued to use conventional learning methods that were usually used by teachers in the classroom.

The treatment was conducted for 4 meetings, and each meeting lasted for 45 minutes, so the total treatment time for 4 meetings was 180 minutes. During the treatment process, the researcher guided students in using the wordscapes application, helped understand the meaning of words that appeared, and provided additional explanations.

The function of this treatment was to introduce an interesting, fun, and technology based vocabulary learning method through the wordscapes application. The aimed was to find out whether this method can improve students vocabulary acquisition more effectively compared to the usual learning method.

b. Vocabulary test

A vocabulary test was a tool used to measure the extent to which students understood and mastered vocabulary. It assessed students ability to recognize, understand, and use words appropriately in various contexts (Cervatiuc, 2007) . To help students improve their vocabulary mastery, the researcher conducted a study using

Wordscapes learning media. This study was conducted on a group of seventh grade MTs A and B students at Al Um boarding school north Bengkulu who were purposively selected.

The first step in this study was to give a pre-test. This test consisted of 26 multiple choice questions which aimed to find out how much vocabulary the students had mastered before being given the treatment. After the pre-test, students followed the learning using wordscapes application for four meetings. Wordscapes is a word game that invites students to arrange letters into words. and then after students took part in learning using Wordscapes, they are given post-test questions. This post- test also consisted of 26 multiple choice questions, just like the pre-test. The purpose was to see if there was an increase in vocabulary mastery after students learned with Wordscape media.

Each question had only one correct answer. The scoring was done in a simple way, correct answers were given a score of 1, and incorrect answers were given a score of 0. After all students completed the pre-test and post-test questions, the researcher collected and calculated the pre-test and post-test scores of each student.

Furthermore, researchers compared the pre-test and post- test scores to see if there was any improvement. The data was then analyzed using statistical calculations, to find

out whether the use of Wordscapes was really effective in improving students vocabulary mastery.

Table 4. Score Interval for English Teaching Vocabulary

The Rage of Score	Scores Category	
20-18	Excellent	sophisticated range-effective word idiom choice and usage etc.
17-14	Good To Average	adequate range occasional errors of word/idiom form, choice, usage but meaning not obscured.
13-10	Fair To Poor	limited range frequent errors of word/idiom form, choice, usage etc.
9-7	Very Poor	Essentially translation little knowledge of English vocabulary. of

Source : J. B. Heaton, 1997

c. Documentation

Documentation was a data collection technique that gathers information from various types of documents or written sources. These can be reports, notes, texts, archives, journals, or other recordings relevant to the research objectives. In this study, documentation was needed to collect data relevant to the title (Amelia et al., 2023). The

documentation includes a list of names of students who are the subject of the study, as well as grades needed for the study. The documentation also includes photographs of learning activities and pre- and post-test results on the given material.

F. Research Instrument

Research used instruments to collect data from it is subjects. In quantitative research, instruments were very important because they are used to measure the variables under study. In this research, the measuring instrument used was a vocabulary test, which consists of a pre-test and post-test. This test was designed, created and implemented to obtain information about learners knowledge, attitudes, skills, values and preferences related to vocabulary mastery (Olajide, 2018). This vocabulary test aimed to measure how effective the use of Wordscapes application was in improving students vocabulary mastery.

Thus, a vocabulary test was given to students consisting of twenty questions to evaluate their vocabulary ability. Pre-test and post- test are included in this test, which is given to two groups: experimental class and control class. Before being used in the study, the measurement of this vocabulary test instrument must also be tested for validity and reliability to ensure the accuracy and consistency of the instrument. The questions could be used for pre-test and post-test for both

groups after they are tested and meet the eligibility standards.

G. Data Analysis Technique

The prerequisite test data analysis used in this study includes normality test, homogeneity test, T-test, N-Gain test and hypothesis testing.

1. Validity of the test

Before the researcher conducts the research, the researcher conducts the validity of the instrument first. The instrument to be tested must show suitability in the aspects to be tested. according to (Kimberlin & Winterstein, 2008) Validity is the extent to which a study accurately measures what it wants to measure (Kouam Arthur William, 2024).

Table 5. Test Instrument Validity Criteria

No	Cronbach's Alpa	Validity Level
1.	0,81 – 1,00	Highly
2.	0,61 – 0,80	High
3.	0,41– 0,60	Fairly
4.	0,21 – 0,40	Low
5.	0,00 – 0,20	Very Low

Source: Widodo at al, 2023

In addition, researcher also analyzed the test results used computer statistics such as SPSS version 25. And the test results consisted of 65 questions containing three vocabulary indicators. following were the results of the data analysis of the instrument validity test:

Table 6. Instrumen Validity

variable	Item	r table	r count	Result
	S1	0,4227	0,643	Valid
	S2	0,4227	0,598	Valid
	S3	0,4227	0,574	Valid
	S4	0,4227	0,440	Valid
	S5	0,4227	0,435	Valid
	S6	0,4227	0,435	Valid
	S7	0,4227	0,254	Unvalid
	S8	0,4227	0,077	Unvalid
	S9	0,4227	0,529	Valid
	S10	0,4227	-0,004	Unvalid
	S11	0,4227	0,223	Unvalid
	S12	0,4227	0,176	Unvalid
	S13	0,4227	0,523	Valid
	S14	0,4227	-0,099	Unvalid
	S15	0,4227	0,192	Unvalid
	S16	0,4227	0,493	Valid
	S17	0,4227	0,138	Unvalid
	S18	0,4227	0,333	Unvalid
	S19	0,4227	0,158	Unvalid
	S20	0,4227	0,319	Unvalid
	S21	0,4227	0,595	Valid
	S22	0,4227	0,519	Valid

Soal	S23	0,4227	0,378	Unvalid
	S24	0,4227	0,419	Unvalid
	S25	0,4227	0,631	Valid
	S26	0,4227	0,526	Valid
	S27	0,4227	0,282	Unvalid
	S28	0,4227	0,131	Unvalid
	S29	0,4227	0,530	Valid
	S30	0,4227	0,443	Valid
	S31	0,4227	0,013	Unvalid
	S32	0,4227	0,469	Valid
	S33	0,4227	0,131	Unvalid
	S34	0,4227	0,482	Valid
	S35	0,4227	0,011	Unvalid
	S36	0,4227	0,145	Unvalid
	S37	0,4227	0,043	Unvalid
	S38	0,4227	0,174	Unvalid
	S39	0,4227	0,481	Valid
	S40	0,4227	0,164	Unvalid
	S41	0,4227	0,407	Unvalid
	S52	0,4227	0,595	Valid
	S43	0,4227	0,540	Valid
	S44	0,4227	0,355	Unvalid
	S45	0,4227	0,278	Unvalid
	S46	0,4227	0,284	Unvalid

	S47	0,4227	0,389	Unvalid
	S48	0,4227	0,161	Unvalid
	S49	0,4227	0,104	Unvalid
	S50	0,4227	0,497	Valid
	S51	0,4227	0,264	Unvalid
	S52	0,4227	0,470	Valid
	S53	0,4227	0,352	Unvalid
	S54	0,4227	0,039	Unvalid
	S55	0,4227	0,574	Valid
	S56	0,4227	0,530	Valid
	S57	0,4227	0,158	Unvalid
	S58	0,4227	0,315	Unvalid
	S59	0,4227	0,387	Unvalid
	S60	0,4227	0,448	Valid
	S61	0,4227	-0,182	Unvalid
	S62	0,4227	0,421	Unvalid
	S63	0,4227	0,411	Unvalid
	S64	0,4227	0,260	Unvalid
	S65	0,4227	0.484	Valid

In this validity test, researcher used 65 multiple choice questions with predetermined indicators, and the test of this question instrument was carried out at SMP Negeri 61 North Bengkulu which of course has an accreditation level equivalent to the school that will be the

main research location, namely at Madrasah Tsanawiyah boarding school Al-Um. This trial involved 22 students as test subjects for the question instrument. After the trial was completed, the researcher analyzed the data by calculating the validity of each question. From the results of the analysis, it was found that 26 of the 65 questions tested were declared valid with the following indicators:

Table 7. Indicators of Vocabulary Validity Test

No	Test item	Test indicator
1.	The word ***act*** means to … a. Listen b. Move c. Sing d. Draw	Students can define verbs in English.
2.	The word ***cat*** in English means … a. Bird b. Dog c. Pet d. Fish	Students can define nouns in English.
3.	***Sekarang*** in english is … a. Now b. Yesterday c. Tomorrow d. Last night	Students can define adverbs of time in English.

4.	The word ***won*** is the past tense of … a. Win b. Work c. Write d. Want	Students can identify the past tense form of
5.	The word ***are*** is used for .. a. He b. She c. It d. They	Students can use the auxiliary verb "are" correctly.
6.	The word ***era*** means … a. A time period b. A place c. A sound d. A shape	Students can define nouns that refer to time
7.	The word ***rip*** means to … a. Tear b. Fix c. Buy d. Fold	Students can define verbs related to the action of tearing.
8.	The word ***rip*** means to … e. Tear f. Fix g. Buy	Students can define verbs related to the action of tearing.

	h. Fold	
9.	The word ***ten*** refers to … a. A number b. A color c. A place d. A shape	Students can define nouns that refer to numbers.
10.	***Telinga*** in English is … a. Eye b. Face c. Nose d. Ear	Students can define nouns that refer to body parts.
11.	Which word means ***a small drop of liquid ?*** a. Drip b. Rip c. Rid d. Dip	Students can define nouns that refer to small drops of liquid.
12.	Which word means ***Just or equal***? a. Fir b. Fair c. Far d. Air	Students can define adjectives that mean fair or equal
13.	Which word refers to ***the end of something***? a. Dent b. Finish c. Open d. Start	Students can define verbs related to ending something.

14.	The number ***ten*** is equal to … a. 100 b. 10 c. 50 d. 5	Students can identify the numerical value of the word "ten".
15.	***Ketuk*** in English is … a. Pat b. Apt c. Tap d. Park	Students can define verbs related to knocking.
16.	***Ketuk*** in English is … e. Pat f. Apt g. Tap h. Park	Students can define verbs related to knocking.
17.	Fill in the blank ***let us go to "_____"*** a. Park b. Par c. Ark d. Rap	Students can complete blank sentences with the appropriate nouns.
18.	The word ***cat*** is a type of … a. Animal b. Plant c. Machine d. Place	Students can classify nouns into the appropriate categories.
19.	Which word means ***period of time***? a. Season b. Age c. Era d. Part	Students can define nouns that refer to time periods.
20.	The word ***tap*** is an example of a … a. Noun b. Verb	Students can identify examples of nouns that fall

	c. Place d. adjective	under the animal category.
21.	***Robek*** in English is … a. Drip b. Rip c. Rid d. Dip	Students can define verbs related to tearing.
22.	If something is ***near***, what is the opposite of that? a. Far b. Air c. Park d. Ten	Students can identify the antonym of the adjective "near".
23.	***Sepuluh*** in English is … a. Four b. Ten c. Nine d. Five	Students can define numerals in English.
24.	Which of these words means to ***win or succeed*** ? a. Tend b. Act c. Rap d. Cat	Students can identify verbs related to winning or succeeding.
25.	Which word refers to ***a fishing tool or something used to catch***? a. Net b. Ten c. Fir d. Ark	Students can define nouns that refer to fishing tools.
26.	Find the word that is a synonym for ***far***… a. Fir b. Era c. Distant d. Near	Students can find synonyms for the adjective "far".

2. Reliabillity of the test

According to Kouam Arthur William reliability refers to the consistency and stability of the results (Kouam Arthur William, 2024). After tested the questions, there were questions that have validity criteria, so after the validity test the next step was the reliability test. The reliability value is measured using Cronbach Alpha, if the Cronbach Alpha value> r-table then the variable can be said to be realizable.

Table 8. Test Instrument Reliability Criteria

No	Cronbach's Alpa	Reliability Level
1.	0,00 – 0,20	Lack of Reliabel
2.	0,20 – 0,40	Somewhat Reliable
3.	0,40 – 0,60	Fairly Reliabel
4.	0, 60 – 0,80	Reliable
5.	0,80 – 1,00	Highly Reliable

Source: Nuzulia, 2019

Researchers analyzed the reliability value using the SPSS version 25 program. This reliability test was carried out to see whether the research instrument provided consistent results. The calculation uses the Cronbach's Alpha method, which measures the extent to which the questions in the instrument are related to each other. The calculation results show the reliability coefficient value (Cronbach's Alpha) as follows:

Table 9. Instrumen Reliability

Reliability Statistics	
Cronbach's Alpha	N of Items
0,883	65
Reliabel	

In this reliability test, researcher used 65 multiple choice questions with predetermined indicators, and the test of this question instrument was carried out at SMP Negeri 61 North Bengkulu which certainly had an accreditation level equivalent to the school that would be the main research location, namely at Madrasah Tsanawiyah boarding school Al-Um. This trial involved 22 students as test subjects for the question instrument. After the trial was completed, the researcher analyzed the data by calculating the test result data by calculating the reliability. After processing the reliability data of the test questions, the reliability test coefficient was 0.883, which is based on the category above that the item is said to be highly reliable if it reaches a value of 0.600 or higher (Hari Sugiharto Setyaedhi, 2024). Therefore, it can be assumed that this test has a good level of reliability (Herlawan et al., 2021).

3. The level difficulty test

One important component in making research instruments is the item difficulty test. Analyzing the level of difficulty of items means examining test questions in terms of difficulty so that it could be obtained which questions are

easy (Magdalena, Fauziah, et al., 2021). This test was conducted to evaluate the effect of Wordscapes application on students vocabulary mastery. This test was conducted to analyze the difficulty level of the game so that each question was in accordance with the students abilities. In this process, data was collected from students who completed the game vocabulary test and then analyzed the results. To determine whether the question was easy, difficult, or moderate, the difficulty level was calculated by dividing the number of students who answered correctly by the total number of test takers. The general formula is :

$$P = \frac{Rh + Ri}{Nh + Ni} \text{ X } 100\%$$

Description:

P = Difficulty level in percent

N_h = Number of test takers in high score group

R_h = Number of correct answers in high score group

N_i = Number of test takers in low score group

R_i = Number of correct answers in low score group

$$P = \frac{315}{6} + \frac{55}{6} \text{ X } 100\%$$

P = 61,6%

Table 10. Interpretation of difficult question categories

Question category	Interpretation of results
Classified as easy	0,71% ---------- 100%
Classified as medium	0,31%---------- 0,70%
Classified as difficult	0%---------- 0,30%

Source: (Gde Yadnyawati, 2019)

In testing research questions, it was important to balance the level of difficulty of the test items made. It was intended that the questions given are neither too easy nor too difficult. Based on the calculation of the level of difficulty, the tested questions reached 61.6%. According to the applicable criteria, this figure is included in the medium category, because the range of 41% - 70% is categorized as medium difficulty. Therefore, the question is suitable for use in research.

4. Item discrimination test

Differentiating power referred to the extent to which the question could distinguish between students who had high abilities (upper group) and those who had low abilities (lower group) in understanding the material being tested (Pradita et al., 2023). The purpose of this test was to determine the extent to which vocabulary test items had the ability to differentiate between students who had high and low ability in mastering English vocabulary. Items with high discriminating power will showed a clear difference

between students who have mastered the vocabulary. In this research, the test of discriminating power was conducted by dividing students into two groups based on their vocabulary test scores. Students in the upper group received the highest vocabulary test score, and students in the lower group received the lowest vocabulary test score.The general formula is :

$$DP = \frac{U-L}{N}$$

Description:

DP = Question discriminating power.

U = Number of correct answers from high score group test takers

L = Number of correct answers from low score group test takers

N = Number oFstudents in each group

$$DP = \frac{315-55}{12}$$

DP = 21,66%

Table 11. Interpretation of the Power Difference Test

T-test	Interpretation of results
0,71 ≤ DP ≤1,00	Very good
0,41 ≤ DP ≤ 0,70	Good
If +0,21 < DP < 0,40	Sufficiently qualified
If 0 < DP ≤ 0,20	Weak

Source: (Desman et al., 2025)

The Distinguishing Power Test is conducted to ensure that the test given could effectively identify the level of vocabulary mastery of each student. In this research, the results of the calculation of Distinguishing Power reached 21,66%. When compared to the eligible category, which is in the range of 0.21 < DP(0.33) < 0.40, it could be concluded that the Distinguishing Power in this research was sufficiently qualified.

5. Normality test

Normality testing is a statistical method to determine whether data follows a normal distribution, which was an important requirement in parametric statistical analysis (Sihotang, 2023). A test was often used to determined if the data was normal. Normality tests were conducted to ensure the instrument was normal and whether the research is generally outstanding. Researchers use SPSS to test and establish normality. Then there are testing criteria in the Normality Test, namely:

a. Sig Value (P Value) < 0,05 concluded that the data was not normally distributed.
b. Sig Value (P Value) > 0,05 conclude that the data is normally distributed.

6. Homogenity test

The homogeneity test is a test to ascertain whether data from two or more groups have the same variation

(variance). This was important for valid statistical analysis (Sihotang, 2023). The homogeneity test determines whether or not population data was homogeneous. Use the following principles to determine homogeneity:

a. Significance test (α) = 0.05
b. If sig>α, then the variance of each sample is the same (homogeneity).
c. If sig<α, then the variance of each sample is the not same (not homogeneity) to determine it the researcher uses SPSS.

7. T-test

The T-test is an effective tool, but it was effective could be affected under certain conditions, such as when data was not normally distributed or when it was used on data that does not match (Novak, 2022). The analysis will be carried out using the SPSS T-test, the test was carried out to determine how significant the partial effect of the independent factor was on the dependent variable when the other independent variables are assumed to be constant. and the formula to be used is as follows.

a. The independent variable affects the dependent variable uniquely if the significance level is less than 0.05.
b. The independent variable does not affect the dependent variable if the significance level is greater than α (0.05).

8. F-test

George W. Snedecor named this statistical tool the F test, named in honor of its inventor, Sir Ronald Fisher, a renowned statistician. The F test is one of the important tools in statistics used to compare two or more variances, i.e. how much the data is spread out in different groups (Odek & Opuodho, 2023). One of the most commonly used applications of the F test is in Analysis of Covariance (ANCOVA). ANCOVA is used to compare the means of two or more groups by taking into account one or more control variables (called covariates) that can affect the results of the analysis. With covariates, ANCOVA can reduce the influence of outside variables that are not the main focus of the research, so that the results of comparisons between groups become more accurate and objective. This technique is very useful in experimental research, especially when trying to determine the effectiveness of a particular treatment or method.

9. The effect size

The effect size is a measure used to describe how much influence or relationship between two variables in research. This measure was important because it provides information about how large or strong the effect was not just whether or not it exists. Two commonly used effect sizes are Cohen's d, which measures the mean difference

between two groups, and Pearsons r, which measures how strong the relationship was between two variables (Funder & Ozer, 2019). The following was the category of effect size values used to measure how much influence or relationship between two variables in research:

Table 12. Value of the effect size

No	Velue	Effect size
1.	0-00-0,1,95	very weak effect
2.	0,20-0,395	weak effect
3.	0,40-0,595	modest effect
4.	0,60-0,749	strong effect
5.	0,80-1,00	very strong effect

Source: Jacob Cohen, 2019

10. Statistical Hypothesis

Hypothesis testing functions in testing Ho was accepted or rejected and Testing the alternative Ha was accepted or rejected. Hypothesis testing can also be done using SPSS version 25 with basic guidelines for collecting the following test results:

a. If the value of hig> or Sig. (2-tailed) < 0.05 it is said that the hypothesis is accepted.
b. If the hig value < or Sig.(2-tailed) > 0.05 it is said that the hypothesis is rejected