

CHAPTER III

This chapter will explain the overall research design related to methods, the discussion of each point has been grouped into the following sub-chapters: research method, population, and sample research subject, instruments and data collection techniques, research data validity, data analysis technique, and research ethical considerations.

A. Research method

Meta-analysis is research that uses existing studies and has been used by other researchers and is carried out systematically and quantitatively to obtain accurate conclusions.¹ This research used a meta-analysis of group contrasts, a study that combines the results of previous studies using treatment/treatment comparison data on experimental groups and controls in each article used as a sample. While the approach used is quantitative. The data that has been collected is then extracted, and a statistical analysis process is carried out. Based on the positivist philosophy, quantitative research is a method of conducting studies on a specific population or sample, collecting data with research instruments, and analyzing data that is quantitative or statistical in nature in order to test a hypothesis that has already been formed.²

B. Populations and Sample

Population is a generalization region consisting of objects/subjects that have certain qualities and characteristics defined by the researcher and then drawn conclusions. In this study, the population is distinguished between the general population and the target population. The target population is the population or general area that is the target in our research.³

According to the explanation above, the general population of this study can be concluded to the whole national and international journal articles using the Google Scholar database published between 2019 and 2022. Search for finding data for analysis material using a combination of keywords such as “cooperative learning in ELT or EFL.” The target population is the entire journal of research articles that meets the criteria used for the qualification of data used in meta-analysis research.

¹ Retnawati et al., *Pengantar Analisis Meta*.

² Sugiyono, ‘Metode Penelitian Kuantitatif, Kualitatif Dan R & D’, OPAC Perpusnas RI, accessed 27 March 2023, <https://opac.perpusnas.go.id/DetailOpac.aspx?id=911046>.

³ Sugiyono. 70.

This research began by collecting national and international journal articles using the Google Scholar database published between 2019 and 2022. Search for finding data for analysis material using a combination of keywords such as “cooperative learning in ELT or EFL.” In this research, a total of 15,600 articles were found using these keywords. Researchers used 60 journal articles that had been selected based on predetermined qualifications as a sample of research.

To determine the number of samples used in this compilation is the Slovin formula, the Slovin formula is the formula used to calculate the minimum number of samples in a finite population survey, where the main purpose of the survey is to estimate the proportion of the population.

$$n = \frac{N}{1 + N(e)^2}$$

Description of the formula:

n = Sample Number

N = Population Number 38

e = Constant (% standard tolerable error rate for a sample withdrawal)

Researcher conducted that because the population is large (more than a thousand), in this case the researchers took a tolerance rate of error above ten percent, which is 13%. Based on the formula above, the samples required in the study are:

$$n = \frac{15600}{1 + 15600(0,13)^2} = \frac{15600}{1 + 15600 (0,0169)} = 58,9$$

Based on the above calculations, the number of samples required in this study is 58.9 samples, and then rounded up to 60 samples.

C. Research Subject

A sample taken from the population is referred to as a sample. Purposive sampling, or sampling based on current criteria, is the method used for sample selection. Explicit criteria regarding the criteria for studies to be included in the analysis are the basis for criteria for sample selection.⁴

The inclusion and exclusion criteria are determined based on the research characteristics. In addition to this, in order to meet the requirements for a meta-analysis, the research article must be able

⁴ Sugiyono, 80–85.

to be accessed in its entirety (full text), and the data contained within it must be able to quantify the effect size. There are certain criteria for including and excluding an article in the following table.

In order to assess the impacts of cooperative learning in the teaching and learning of English, the following standards were applied when deciding which studies would be reviewed:

1. The criteria for exclusion
 - a. Research on the cooperative learning model in English teaching.
 - b. Research use English language.
 - c. Research undertaken between 2019 and 2022.
 - d. Only in English instruction.
 - e. Published online.
2. Criteria for inclusion
 - a. The article's study design is either quasi-experimental or experimental
 - b. Must include the necessary quantitative data, such as the control group's standard deviation, mean, and mean of the experimental group.

D. Instruments and Data Collection Techniques

The tool used to gather research data is referred to as a research instrument. The research instrument takes the form of a data sheet used in the processes of data extraction, synthesis, and analysis. Specifically, it is a coding data sheet presented in the form of a table. The coding sheet contains the necessary information for data analysis, including the article's identity (author's name, article title, and publication year), population and setting (research location, sample characteristics, and sample size for both experimental and control groups), research variables (independent and dependent variables), research design and hypothesis testing, types of learning interventions in the experimental and control groups, and a research conclusion presented in a table summarizing the data. The results of the data analysis process are also included in the data synthesis table. The complete coding results of the article can be found in the appendix.

The basic meta-analysis book by Retnawati et al. provides guidance for the variables used in coding to capture information regarding effect sizes in meta-analysis research.⁵ These variables are as follows:

⁵ Retnawati et al., *Pengantar Analisis Meta*, 18.

1. Article data, including the name of the researcher, the title of the research, the journal name and year of publication, the publisher, the journal index, and the source.
2. Research subjects, research samples, and research location or region are examples of sample characteristics.
3. The sort of learning intervention (cooperative learning strategy) utilized in the experimental class.
4. Statistical data including mean, standard deviation, in experimental and control classes.

Researcher gathered data by searching Google Scholar for articles that pertain to or are associated with the subject of the study. As indicated in the coding data sheet, the data gathered is research data in accordance with the necessary variables. The average of each sub-study for each experimental group and control group, as well as the standard deviations from each sub-study, will then be used to split the data results by group. Researchers have found sixty papers about cooperative learning techniques in English education. Every article that is found must satisfy the previously stated inclusion and exclusion criteria. The content of the sixty articles will next be examined and chosen in accordance with the information required to determine the effect size, taking into consideration the variables listed in the coding sheet. A conclusion is reached by following a common thread after the selection and analysis procedure is completed.

E. Data Analysis Technique

The data analysis technique employed in this study is meta-analysis, which involves calculating the effect size, mean effect size, and standard deviation. The calculation of impact size in this study utilizes Cohen's effect size equation, both for each individual research article and for the overall research articles. The categorization of Cohen's effect size used is based on Sawilowsky's development,⁶ which is as follows:

$0.01 \leq d < 0.2 =$ Very small effect

$0.2 \leq d < 0.5 =$ Small effect

$0.5 \leq d < 0.8 =$ Medium effect

$0.8 \leq d < 1.2 =$ Large effect

$1.2 \leq d < 2.0 =$ Very large effect

$d \geq 2.0 =$ Extremely large effect

⁶ Shlomo S. Sawilowsky, 'New Effect Size Rules of Thumb', *Journal of Modern Applied Statistical Methods* 8, no. 2 (1 November 2009): 559, <https://doi.org/10.22237/jmasm/1257035100>.

The calculated effect size is used to determine the overall effect size of the research article, as well as to interpret the overall effect size calculation based on the predetermined unit of analysis set in the problem statement. The effect size estimations based on the introduction to meta-analysis book by Retnawati et al. are shown in the following equation.⁷

1. Quantifying the effect size.

Calculate the estimated difference in sample means (d) using the following equation.

$$d = \frac{\bar{X}_1 - \bar{X}_2}{S_{within}}$$

Define d as the discrepancy between the average values of the two groups (\bar{X}_1 dan \bar{X}_2) measure in standard deviation units (S_{within}). As a result it is imperative to get the S_{within} value using the subsequent equation,

$$S_{within} = \sqrt{\frac{(n_1 - 1) S_1^2 + (n_2 - 1) S_2^2}{(n_1 - 1) + (n_2 - 1)}}$$

S_{within} = combined standard deviation.

N_1 = number of experimental class samples.

S_1 = experimental class standard deviation.

N_2 = number of control class samples.

S_2 = control class standard deviation.

2. Calculate the variance of the effect size.

For variance d is formulated as follows:

$$Vd = \frac{n_1 + n_2}{n_1 n_2} + \frac{d^2}{2(n_1 + n_2)}$$

3. Calculate the standard deviation of the effect size.

If the d variant (Vd) is in the quadrilateral, a standard error will be obtained from d . with the following equations:

$$SEd = \sqrt{Vd}$$

According to Hedges, quoted by Retnawati et al., The d value of has a little bias, tends to produce an estimated value is too high, so the fence proposes to minimize the bias which is commonly known as a Hedges g . Conversion of the value of d to g requires a vector correction called J .

⁷ Retnawati et al., *Pengantar Analisis Meta*, 112–113.

4. Calculate the correction factor J to convert effect size d to g

To find out the value of J , it is necessary to know the value of the degree of free to estimate the value of J with the equation:

$$df = n1 + n2 - 2$$

So can be estimated with the following equation:

$$J = 1 - \frac{3}{4df - 1}$$

5. The variance of the effect size d to g .
Hedges g is formulated as follows with variant g as follows,

$$g = J \times d$$

And the variance of g estimated with the following equation,

$$Vg = J \times Vd$$

6. Calculate the standard error of the effect size (SE_g)
The standard error of the effect size estimated with the following equation,

$$SEg = \sqrt{Vg}$$

The determination of the summary effect can be done through the procedures of the fixed effect model and the random effect model. In this study, the calculation of the summary effect was conducted using the random-effect model.⁸

1. Calculating weight (W)

$$Wi = \frac{1}{Vy_i}$$

When;

$$Vy_i = Vy_i + T^2$$

2. Calculating the overall effect (M)

$$M = \frac{\sum_{i=1}^K WiYi}{\sum_{i=1}^K Wi}$$

3. Calculate the variance of the summary effect (Vm)

$$Vm = \frac{1}{\sum_{i=1}^K Wi}$$

4. Calculate the standard error of the summary effect

$$SEm' = \sqrt{Vm}$$

5. Calculating confidence intervals

⁸ Elisabetta Crocetti, 'Systematic Reviews With Meta-Analysis: Why, When, and How?', *Emerging Adulthood* 4, no. 1 (February 2016): 39, <https://doi.org/10.1177/2167696815617076>.

$$LLm = M - 1.96 \times SEM$$

$$ULm = M + 1.96 \times SEM$$

6. Calculating z for hypothesis testing

$$Z = \frac{M}{SEM}$$

p - Value one-tailed test: $p = 1 - \Phi(\pm|Z|)$

p - Value two tailed test: $p = 2[1 - \Phi(\pm|Z|)]$

However, this study will utilize the JSAP program to obtain the summary effect, confidence interval, forest plot, and funnel plot in order to determine the presence of publication bias in the articles used in the meta-analysis.

F. Research Ethical Consideration

Ensuring ethical issues in meta-analysis research is crucial to guarantee an honest, transparent, and accountable approach to this synthesis. Meta analysts must be attentive to several ethical considerations.

1. Respecting the copyright and privacy of the authors and participants involved in the original study included in the meta-analysis.
2. Provide comprehensive and accurate information regarding the methods, procedures, results, and implications of meta-analysis.
3. Presenting all primary search results openly and without selecting or hiding specific studies.
4. Avoiding prejudice or conflicts of interest that can influence the interpretation or presentation of data.
5. Report all weaknesses or limitations of the meta-analysis, including potential methodological or statistical errors.
6. Give appreciation to all sources of data and information used in meta-analysis.