The Effectiveness of Project Based Learning on Students' Creative Thinking Skills in English Language Learning: A Meta-Analysis Study

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Abstract

This study aims to determine the effect of the overall size of Project-based Learning research on students' creative thinking ability in English language learning. The study analyzed 9 effect measures accessed through Google Scholar, ScienceDirect, Wiley and ERIC from 2015 to 2023. The meta-analysis involved 340 students. Analyze data with the help of JSAP applications. The calculation of the effect size of each study used a 95% confidence level. The results showed that the effect size obtained through the random effects model was 1,287 (High). This finding explains that the application of model project-based learning is effective in improving students' creative thinking skills in learning English. This meta-analysis illustrates how much influence the project-based learning model has on students' creative thinking skills in English learning.

Keywords: *Blended Learning; Size Effect; English; Meta-analysis*

Introduction

Creative thinking is an ability that students must have in providing new ideas to solve a problem (Guven et al., 2022; Kristanto, 2023). The ability to think creatively helps students learn more actively and innovatively (Nogerbek & Kh, 2022; Syafrial et al., 2022. In addition, according to Tok, (2022) creative thinking skills train students in providing solutions in solving problems in teaching and learning activities. The ability to think creatively encourages students can improve students' problem-solving abilities (Damrongpanit, 2022).

It is important that students' creative thinking skills in learning English still have problems. This can be seen from the learning process that does not involve students actively in learningc (Suharyat et al., 2022; Zulkifli et al., 2022; Ichsan et al., 2023), so as not to encourage students to develop their cognitive potential. Lack of interest and curiosity of students in the learning process (Winarto et al., 2022; Santosa et al., 2021; Luciana et al., 2023; Zulyusri et al., 2023). Inappropriate selection of learning models and methods to encourage students' creative thinking skills so as to make learning menoton (Azmin, 2015;

Jermsittiparsert et al., 2021; Thiel & Marx, 2019). Therefore, there is a need for a learning model that can support students' creative thinking skills.

Project-based learning is a learning model that can encourage students' creative thinking skills (Balemen, 2018; Mursid et al., 2022); (Simanjuntak, 2021). *Project-based* learning is a learning model that guides students to learn to create a project that can help the learning process (Wanglang &; Chatwattana, 2023); (Muzana et al., 2021); Alotaibi, 2020). The project-based learning model can train creatives to solve a problem (Ummah et al., 2019); (Sudjimat, 2021; Rofik et al., 202); Shin, 2018). Wardani et al., (2020) The *project-based* learning model can increase student understanding in learning (Wayan Santyasa et al., 2021); (Arce et al., 2014), thus encouraging students' ability to think creatively in learning.

Furthermore, several studies show *that the project-based learning* model is effective in improving students' creative thinking skills (Sumarni &; Kadarwati, 2020; Yunita et al., 2021; Handayani et al., 2018; Khoiri et al., 2023; Nasir & Jayanti, 2021). Other research results show that the project-based learning model can improve students' critical and creative thinking skills (Yustina et al., 2020; Ningsih et al., 2020); (Mihardi et al., 2013; Yamin et al., 2020). The project-based learning model can support students' creative thinking skills in general in science learning (Zahro, 2021; (Rahayu &; Indriyanti, 2023; Astuti et al., 2022).

The gap in this study, many *project* based learning model studies have not found meta-analysis of *project based elarning* on creative thinking skills in English language learning. Therefore, this study aims to determine the effectiveness of the *Project-based Learning* model on students' creative thinking skills in English language learning.

Methods

This study is a meta-analysis study. This meta-analysis study aims to determine the effectiveness of project-based learning on students' creative thinking skills in English language learning. Meta-analysis is a type of research that analyzes previous research quantitatively (Suharyat, Ichsan, et al., 2022; Rahman et al., 2023); Setiawan et al., 2022; Ayaz, 2015); Putra et al., 2023; Santhosh et al., 2023). According to Borenstein et al., (2010) the meta-analysis research steps include 1) determining inclusion criteria, 2) collecting data and coding data from each study, 3) analyzing data statistically.

Eligibility Criteria

To get valid research data in the meta-analysis, there needs to be inclusion criteria. The inclusion criteria in the research are 1) research comes from national, international journals or proceedings indexed by SINTA and Scopus, 2) research is published in 2017-2023, 3) research has an experimental class with a project-based learning model and a control class with conventional learning, 4) research must report complete data to calculate the value of effect size.

Furthermore, from the results of data search, 9 research publications were obtained that have met the criteria with the publication year 2017-2023 (Table. 2).

Data Collection

The process of collecting data in this meta-analysis through the databases ERIC, Google Scholar, Wiley and ScienceDirect. The keywords of data source collection are "students' creative thinking ability in English language learning", *Project Based Leaning*", "The influence of the project-based learning model on students".

Statistical Analysis

Statistical analysis in meta-analysis is to determine the effect size of each study. The effeck size in this study is an index of the influence of the project-based learning model on students' creative thinking ability in English language learning. According to the Borenstein & Hedges, (2009) statistical calculation steps in the meta-analysis are 1) calculate the effect size value of each study, 2) conduct heterogeneity tests and determine estimation models, 3) perform publication bias checks, 4) calculate p-value values to test research hypotheses. Next, statistical analysis in meta-analysis with the help of JSAP application. The criteria for effect size values can be seen in table 1.

Table 1. Effect Size Value Category

Effect Size	Category
$0.00 \leq ES \leq 0.20$	Ignored
$0.20 \leq ES \leq 0.50$	Low
$0.50 \leq ES \leq 0.80$	Moderate
$0.80 \leq ES \leq 1.30$	High
$ES \geq 1.30$	Very High

Source: Cohen (Supratman et al., 2021; Rahman et al., 2023; Ichsan et al., 2022)

Results and Discussion

Furthermore, from the results of the analysis of 9 research journals, effect size and standard error can be seen in Table 2.

Table. 2 Effect size and Standard Error

Code Journal	Years	Effect Size	Standard Error
P1	2018	1.34	0.39
P2	2021	0.72	0.27
P3	2021	1.80	0.31
P4	2017	2.19	0.38
P5	2023	0.89	0.23
P6	2020	2.08	0.42
P7	2023	0.67	0.29
P8	2019	0.97	0.41
P9	2021	1.29	0.33

Based on Table 2, the overall effect size value of each study ranged from 0.72 to 2.19. According to the effect size criteria, (J. Cohen, 1988) from 9 studies obtained 4 effect size (44%) very high criteria, 3 effect size (34%) high criteria and 2 effect size (22%) medium criteria. Next, determine the estimation model and *mean effect size* of 9 researchers who have been analyzed. The results of determining the random effect model and *fixed effect model estimation* model can be seen in table 3.

Table 3. Random and Fixed Effect Model

	Q	Df	P
Omnibus test of Coefficients Model	47.901	1	< 0.001
Test of Residual Heterogeneity	114.652	8	< 0.001

Table 3. Shows a value (Q = 114.652) greater than 47.901 with a confidence level of 95%. Furthermore, the value (p < 0.001) then the effect distribution in this meta-analysis study is

heterogeneous. Therefore, the random effect model is more effective for estimating the 9 studies analyzed.

Next, examine the publication bias of the 9 studies that have been analyzed. To determine the existence of publication bias, it can be analyzed with a funnel plot and calculate the value of Roshentall Fail Safe N (FSN) (Joseph, 2023)2; (Suparman et al., 2021; Chamdani et al., 2022; Nurtamam et al., 2023; Suryono et al., 2023; Goyal et al., 2022). Analysis of publication bias with *funnel plots* can be seen in Figure 1.
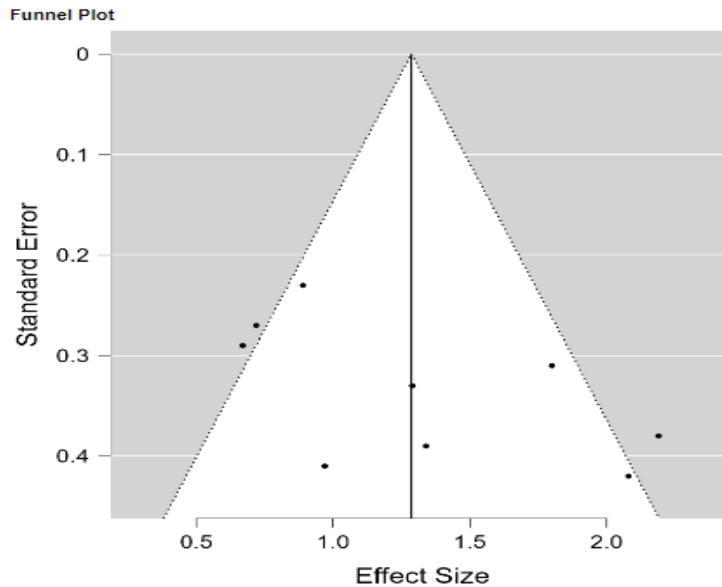

Figure 1. Funnel Plot

Based on figure 1. Explaining the results of the analysis with the funnel plot is difficult to conclude whether the funnel plot is symmetric or asymmetric, so it is necessary to do the *Rosenthal Fail Safe* N (FSN) test. The results of the Rosenthal Fail Safe N (FSN) test can be seen in Table 4.

Table 4. Rosenthel Fail Safe N Test

File Drawer Analysis			
	Fail: Safe-N	**Target Significance**	**Observed Significance**
Rosenthal	446.000	0.050	< 0.001

Based on Table 4, the value of *Fail Safe N* (FSN = 446.000) with the value of sig. 0.050 and p < 0.001. Furthermore, the FSN value is calculated in the formula 446 / (5K + 10) = 5.9 + 10 = 8.10 > 1 meaning that in the meta-analysis no publication bias was found so that the data analyzed were scientifically. The last step is to calculate the summary value or mean effect size of the 9 studies analyzed. The results of the summary analysis or mean effect size can be seen in Table 5.

Table 5. Summary or mean effect size

	Effect Size	**ONE**	**Z**	**P**	**95 % Confidence Interval**	
					Lower	Upper
Intercep	1.287	0.190	6.784	< 0.001	0.915	1.658

Based on Table 5, it shows the *random effect analysis of the 95* % Confidence Interval model lower of 0.915 and upper of 1.658 and overall effect size value of 1.287. The *effect size* category according to (Cohen et al., 2007) is included in the high category. Furthermore, from the calculation results of the Z test obtained the value (Z = 6.784). This result explains statistically significant with a p value of < 0.001, it can be concluded that the *project-based learning* model effectively increases students' creative thinking skills compared to conventional models.

This research is in line with (Astuti et al., 2022; Waliyati et al., 2019) that *the project-based learning* model can improve students' creative thinking skills. This finding is in line with (Astri et al., 2022) explaining that *the project-based learning* model helps students learn more actively and creatively so as to provide solutions to solve a problem. The *proejct based* learning model fosters student interest and motivation to design projects in the learning process. Furthermore, *the project-based learning* model can, (Badawi et a. 2023; (Suharyat, Santosa, et al., 2022; Bakkali, 2022;Guo et al., 2020; Wang, 2022) Helps develop students' cognitive potential in learning so as to encourage creative thinking skills. The *project-based* learning model can create a pleasant learning atmosphere for students.

The *project-based learning* model trains students to develop new ideas. This encourages students to be more innovative in learning English (Lu, 2021). The *project-based* learning model can encourage calabotive attitudes and critical thinking of students in learning (Asfihana, 2022; Macleod &; Veen, 2020). Not only that, the *project-based* learning model can develop student knowledge so that it can make a project that is useful in the learning process (Rio & Rodriguez, 2022). The project-based learning model is effective for improving students' higher-order thinking skills in English learning activities (Niswara et al., 2019). Higher order thinking skills one of creative thinking can help students more easily understand the subject matter (Razak et al., 2021; Umar &; Ko, 2022).

Summary and Conclusion

In the meta-analysis research, it can be concluded that the project-based learning model has a positive impact on creative thinking skills in English language learning. It can be seen that the summary value or mean effect size is 1,287 with high criteria. The findings show that the project-based learning model is effective in encouraging students' creative thinking skills compared to conventional learning models.

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