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Size Effect of Project Based Learning Model on Creative Thinking Skills of Civil Engineering Study Program Students

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Abstrak

Penelitian ini bertujuan untuk mengetahui efek size model project beased learning terhadap keterampilan berpikir kritis mahasiswa prodi teknik sipil. Jenis penelitian ini adalah meta-analisis. Sumber data berasal dari 9 jurnal nasional dan internasional yang terbit dari tahun 2013-2023. Penelusuran sumber data melalui database google scholar, ProQuest, Eric dan Plos ONE. Teknik pengumpulan data adalah observasi langsung dan dokumentasi. Teknik analisis data adalah teknik analisis kuantitatif dengan menghitung nilai effect size (ES) dan Nilai rata-rata (mean). Hasil ini menjelaskan bahwa nilai rata-rata Effect Size (ES = 0.970) dan nilai rata-rata sebesar 80.72. Temuan ini menunjukan bahwa adanya pengaruh signifikan model project based learning terhadap keterampilan berpikir kreatif mahasiswa prodi teknik sipil dibandingkan model pembelajaran konvensional.

Kata Kunci: Model Pembelajaran, Project Based Learnin, Berpikir Kreatif, Effect Size

Size Effect of Project Based Learning Model on Creative Thinking Skills of Civil Engineering Study Program Students

Abstract

This study aims to determine the effect size of the project-based learning model on the critical thinking skills of civil engineering study program students. This type of research is a meta-analysis. Data sources come from 9 national and international journals published from 2013-2023. Search for data sources through the google scholar database, ProQuest, Eric, and Plos ONE. Data collection techniques are direct observation and documentation. The data analysis technique is a quantitative analysis technique by calculating the effect size (ES) value and the average value (mean). These results explain the average value of Effect Size (ES = 0.970) and the mean value of 80.72. This finding shows that there is a significant effect of the project-based learning model on the creative thinking skills of civil engineering study program students compared to conventional learning models.

***Keywords**: Learning Model, Project Based Learning, Creative Thinking, Effect Size*

Introduction

Creative thinking is an ability that students must have in facing the 4.0 revolution towards 5.0 society (Ritter et al., 2020; Zhu et al., 2013; Santosa et al., 2021). Creative thinking skills play an important

role for students in solving problems (Rahman et al., 2023; Zulyusri et al., 2022; Nurtamam et al., 2023; Sumarni & Kadarwati, 2020). Creative thinking trains students to provide new ideas in learning (Mursid et al., 2022; Antika & Nawawi, 2017; Setyarini & Jannah, 2020; Ichsan et al., 2023). According to Liu et al., (2015) Creative thinking skills help students in creating an innovation that is useful in life. Furthermore, students who have these creative thinking skills are more active and innovative in learning (Astri et al., 2022; Wu & Koutstaal, 2020).

Indonesian students' thinking skills are still low (Dariman, 2019; Rusmini, 2022) so that the learning process does not run optimally. The 2018 PISA results stated that the level of science literacy of students in creative thinking obtained a score of 396, ranked 71 out of 78 participating countries (Elfira et al., 2023; Rahman et al., 2023; Suryono et al., 2023; Ichsan et al., 2022; Abdul Rahman et al., 2023). The low level of students' creative thinking skills is influenced by the lecturer-centered learning system (Yustiana el al., 2022; Suwendra, 2023; Karim et al., 2023) so that it makes it difficult for students to get bored and difficult to understand the subject matter (Ndiung et al., 2021; Supriyadi et al., 2023; Supratman et al., 2021; Razak et al., 2021). Research results Made et al., (2020) stated that the average student score that leads to students' creative thinking skills is only 62.84 far from the KKM value of 70. In addition, the application of learning models and methods that are not appropriate (Ramdani, 2016), so that students are less motivated to learn Civil Engineering students.

Project Based Learning model is an effective project-based learning model to improve students' creative thinking skills (Syawaludin et al., 2022; Listiqowati, 2022; Putra et al., 2023; Putra, 2021; Suharyat et al., 2022). The Project Base Learning model can encourage student motivation and innovation to learn more creatively (Jumadi et al., 2021; Hasibuan et al., 2022). According to Hanif et al., (2019) Project Based Learning model develops students' thinking potential to provide solutions in solving a problem in life. Research results by Yunita et al., (2020) said that the Project-based Learning model can encourage student learning outcomes and thinking skills in learning.

Previous research by (Wulandari et al., 2021) explained that the Project Based Learning model can help students' creativity in producing a work that is useful in life. Research results by (Nur et al., 2018) Project-based learning model trains students to learn real active directly in the learning process. Furthermore, the Project Based Learning model can help students in developing thinking skills and student understanding in learning (Fauziah et al., 2018; Anggraini et al., 2019). But in reality, there are many studies on the Project Based Learning model but there is still a lack of research on the size effect of the Project Based Learning model on the creative thinking skills of civil engineering students.

Methods

This research is a type of meta-analysis. Meta-analysis research is a type of research that analyzes a previous study that can be statistically analyzed (Sofianora et al., 2023; Zulyusri et al., 2023; Rahman , et al., 2023; Bagus et al., 2022; Chen et al., 2022; Santosa et al., 2021). The source of this research comes from analyzing 9 national and international journals published from 2013-2023. Searching for data sources in this study through Google scholar, ProQuest, Eric and Plos One.

The research inclusion criteria are data sources from national and international journals indexed by SINTA and Scopus; Experimental or quasi-experimental type of

research; Has a relationship with the Project Based Learning model and student creative skills and has complete data to calculate the effect size value. Furthermore, data collection techniques are direct observation and documentation through the journal database. Data analysis is statistical analysis by calculating the effect size (ES) value and the average value of student learning outcomes (mean) with the help of the JSAP application. The effect size criteria in this study can be seen in table 1.

Table 1. Effect Size Value Criteria

Effect Size	Kriteria
0 ≤ ES ≤ 0.20	Low
0.20 ≤ ES ≤ 0.80	Moderate
ES ≥ 0.80	High

Source:(Setyasih et al., 2022; Rahman et al., 2023; Zulkifli et al., 2022)

Result and Discussion

Result

Based on the analysis of national and international journals on the Project Based Learning model on the creative thinking skills of civil engineering study program students, there are only 9 journals that have met the inclusion criteria. Journals that have met the inclusion criteria are analyzed for publication year, journal type, variables and effect size which can be seen in Table 2.

Table 2. Meta-Analysis of Data Sources Based on Inclusion Criteria

Code	Year	Journal Type	Variabel	ES	Criteria
A1	2020	National	Creative Thinking	1.20	High
A2	2022	National	Creative Thinking	0.80	High
A3	2015	International	Creative Thinking	0.98	High
A4	2018	National	Creative Thinking	0.55	Moderate
A5	2020	National	Creative Thinking	0.75	Moderate
A6	2023	National	Creative Thinking	1.33	High
A7	2021	International	Creative Thinking	0.51	Moderate
A8	2019	International	Creative Thinking	0.66	Moderate
A9	2017	National	Creative Thinking	0.94	High
Average Effect Size				**0.875**	**High**

Table 2. shows that the effect size analysis of the Project Based Learning model on students' creative thinking skills is only 5 journals that have a high effect size and 4 journals have a medium effect size with an average effect size (ES = 0.875). Furthermore, seeing the comparison of the posttest scores of the creative thinking skills of experimental and control class students can be seen in Table 3.

Table 3. Comparison of Creative Thinking Skills scores of experimental and control classes

Code	Exsperimen			Control		
	N	Mean	SD	N	Mean	SD
A1	12	80.17	7.10	12	70.49	11.70
A2	38	90.21	17.34	38	65.78	6.12
A3	20	79.43	6.01	20	72.33	4.22
A4	24	84.90	11.45	20	80.17	7.18
1A5	26	87.11	9.13	24	75.14	14.90
A6	30	93.75	5.10	30	72.10	6,34
A7	40	88.23	19.23	40	68.87	3.11
A8	36	75.67	9.60	35	60.12	9.88
A9	18	89.01	5.66	18	74.71	4.91
Average		***85.38***			**71.07**	

Table 3. Shows that the average value of creative thinking skills of experimental class students, 85.38, is higher than the control class, 71.07. The results explain that the application of the Project Based Learning model is better for improving the creative thinking skills of civil engineering students than conventional learning models. Furthermore, to find out the significance of the Problem Based Learning model on creative thinking skills can be seen in Table 4.

Table 5. Significance Test Results of Project Based Learning Model > Student Creative Thinking Skills

Code	Test Type	Sig Value.
A1	*Independent t-test*	0.00
A2	*Independent t-test*	0.00
A3	*Independent t-test*	0.01
A4	*Independent t-test*	0.00
A5	*Independent t-test*	0.00
A6	*Ancova*	0.00
A7	*Ancova*	0.00
A8	*Independent t-test*	0.00
A9	*Independent t-test*	0.00

Based on Table 4. Shows that the sig value <0.05 then the Project Based Learning model has a significant effect on the creative thinking skills of civil engineering students than the conventional model. The Project Based Learning model has a positive impact on lecturers to improve students' creative thinking skills in learning.

Discussion

The application of the Project Based Learning model has a significant effect on the creative thinking skills of civil engineering students. This can be seen from the sig value <0.05 from each journal related to the Project Based Learning model on students' creative thinking skills. The research results are in line with (Fadillah et al., 2021) Project Based Learning learning model influences learning outcomes and students' creative thinking skills. The project-based learning model can help students be more active and innovative to produce new ideas or ideas in learning activities (Umar & Ko, 2022; mohand & Melchor, 2021). Furthermore, research results (Liu et al., 2019) Project-based leaning model helps civil engineering students more easily provide new ideas or ideas in solving a problem that occurs.

(Zega, 2021) The Project Based Learning model trains students to think at a high level in producing a project. Creative thinking skills help civil engineering students to easily design a project easily and quickly (Stabryla et al., 2022; Oschepkov et al., 2022; Long et al., 2020). In addition, creative thinking skills also train civil engineering students' competence in learning (Sampaio, 2022; Ahmed et al., 2021). Furthermore, creative thinking skills help students in understanding the learning content (Dhani et al., 2023; Zulyusri et al., 2022; Suharyat et al., 2023; Ulger, 2018;Biazus & Mahtari, 2022). Therefore, creative thinking skills play an important role in supporting the success of civil engineering students in learning.

Furthermore, the results of the effect size analysis of each journal show the average effect size value (ES = 0.875) with high criteria. This finding explains that the application of the Project Based Learning model in learning can have a positive impact on creative thinking skills compared to conventional models. The results of this study are in line with (Umamah & Andi, 2019; Fahrudin et al., 2017) Project Based Learning model is more effective to encourage learning outcomes and creative thinking skills of students. The Project-based Learning model uses a constructivism approach that centers students more independently in learning to produce a projec (Fatmawati & Zubaidah, 2020; Iakovos, 2011). Therefore, this model assists lecturers in achieving the desired learning objectives (Riyanti, 2020; Santosa et al., 2021; Lailatul et al., 2019).

Conclusion

From the results of the study it can be concluded that the average value of Effect Size (ES = 0.875) and the average value of creative thinking skills of the experimental class was 85.38 and the control class was 71.07. This finding shows that there is a significant effect of the project-based learning model on the creative thinking skills of civil engineering study program students compared to conventional learning models. The Project Based Learning model trains students to develop their thinking potential in solving a problem in civil engineering.

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