

# The Influence of Inquiry Training Learning Model Based Design Thinking on Creative Thinking Skills of Indonesia Students: Systematic Literature Review and Meta-analysis

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**Abstract:** The purpose of this study is to determine the influence of the design thinking-based inquiry training learning model on the creative thinking skills of students in Indonesia. This type of research is a type of systematic literature review (SLR) research and meta-analysis. The sources in this study analyzed 13 studies obtained through the databases of Google Scholar, Education Resources Information Center (ERIC), Wiley, PLoL ONE, Taylor of Francis, and IEEE published from 2019-2023. Analyze data with the help of JSAP applications. The results concluded that the summary effect size value ( $rE = 0.84$ ;  $p < 0.001$ ) high effect size category. This finding shows that the inquiry training learning model based on design thinking has a high positive effect on the creative thinking ability of students in Indonesia.

**Keywords:** Creative thinking; Design thinking; Effect size; Inquiry training learning

## Introduction

Creative thinking skills are a skill that students must have to face the industrial revolution 4.0 (Nasution et al., 2023; Ritter et al., 2020). Creative thinking skills help students develop new ideas or ideas in solving a problem (Kartikasari et al., 2022; Suwendra, 2023; Suryandari et al., 2021; Tabieh & Hamzeh, 2022). Creative thinking skills assist students in developing innovations in learning (Tok et al., 2022; Hews et al., 2023; Yildiz & Yildiz, 2021; Sur & Ateş, 2022). In addition, creative thinking skills play an important role in making a decision in solving a problem (Sulistiyarini et al., 2022; Silva et al., 2022; Siburian et al., 2019). Students who have creative thinking skills can create new things that are useful in life (Attanurakkee & Dhammabhisamai, 2022; Yustiana et al., 2022; Saregar et al., 2021). Therefore, creative thinking skills provide positive benefits to the

development of students' cognitive functions in learning activities.

But in reality, students' creative thinking skills in Indonesia are still relatively low (Utomo et al., 2014; Nurtamam et al., 2023; Made et al., 2020; Ichsan et al., 2023). The results can be seen in the results of the 2018 *Programme For International Student Assessment (PISA)* survey, the science literacy of Indonesian students was ranked 71 out of 78 member countries (Elfira et al., 2023; Utomo et al., 2023; Zulkifli et al., 2022; Supriyadi et al., 2023; Sofianora et al., 2023). Similarly, the results of *TIMSS (Trend In International Mathematic and Science Study)* research in 2015, students' ability to think creatively and critically in the fields of science and mathematics was ranked 69 out of 79 participating countries {Formatting Citation}. The low creative thinking skills of students can also be seen in learning activities that are only centered on teachers (Adiilah &

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Haryanti, 2023; Dwi et al., 2022; Jumadi et al., 2021), so students find it difficult to understand the subject matter. Learning activities that do not involve active students (Dominggus et al., 2021; Rahman et al., 2023; Hariyadi et al., 2023) and the selection of learning models that are lacking not to encourage creative thinking skills (Atmojo & Sajidan, 2020).

The *inquiry training* learning model is a learning model that is able to improve creative thinking skills in learning activities (Inati et al., 2016). The *inquiry training* learning model is a learning model that trains students to be directly involved in carrying out activities scientifically (Yuliska et al., 2020). The *inquiry training learning* model can help students improve problem-solving skills (Turnip et al., 2016; Gillani, 2010). Furthermore, the *inquiry training* learning model can be combined with *design thinking learning*. *Design Thinking* is a learning concept that involves students stimulating the thought process and periodication in creating a positive change (Rauth et al., 2010; Dorland, 2023; Ladachart et al., 2022). *Design thinking* can help students learn actively and creatively in learning (Pratomo et al., 2021).

Research Andrini (2016) inquiry learning model can improve student learning outcomes. Research {Formatting Citation} *inquiry training learning* model can develop Shiva science literacy. Research by Zulyusri et al. (2023) design thinking-based learning can improve students' critical and creative thinking skills. The gap in research is that many studies on inquiry training have not found research related to the effect of size model *inquiry training learning* based one *sign thinking*. Based on these problems, this study aims to influence the design thinking-based inquiry training learning model on the creative thinking skills of students in Indonesia.

## Method

This research is a type of systematic literature review (SLR) research and meta-analysis. This study aims to determine the influence of the design thinking-based inquiry training learning model on the creative thinking skills of students in Indonesia. According to (Borenstein et al., 2009) Meta-analysis research is carried out with steps consisting of determining inclusion criteria; collecting and coding data, and conducting statistical analysis.

### Eligibility Criteria

The process in this study has several inclusion criteria, namely research published from 2019-2023; data comes from reputable national and international journals indexed by SINTA, WOS and Scopus; Research must use experimental methods; The data has an average value, sample size and standard deviation (SD)

and the research comes from Indonesian and English language journals and the research has r, t, and F values related to the influence of the design thinking-based inquiry training learning model on critical thinking skills. Data source selection technique using *Preferred Reporting Items for Systematic Reviews and Meta-Analysis* (PRISMA) method (Figure 1). From the results of data search, 13 studies that meet the inclusion criteria can be seen in Table 2.

### Data Collection

The collection of data sources comes from journal databases, namely Google Scholar databases, Education Resources Information Center (ERIC), Wiley, PLoS ONE, Taylor of Francis and IEEE. The data collection keywords are "model inquiry training learnig; Design Thinking", "The Influence of the Inquiry Training Learning Model on the ability to think creatively", and "the influence of the design thinking-based inquiry training model on students' creative thinking ability".

### Data Analysis

Data analysis in this study calculated the effect size value of the entire research analyzed. According to Borenstein et al. (2009) Meta-analysis statistical analysis procedure, namely calculating the effect size value of the primary study; conducting heterogeneity tests; checking publication bias; and calculating the p-value to test a hypothesis. Data analysis in this study with the help of JSAP application. There are inclusion criteria guided by categories (Cohen et al., 2007) seen in Table 1.

**Table 1.** Categories Effect Size Cohen's

Effect Size	Category
$0.00 \leq 0.20$	Low
$0.00 \leq 0.80$	Medium
$D \geq 0.80$	High

## Result and Discussion

In the process of collecting data through the Google Scholar database, ERIC, Wiley, Taylor of Francis, and IEEE obtained 13 studies that met the inclusion criteria related to the design thinking-based inquiry training learning model on students' creative thinking skills. Data that have met the inclusion criteria are analyzed based on the characteristics of the publication code, year of publication, research index, research sample, N, r, t values and effect size shown in Table 2.

Based on Table 2, describes the results of the analysis of 13 studies that meet the inclusion criteria for each study indexed by SINTA, Scopus and Wos. Furthermore, the research samples came from elementary schools, junior high schools, high schools and college students. The sample size (N) in the study

amounted to 997 participants. In addition, the value of effect size analysis from 13 studies based on criteria (Cohen et al., 2007) obtained three effect size (23%) medium criteria and ten effect size (77%) high criteria.

The next step is to conduct heterogeneity tests and determine the estimation model. The results of the heterogeneity test can be shown in Tables 3 and 4.

**Table 2.** 13 Research Meets Inclusion Criteria

Publication Code	Sample	N	r	t	F	Effect Size
F1	Junior School Student	72		0.872	5.054	0.87
F2	Junior School Student	45		2.018		0.95
F3	High school student	40		1.905		1.07
F4	High school student	128		0.783		0.59
F5	High school student	90		0.917		0.92
F6	Junior School Student	80		2.450		2.14
F7	Junior School Student	48		1.302		1.30
F8	High school student	38	0.320	0.694		0.72
F9	Elementary school student	40		9.142		0.84
F10	High school student	94	0.491	5.806		1.50
F11	High school student	112	0.513	4.662		0.68
F12	Colleger	104		0.974		0.92
F13	Colleger	86		0.925		0.89

Based on Table 3, showing the results of the heterogeneity test from 13 studies concluded that the effect size is heterogeneously distributed. Hasil seen from the value ( $p < 0.001$ ;  $Q = 63,220$ .) Publication bias serves to determine the presence or absence of bias in meta-analysis research (Yıldırım, 2022; Öztürk et al., 2022). Checking publication bias in research *with funnel plots*. The results of checking publication bias with Funnel plot effect size are shown in figure 1.

Based on figure 1, explaining the results of checking publication bias with funnel plots from 13 analyzed studies is difficult to determine whether the curve is symmetrical or asymmetric. To find out this, it is necessary to do Egger's test to find out the curve shape of the 13 effect size. Egger's test results are shown in Table 4.

**Table 3.** Heterogeneity Test Results

	Q	Df	p
Omnibus test of Model Coefficients	63.220	1	< 0.001
Test of Residual Heterogeneity	414.170	9	< 0.001

Note. p value are approximate

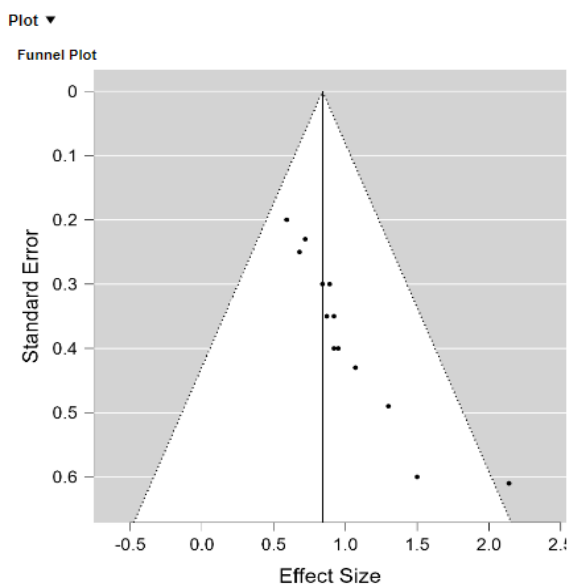
**Table 4.** Egger's Test Results

	z	p
Sei	2.841	< 0.004

Based on Table 4, the value ( $p < 0.004$ ;  $z = 2.84$ ) means that the *distribution of the funnel plot* is symmetrical. The findings show that in this study there was no publication bias. The next step is to calculate the summary effect size value of the 13 studies analyzed. The results of this summary effect size test aim to determine the influence of the *design thinking-based inquiry training learning* model on students' creative thinking skills. The summary effect size test results can be shown in Table 5.

Based on Table 5, explaining the results of the summary effect size test obtained values ( $r_E = 0.840$ ;  $SE = 0.190$ ;  $Z = 9.433$ ;  $P < 0.001$ ), then the application of the design thinking-based inquiry training learning model has a high influence on the creative thinking skills of students in Indonesia.

This result is in line with research (Wahyudi et al., 2019) model inquiry training learning can improve students' creative thinking skills. This finding is supported by research (Prime, 2020) inquiry training model can improve students' critical and creative thinking skills in learning. The inquiry training learning model is able to develop problem-solving skills in



**Figure 1.** Funnel plot standard error

students (Turnip et al., 2016). The *inquiry training* learning model based on design thinking can foster representative thinking skills in learning. *Inquiry*

*training learning* model students learn on their own in finding a concept or material (Ertikanto, 2017; Ahokoski et al., 2016).

**Table 5.** Summary Effect Size Test Results

	Estimates	SE	z	p	95 % Confidence Interval	
					Lower	Upper
Intercept	0.840	0.190	9.43	< 0.001	0.617	0.964

Design thinking-based *inquiry training learning* model students can learn more creatively and innovatively in solving a problem (Bernard & Różycki, 2020; Hashim et al., 201; Moffett & Cassidy, 2023). Design thinking-based learning students are able to develop innovative thinking to solve a problem (Chahine et al., 2020; Liudmyla et al., 2022). In addition, learning with design thinking helps produce a product that can be utilized in learning activities (Grizioti & Langenhove, 2022; Mccurdy et al., 2020). Therefore, the inquiry training learning model based on design thinking fosters students' motto in developing creative thinking in student learning in Indonesia.

## Conclusion

From the results of this study it can be concluded that the summary effect size value ( $rE = 0.840$ ;  $p < 0.001$ ) high effect size category. This finding shows that the inquiry training learning model based on design thinking has a high positive effect on the creative thinking ability of students in Indonesia. The inquiry training learning model based on design thinking students can develop ideas to produce products that are useful in learning activities.

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## Author Contributions

All researchers contributed to this research by Yuyun Suprato; Asmawati, Abdul Rahman, Wasito Utomo and Tomi Apra Santosa collected data, coded the data, and analyzed the data statistically and interpreted the data.

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## Conflicts of Interest

The authors declare no conflict of interest.

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