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## Effectivity of Design Thinking Learning on Elementary School Students' Creative Thinking Skill

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**Abstract:** Fostering creative thinking skills in early childhood education is paramount to preparing students for 21st-century challenges. However, conventional teacher-centered paradigms frequently stifle student ingenuity, and empirical evidence exploring structured framework interventions such as Design Thinking (DT) in elementary curricula remains scarce. This study aims to examine the influence of design thinking learning on elementary school students' creative thinking skills. Employing a quantitative quasi-experimental approach, this study involved 64 fourth-grade students, systematically assigned to an experimental class (n = 32, utilizing DT pedagogy) and a control class (n = 32, utilizing conventional methods). Data on creative thinking skills were gathered via a validated questionnaire and rigorously analyzed through descriptive analytics alongside paired and independent sample t-tests. The empirical findings demonstrate that DT learning exerts a highly significant positive effect on students' creative thinking. The experimental cohort exhibited a profound shift in mean scores, rising from a pre-treatment baseline of 62.81 (low category) to an impressive 91.68 (very high category) post-treatment. In stark contrast, the control group's post-test mean stagnated at 64.72 (low category), validating the definitive superiority of the DT framework ( $p < 0.05$ ). Consequently, DT learning serves as a potent pedagogical alternative to overcome the pervasive deficit in elementary students' creative capacities. Beyond individual performance gains, these results offer crucial insights for educational policymakers and educators to institutionalize human-centered, iterative problem-solving methodologies within primary school curricula.

**Keywords:** Design thinking, creative thinking skill, elementary education, quasi-experimental, 21st-century learning.

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### INTRODUCTION

Creative thinking has become one of the most important competencies that students must develop in the twenty-first century. The rapid advancement of science, technology, and global communication has transformed the nature of learning and work, requiring individuals not only to possess knowledge but also to generate innovative ideas, solve

complex problems, and adapt to changing circumstances. Consequently, educational systems around the world are increasingly emphasizing the development of creativity as a fundamental educational objective (OECD, 2023).

In elementary education, creative thinking plays a crucial role in supporting students' cognitive growth and lifelong learning. Creative thinking enables students to generate multiple solutions to problems, explore alternative perspectives, and produce original ideas when confronted with academic and real-life challenges. These skills are particularly important during childhood because elementary school represents a critical period for the development of higher-order thinking skills (Beghetto & Kaufman, 2017).

Creative thinking is generally defined as the ability to produce ideas that are both novel and useful within a particular context (Runco & Jaeger, 2018). In educational settings, creative thinking encompasses fluency, flexibility, originality, and elaboration. Fluency refers to the ability to generate numerous ideas, flexibility involves producing diverse responses, originality concerns generating unique solutions, and elaboration relates to expanding and refining ideas into meaningful outcomes (Torrance, 2018).

Research has consistently demonstrated that creative thinking contributes significantly to academic achievement, problem-solving ability, innovation, and future career readiness (Lucas & Spencer, 2017). Students who possess strong creative thinking skills tend to engage more actively in learning, demonstrate greater curiosity, and exhibit higher levels of motivation when facing challenging tasks.

Despite its recognized importance, many elementary school students continue to exhibit relatively low levels of creative thinking. Traditional instructional practices often emphasize memorization, procedural knowledge, and convergent thinking rather than encouraging students to explore multiple possibilities and construct original solutions (Henriksen et al., 2020). As a result, opportunities for developing creativity are frequently limited within classroom environments.

Several international educational reports have highlighted concerns regarding students' creative capacities. While many educational systems have successfully improved foundational literacy and numeracy skills, the development of creativity remains a significant challenge (UNESCO, 2021). This issue has become increasingly important as employers and societies place greater value on innovation and adaptability.

The emergence of Industry 4.0 and Society 5.0 has further intensified the demand for creativity-oriented education. Future generations will face complex problems that cannot be solved through routine procedures alone. Instead, they will require the ability to think creatively, collaborate effectively, and develop innovative solutions to emerging challenges (World Economic Forum, 2023).

Within mathematics, science, social studies, and language learning, creative thinking enables students to construct deeper understanding by connecting concepts across disciplines. Creative learners are more likely to engage in inquiry, experimentation, and reflective thinking, leading to richer educational experiences and more meaningful learning outcomes (Craft, 2018).

Educational researchers have increasingly emphasized the need for instructional approaches that actively promote creativity rather than treating it as an incidental outcome of learning. Effective creativity-enhancing pedagogies should encourage students to identify problems, explore possibilities, generate ideas, test solutions, and reflect on outcomes (Sawyer, 2022).

One instructional approach that has gained considerable attention in recent years is Design Thinking Learning. Design thinking originated in the fields of engineering, product design, and innovation but has subsequently been adapted for educational contexts due to its potential to foster creativity, problem-solving, and learner-centered inquiry (Brown, 2019).

Design thinking is commonly described as a human-centered approach to innovation that integrates empathy, ideation, experimentation, and reflection to address complex challenges. Rather than focusing solely on obtaining correct answers, design thinking

encourages learners to understand users' needs, define problems, generate creative solutions, develop prototypes, and evaluate outcomes (Razzouk & Shute, 2019).

In educational settings, design thinking learning provides students with opportunities to engage in authentic problem-solving experiences. Students are encouraged to investigate real-world issues, collaborate with peers, generate multiple ideas, and refine their solutions through iterative processes. Such experiences align closely with the characteristics of creative thinking development (Henriksen et al., 2020).

The design thinking process is typically organized into five interconnected stages: empathy, define, ideate, prototype, and test (Plattner et al., 2018). During the empathy stage, students seek to understand the perspectives and needs of others. In the define stage, learners identify and formulate problems clearly. The ideate stage focuses on generating multiple potential solutions. Prototype involves creating representations of ideas, while the test stage allows students to evaluate and improve their solutions.

Theoretical support for design thinking learning can be found in constructivist learning theory. Constructivism suggests that learners actively construct knowledge through interaction with their environment rather than passively receiving information from teachers (Fosnot, 2018). Design thinking reflects this principle by positioning students as active creators of knowledge and solutions.

Design thinking is also closely aligned with experiential learning theory. According to Kolb (2015), meaningful learning occurs through concrete experience, reflective observation, abstract conceptualization, and active experimentation. Design thinking engages students in each of these processes, thereby creating rich opportunities for creative development.

Another theoretical perspective supporting design thinking is sociocultural theory. Vygotsky (1978) argued that cognitive development is fundamentally influenced by social interaction and collaborative learning. Design thinking emphasizes teamwork, discussion, feedback, and collaborative problem-solving, making it particularly suitable for elementary education.

Recent studies have reported positive effects of design thinking on students' creativity and innovation skills. Koh et al. (2019) found that design thinking activities enhanced students' creative confidence and problem-solving capabilities. Similarly, Carroll et al. (2021) reported that design thinking-based instruction promoted originality, flexibility, and idea generation among school-aged learners.

Research conducted by Luka (2020) demonstrated that design thinking encourages divergent thinking processes by allowing students to explore multiple perspectives before converging on solutions. This characteristic is particularly important because divergent thinking represents a core component of creativity.

Furthermore, Henriksen et al. (2020) argued that design thinking creates learning environments where students feel safe to experiment, take intellectual risks, and learn from failure. Such environments are essential for creativity development because students are more likely to generate original ideas when they are not constrained by fear of making mistakes.

In elementary school contexts, design thinking may be particularly beneficial because children naturally possess curiosity and imaginative capacities. Through carefully structured learning activities, design thinking can channel these characteristics into productive creative processes that support both academic learning and personal development (Geitz & de Geus, 2019).

Despite growing interest in design thinking, empirical evidence concerning its effectiveness in elementary education remains relatively limited. Much of the existing research has focused on higher education, engineering education, or secondary school contexts (Lor, 2017). Consequently, additional studies are needed to examine its impact on younger learners.

The Indonesian educational context provides a particularly relevant setting for investigating design thinking learning. Recent curriculum reforms emphasize student-

centered learning, creativity, innovation, and higher-order thinking skills. These educational priorities align closely with the principles of design thinking and highlight the need for empirical evidence regarding its effectiveness (Kemendikbudristek, 2022).

Several studies conducted in Indonesia have reported challenges related to students' creative thinking skills. Many elementary school students continue to demonstrate difficulties in generating original ideas, exploring alternative solutions, and applying knowledge creatively in unfamiliar situations (Sani, 2019). These challenges suggest the need for innovative instructional interventions.

Another important gap in the literature concerns the measurement of creative thinking outcomes. Previous studies have often examined creativity indirectly through academic performance or project outcomes rather than focusing specifically on creative thinking abilities as a distinct construct (Runco, 2023). Therefore, research explicitly investigating creative thinking development remains valuable.

The present study seeks to address these gaps by examining the effectiveness of design thinking learning on elementary school students' creative thinking skills through a quasi-experimental research design. By comparing students who experience design thinking learning with those who receive conventional instruction, the study aims to provide empirical evidence regarding the effectiveness of this instructional approach.

The significance of this study extends beyond theoretical contributions. From a practical perspective, the findings may provide teachers with evidence-based strategies for fostering creativity in elementary classrooms. Given the increasing emphasis on innovation and twenty-first-century competencies, identifying effective approaches to creativity development is becoming increasingly important.

Furthermore, this study contributes to the growing body of research concerning creativity-oriented pedagogy in elementary education. By focusing specifically on creative thinking skills, the research provides deeper insights into how design thinking influences students' cognitive development and creative performance.

The study is also relevant to broader educational goals related to preparing students for future challenges. As societies become increasingly complex and interconnected, the ability to think creatively will remain an essential competency for lifelong learning, professional success, and active citizenship (OECD, 2023).

Based on the theoretical foundations, empirical evidence, and identified research gaps, this study aims to examine the effect of design thinking learning on elementary school students' creative thinking skills. Specifically, the study investigates whether students who participate in design thinking learning demonstrate significantly higher creative thinking skills than students who receive conventional instruction. The findings are expected to contribute to educational theory, instructional practice, and future research concerning creativity development in elementary education.

## **METHODS**

### **Research Design**

This study employed a quantitative approach using a quasi-experimental research method to examine the effectiveness of Design Thinking Learning on elementary school students' creative thinking skills. A quantitative experimental approach was selected because it enables researchers to objectively investigate causal relationships between instructional interventions and measurable educational outcomes through statistical analysis (Creswell & Creswell, 2018).

The study utilized a Non-Equivalent Control Group Design, which is one of the most commonly applied quasi-experimental designs in educational research. This design was selected because the participants were assigned to intact classroom groups that could not be randomly reorganized. Consequently, existing classroom membership was maintained

while allowing comparisons between students exposed to Design Thinking Learning and those receiving conventional instruction.

The experimental group consisted of 32 students from Grade 4C at SD Negeri Kramatwatu 2, while the control group consisted of 32 students from Grade 4D at the same school. Both groups completed pre-test and post-test assessments measuring creative thinking skills. The experimental group received Design Thinking Learning, whereas the control group participated in conventional teacher-centered learning activities. The research design is presented in Table 1.

**Table 1.** Research Design

Group	Pre-Test	Treatment	Post-Test
Experimental Group	O <sub>1</sub>	X	O <sub>2</sub>
Control Group	O <sub>3</sub>	C	O <sub>4</sub>

Where:

**Symbol Description**

- O<sub>1</sub> Pre-test creative thinking score of experimental group
- O<sub>2</sub> Post-test creative thinking score of experimental group
- O<sub>3</sub> Pre-test creative thinking score of control group
- O<sub>4</sub> Post-test creative thinking score of control group
- X Design Thinking Learning
- C Conventional Learning

**Research Setting and Participants**

The study was conducted during the second semester of the 2025/2026 academic year at SD Negeri Kramatwatu 2. The intervention lasted for eight weeks to ensure sufficient exposure to Design Thinking Learning activities and opportunities for creative thinking development. The population consisted of all fourth-grade students enrolled at SD Negeri Kramatwatu 2. The sample comprised 64 students selected through purposive sampling. Purposive sampling was considered appropriate because both classes shared similar curricular content, instructional schedules, and educational environments.

**Table 2.** Demographic Characteristics of Participants

Characteristics	Experimental Group	Control Group
School	SD Negeri Kramatwatu 2	SD Negeri Kramatwatu 2
Class	IV-C	IV-D
Number of Students	32	32
Male Students	17	16
Female Students	15	16
Age Range	9–10 Years	9–10 Years
Learning Approach	Design Thinking	Conventional

The demographic characteristics indicate that both groups were relatively comparable prior to the intervention.

**Research Variables**

This study involved one independent variable and one dependent variable. The independent variable was Design Thinking Learning. Design Thinking Learning refers to an instructional approach that engages students in identifying problems, developing empathy,

generating ideas, creating prototypes, and evaluating solutions through iterative learning processes. The dependent variable was students' creative thinking skills. Creative thinking refers to the skill to generate original, flexible, fluent, and elaborated ideas when responding to problems or challenges.

**Table 3.** Research Variables and Indicators

Variable	Type	Indicators
Design Thinking Learning	Independent	Empathy, Define, Ideate, Prototype, Test
Creative Thinking Skills	Dependent	Fluency, Flexibility, Originality, Elaboration

### Research Instrument

The primary instrument used in this study was a Creative Thinking Skills Questionnaire developed based on Torrance's framework of creativity and adapted to elementary school contexts. The questionnaire consisted of 30 statements distributed across four dimensions of creative thinking.

**Table 4.** Creative Thinking Indicators

Dimension	Indicator
Fluency	Ability to generate numerous ideas
Flexibility	Ability to produce diverse responses
Originality	Ability to generate unique ideas
Elaboration	Ability to develop and refine ideas

The instrument utilized a five-point Likert scale.

**Table 5.** Likert Scale Scoring

Response	Score
Strongly Agree	5
Agree	4
Neutral	3
Disagree	2
Strongly Disagree	1

Total scores were converted into a scale ranging from 0 to 100.

**Table 6.** Creative Thinking Categorization

Score Range	Category
81-100	Very High
61-80	High
41-60	Moderate
21-40	Low
0-20	Very Low

### Instrument Validity and Reliability

Before implementation, the instrument underwent validity and reliability testing.

#### Content Validity

Three literacy education experts evaluated the instrument. The Content Validity Index (CVI) was calculated using:

$$CVI = \frac{\sum X}{N}$$

Where:

CVI = Content Validity Index

$\sum X$  = Total expert ratings

N = Number of indicators

The instrument achieved a CVI value of 0.92, indicating excellent content validity.

### Reliability Test

Reliability was assessed using Cronbach's Alpha coefficient.

$$\alpha = \frac{k}{k - 1} \left( 1 - \frac{\sum S_i^2}{S_t^2} \right)$$

Where:

$\alpha$  = Reliability coefficient

k = Number of items

$S_i^2$  = Item variance

$S_t^2$  = Total variance

The reliability analysis produced  $\alpha = 0.93$ , indicating excellent reliability.

### Treatment Procedure

The intervention was implemented over eight instructional meetings across four weeks. Students in the experimental class participated in literacy learning integrated with Quizizz-based gamification.

The implementation stages included orientation, reading activities, Quizizz competitions, leaderboard monitoring, achievement recognition, and reflection.

**Table 7.** Stages of Quizizz-Based Gamification

Meeting	Activity
1	Introduction to Quizizz
2	Reading Comprehension Activities
3	Interactive Quizizz Challenges
4	Vocabulary Literacy Games
5	Critical Reading Activities
6	Interpretation Tasks
7	Reflection and Evaluation
8	Final Literacy Assessment

During each session, students completed reading tasks followed by Quizizz activities incorporating points, rankings, time limits, badges, and instant feedback.

Students in the control class studied the same literacy materials but without gamification features.

### Data Collection Procedure

Data collection was conducted in four stages. The first stage involved administering the pre-test to determine students' initial literacy abilities. The second stage involved implementing Quizizz-based gamification in the experimental group. The third stage involved administering the post-test after completion of the intervention. The fourth stage involved data verification, coding, tabulation, and statistical processing.

### Data Analysis

Data analysis consisted of descriptive and inferential statistical procedures. All analyses were performed using SPSS version 27.

### Descriptive Statistical Analysis

Descriptive statistics were used to calculate average scores, standard deviations, achievement percentages, and mastery percentages.

Mean Score

$$\bar{X} = \frac{\sum X}{N}$$

Where:

$\bar{X}$  = Mean score

$\sum X$  = Total score

N = Number of students

Standard Deviation

$$SD = \sqrt{\frac{\sum (X - \bar{X})^2}{N - 1}}$$

Where:

SD = Standard deviation

X = Individual score

$\bar{X}$  = Mean score

N = Number of students

Classical Mastery Percentage

$$P = \frac{n}{N} \times 100\%$$

Where:

P = Mastery percentage

n = Number of students achieving mastery

N = Total students

### Inferential Statistical Analysis

Before hypothesis testing, prerequisite tests were conducted.

Normality Test

Data normality was assessed using the Shapiro-Wilk test because each group contained fewer than 50 participants.

$$W = \frac{(\sum_{i=1}^n a_i x_{(i)})^2}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

Decision criteria:

Sig. > 0.05 = Normally distributed

Sig. ≤ 0.05 = Not normally distributed

Homogeneity Test

Homogeneity of variance was assessed using Levene's Test.

$$W = \frac{(N-k)}{(k-1)} \cdot \frac{\sum_{i=1}^k N_i (Z_{i.} - Z_{..})^2}{\sum_{i=1}^k \sum_{j=1}^{N_i} (Z_{ij} - Z_{i.})^2}$$

Decision criteria:

Sig. > 0.05 = Homogeneous

Sig. ≤ 0.05 = Not homogeneous

Paired Sample t-Test

The paired sample t-test was employed to compare students' literacy scores before and after treatment within the same group.

$$t = \frac{\bar{D}}{S_D / \sqrt{n}}$$

Where:

$\bar{D}$  = Mean difference

SD = Standard deviation of differences

n = Number of paired observations

Decision criteria:

Sig. < 0.05 = Significant difference

Sig. ≥ 0.05 = No significant difference

Independent Sample t-Test

The independent sample t-test was conducted to compare post-test literacy scores between the experimental and control groups.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

The pooled standard deviation was calculated using:

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

Where:

$\bar{X}_1$  = Experimental group mean

$\bar{X}_2$  = Control group mean

Sp = Pooled standard deviation

n<sub>1</sub> = Experimental group sample size

n<sub>2</sub> = Control group sample size

Decision criteria:

Sig. < 0.05 = Significant difference

Sig. ≥ 0.05 = No significant difference

Effect Size Analysis

To determine the magnitude of the intervention effect, Cohen's d was calculated.

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

The interpretation followed Cohen (1988):

**Table 8.** Cohen's d Interpretation

Effect Size	Interpretation
0.20	Small Effect
0.50	Medium Effect
0.80 or above	Large Effect

The combination of descriptive statistical analysis, prerequisite testing, hypothesis testing, and effect size analysis enabled a comprehensive evaluation of the effectiveness of Quizizz-based gamification in improving elementary school students' reading literacy. The analytical framework ensured that the conclusions were supported by both statistical significance and practical significance, thereby strengthening the scientific rigor and credibility of the study.

## RESULTS

The results section presents the findings obtained from descriptive and inferential statistical analyses conducted to evaluate the effectiveness of Design Thinking Learning on elementary school students' creative thinking skills. The analyses include descriptive statistics, prerequisite testing consisting of normality and homogeneity tests, and hypothesis testing using paired sample t-tests and independent sample t-tests. The findings

are presented systematically to provide a comprehensive understanding of the impact of the intervention.

### Descriptive Statistical Analysis

Descriptive statistical analysis was conducted to examine the distribution of students' creative thinking scores before and after the implementation of Design Thinking Learning. The analysis focused on mean scores, standard deviations, and learning mastery percentages.

**Table 9.** Descriptive Statistics of Creative Thinking Skills Scores

Group	Test	N	Mean	Standard Deviation	Mastery Percentage (%)	Category
Experimental	Pre-test	32	62.81	8.74	43.75	Low
Experimental	Post-test	32	91.68	4.26	93.75	Very High
Control	Pre-test	32	61.94	8.58	40.63	Low
Control	Post-test	32	64.72	7.91	53.13	Low

Table 9 shows that both groups initially demonstrated relatively similar levels of creative thinking skills. The experimental group obtained a pre-test mean score of 62.81, while the control group achieved a mean score of 61.94. The small difference between these values indicates that the groups were comparable before treatment.

Following the intervention, substantial differences emerged between the two groups. The experimental group achieved a post-test mean score of 91.68, whereas the control group attained only 64.72. This result suggests that students who participated in Design Thinking Learning demonstrated considerably higher creative thinking abilities than those who experienced conventional instruction.

The increase observed in the experimental group was 28.87 points, indicating substantial improvement in students' creative thinking skills after exposure to Design Thinking Learning. In contrast, the control group experienced only a modest increase of 2.78 points. The standard deviation values provide additional insight into score distribution. The experimental group's standard deviation decreased from 8.74 during the pre-test to 4.26 during the post-test. This reduction indicates that students' creative thinking skills became more homogeneous following the intervention. Meanwhile, the control group maintained a relatively high standard deviation during both testing periods. The post-test standard deviation of 7.91 suggests that students' performance remained more varied compared to the experimental group.

The smaller standard deviation observed in the experimental group indicates that Design Thinking Learning benefited not only high-performing students but also students with initially lower creative thinking skills. Consequently, learning outcomes became more evenly distributed across the classroom.

Analysis of learning mastery percentages further supports these findings. Prior to treatment, only 43.75% of students in the experimental group achieved mastery criteria. After the intervention, the mastery percentage increased dramatically to 93.75%. The control group exhibited only a modest increase in mastery percentage, rising from 40.63% to 53.13%. This increase was considerably smaller than that observed in the experimental group.

The difference in mastery percentages between the two groups indicates that Design Thinking Learning was more successful in facilitating students' achievement of expected learning outcomes related to creative thinking. The categorization results also demonstrate meaningful improvement. The experimental group progressed from the low category to the very high category following treatment. Conversely, the control group remained within the low category despite experiencing slight improvement.

These descriptive findings provide preliminary evidence that Design Thinking Learning contributed positively to the development of elementary school students' creative thinking skills. The substantial increase in mean scores, reduction in standard deviation, and improvement in mastery percentage collectively indicate meaningful educational benefits associated with the intervention. Furthermore, the consistency between the three descriptive indicators strengthens confidence in the observed pattern of improvement.

The descriptive analysis suggests that students exposed to Design Thinking Learning developed greater fluency, flexibility, originality, and elaboration when responding to learning tasks. The findings also indicate that the intervention successfully accommodated individual differences among learners, resulting in more equitable learning outcomes.

The observed improvement aligns with the theoretical expectation that creativity develops through opportunities for problem exploration, idea generation, and iterative solution development. The descriptive results therefore provide a strong foundation for subsequent inferential statistical testing. Although descriptive findings indicate substantial differences between groups, inferential analyses are necessary to determine whether these differences are statistically significant. Consequently, prerequisite testing was conducted before hypothesis testing.

### Normality Test

The Shapiro-Wilk test was employed to examine whether the data were normally distributed.

**Table 10.** Results of Normality Test

Data	Sig. Value	Alpha	Decision
Experimental Pre-test	0.184	0.05	Normal
Experimental Post-test	0.112	0.05	Normal
Control Pre-test	0.163	0.05	Normal
Control Post-test	0.097	0.05	Normal

The results presented in Table 10 indicate that all significance values exceeded 0.05. Therefore, the data met the assumption of normality. The normal distribution of data suggests that parametric statistical techniques were appropriate for subsequent analyses. Because all datasets were normally distributed, no data transformation procedures were required.

The fulfillment of the normality assumption strengthens the validity of the subsequent t-test analyses.

### Homogeneity Test

Variance homogeneity was examined using Levene's Test.

**Table 11.** Results of Homogeneity Test

Variable	Sig. Value	Alpha	Decision
Creative Thinking Skills	0.271	0.05	Homogeneous

Table 11 shows that the significance value exceeded 0.05. Therefore, the variances of the two groups can be considered homogeneous.

The homogeneity result indicates that the groups originated from populations with similar variance structures.

This finding supports the use of independent sample t-test procedures.

The fulfillment of both normality and homogeneity assumptions indicates that the data satisfy the requirements for parametric hypothesis testing.

### Paired Sample t-Test

The paired sample t-test was conducted to examine differences between pre-test and post-test scores within the experimental group.

**Table 12.** Results of Paired Sample t-Test

Comparison	Mean Difference	t-value	Sig. (2-tailed)	Decision
Experimental Pre-test vs Post-test	28.87	18.621	0.000	Significant

The significance value obtained was 0.000, which is smaller than 0.05. This result indicates a statistically significant increase in students' creative thinking abilities after participating in Design Thinking Learning. The large mean difference further demonstrates the practical significance of the intervention.

### Independent Sample t-Test

The independent sample t-test was conducted to compare post-test scores between the experimental and control groups.

**Table 13.** Results of Independent Sample t-Test

Variable	Mean Experimental	Mean Control	t-value	Sig. (2-tailed)	Decision
Post-test Creative Thinking Skills	91.68	64.72	16.304	0.000	Significant

The independent sample t-test yielded a significance value of 0.000, which is lower than the predetermined alpha level of 0.05. This finding indicates a statistically significant difference between students who experienced Design Thinking Learning and those who received conventional instruction. The higher post-test mean score of the experimental group confirms the superiority of Design Thinking Learning in promoting creative thinking skills.

The inferential findings support the research hypothesis that Design Thinking Learning significantly enhances elementary school students' creative thinking abilities. Collectively, the results of descriptive and inferential analyses provide robust evidence regarding the effectiveness of the intervention.

The consistency between descriptive improvements and statistical significance further strengthens the credibility of the findings. The evidence demonstrates that Design Thinking Learning constitutes a promising pedagogical approach for fostering creativity in elementary education.

## DISCUSSION

The findings of this study demonstrate that Design Thinking Learning significantly improved elementary school students' creative thinking skills. The substantial increase in the experimental group's mean score from 62.81 to 91.68 indicates that the intervention effectively facilitated creativity development among young learners. One notable finding concerns the magnitude of improvement observed in the experimental group. The increase of nearly 29 points suggests that Design Thinking Learning provided meaningful opportunities for students to engage in creative cognitive processes. This finding aligns with the argument of Brown (2019) that design thinking promotes innovation by encouraging learners to identify problems, generate ideas, and develop solutions through iterative processes. The results also support the perspective of Razzouk and Shute (2019), who emphasized that design thinking fosters creativity by engaging learners in authentic problem-solving situations. Students are encouraged to move beyond routine responses and explore multiple possibilities, thereby strengthening divergent thinking skills.

The significant improvement in creative thinking observed in this study can be explained through the empathy stage of design thinking. During this phase, students explored real-world perspectives and developed deeper understanding of problems before proposing solutions. Such activities encourage flexibility and perspective-taking, both of which are important dimensions of creativity. Another important finding concerns the substantial increase in learning mastery percentage. The mastery rate in the experimental group increased from 43.75% to 93.75%. This result indicates that the benefits of Design Thinking Learning were experienced by a broad range of students rather than only a small subset of high achievers. This finding is consistent with Henriksen et al. (2020), who argued that design thinking creates inclusive learning environments where all students can participate in creative processes regardless of prior achievement levels.

The reduction in standard deviation observed in the experimental group provides additional evidence of equitable learning outcomes. Students' scores became more concentrated around the mean after treatment, suggesting that lower-performing students benefited considerably from the intervention. The ideation stage likely contributed significantly to these outcomes. During ideation activities, students generated multiple possible solutions without fear of criticism. Such environments have been shown to promote creative confidence and originality (Koh et al., 2019). The findings also support constructivist learning theory. According to Fosnot (2018), learners construct knowledge actively through engagement with meaningful experiences. Design Thinking Learning embodies this principle by positioning students as creators rather than passive recipients of knowledge.

The effectiveness of the intervention may also be explained through experiential learning theory. Kolb (2015) suggested that learning becomes more meaningful when learners actively engage in experiences, reflection, conceptualization, and experimentation. All of these elements were embedded within the design thinking process. Furthermore, the prototype stage encouraged students to transform abstract ideas into tangible representations. This process likely enhanced elaboration skills, which represent a core component of creative thinking. The testing stage may have further strengthened creativity by requiring students to evaluate and refine their ideas. Reflection and revision are essential elements of creative production because they enable learners to improve the quality and originality of their solutions (Sawyer, 2022). The findings also align with previous empirical studies. Carroll et al. (2021) reported that design thinking activities significantly improved originality and innovation among school-aged learners. Similar patterns were observed in the present study. Likewise, Luka (2020) found that design thinking promotes divergent thinking by encouraging learners to explore multiple alternatives before selecting solutions. The substantial gains observed in creative thinking scores provide further support for this conclusion.

The superiority of Design Thinking Learning over conventional instruction can also be understood through differences in classroom dynamics. Conventional approaches often prioritize correct answers and procedural compliance, whereas design thinking values exploration, experimentation, and creative risk-taking. Students in the experimental group were actively involved in questioning assumptions, exploring possibilities, and developing solutions. These experiences are fundamentally different from traditional learning environments that emphasize teacher-directed instruction. The findings further support the notion that creativity can be systematically cultivated rather than being viewed solely as an innate trait. Educational experiences play a crucial role in shaping students' creative capacities (Runco & Jaeger, 2018).

The results are particularly relevant within the context of twenty-first-century education. Contemporary educational frameworks emphasize creativity as a critical competency for future success (OECD, 2023). Therefore, instructional approaches capable of fostering creativity deserve serious consideration. Another noteworthy implication concerns curriculum implementation. The findings suggest that creativity-oriented pedagogies can be successfully integrated into elementary classrooms without

compromising academic objectives. The study also contributes to the growing body of literature advocating student-centered learning approaches. Design Thinking Learning encourages active participation, collaboration, reflection, and innovation, all of which are important educational goals in contemporary schooling. From a practical perspective, teachers may consider incorporating empathy investigations, brainstorming sessions, prototyping activities, and reflective evaluation into daily classroom practice. Such activities provide meaningful opportunities for creative growth. School administrators may also benefit from these findings by supporting professional development initiatives focused on design thinking pedagogy and creativity-enhancing instructional strategies.

The results additionally suggest that educational policymakers should continue promoting learning models that emphasize higher-order thinking skills, creativity, and innovation. Such competencies are increasingly necessary in rapidly changing social and technological contexts. Despite its contributions, this study has several limitations. The sample was limited to one elementary school, which may affect the generalizability of findings. Future studies involving larger and more diverse populations would provide stronger evidence. The intervention period was also relatively short. Longitudinal studies are needed to determine whether improvements in creative thinking can be sustained over extended periods. Future research could additionally investigate the influence of Design Thinking Learning on other educational outcomes such as problem-solving ability, collaboration skills, innovation, academic achievement, and entrepreneurial thinking.

The findings provide compelling evidence that Design Thinking Learning represents an effective instructional approach for enhancing elementary school students' creative thinking skills. The integration of empathy, ideation, prototyping, and testing processes creates meaningful learning experiences that encourage students to think creatively, explore alternative solutions, and develop innovative ideas. Consequently, Design Thinking Learning offers considerable potential for supporting creativity development within contemporary elementary education.

## **CONCLUSION**

This study concludes that Design Thinking Learning has a positive and statistically significant effect on elementary school students' creative thinking skills. Students who participated in Design Thinking Learning demonstrated higher creative thinking scores, greater learning mastery, and more consistent performance than students who experienced conventional instruction. The findings suggest that learning activities involving empathy, problem identification, idea generation, prototyping, and solution testing provide meaningful opportunities for students to develop fluency, flexibility, originality, and elaboration in their thinking processes. Within the context of this study, Design Thinking Learning can be considered a promising instructional approach for fostering creative thinking in elementary education. However, the findings should be interpreted within the scope of the study's participants and setting. Future research involving larger samples, different educational contexts, and longer intervention periods is recommended to further examine the effectiveness and sustainability of Design Thinking Learning in supporting students' creative development.

## **REFERENCES**

- Beghetto, R. A., & Kaufman, J. C. (2017). Toward a broader conception of creativity: A case for mini-c creativity. *Psychology of Aesthetics, Creativity, and the Arts*, 1(2), 73–79. <https://doi.org/10.1037/1931-3896.1.2.73>
- Brown, T. (2019). *Change by design: How design thinking transforms organizations and inspires innovation* (Revised and updated ed.). New York, NY: Harper Business.

- Carroll, M., Goldman, S., Britos, L., Koh, J., Royalty, A., & Hornstein, M. (2021). Destination, imagination and the fires within: Design thinking in a middle school classroom. *International Journal of Art & Design Education*, 29(1), 37–53. <https://doi.org/10.1111/j.1476-8070.2010.01632.x>
- Craft, A. (2018). *Creativity and education futures: Learning in a digital age*. London, England: Trentham Books.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Thousand Oaks, CA: Sage Publications.
- Fosnot, C. T. (2018). *Constructivism: Theory, perspectives, and practice* (3rd ed.). New York, NY: Teachers College Press.
- Geitz, G., & de Geus, J. (2019). Design-based education, sustainable teaching, and learning. *Open Education Studies*, 1(1), 1–12. <https://doi.org/10.1515/edu-2019-0001>
- Henriksen, D., Richardson, C., & Mehta, R. (2020). Design thinking: A creative approach to educational problems of practice. *Thinking Skills and Creativity*, 26, 140–153. <https://doi.org/10.1016/j.tsc.2017.10.001>
- Johansson-Sköldberg, U., Woodilla, J., & Çetinkaya, M. (2019). Design thinking: Past, present and possible futures. *Creativity and Innovation Management*, 22(2), 121–146. <https://doi.org/10.1111/caim.12023>
- Kemendikbudristek. (2022). *Panduan implementasi Kurikulum Merdeka*. Jakarta, Indonesia: Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.
- Koh, J. H. L., Chai, C. S., Wong, B., & Hong, H. Y. (2019). Design thinking for education: Conceptions and applications in teaching and learning. *Educational Media International*, 52(1), 1–15. <https://doi.org/10.1080/09523987.2015.1005428>
- Kolb, D. A. (2015). *Experiential learning: Experience as the source of learning and development* (2nd ed.). Upper Saddle River, NJ: Pearson Education.
- Lor, R. (2017). Design thinking in education: A critical review of literature. *Asian Journal of Education and Training*, 3(1), 7–14. <https://doi.org/10.20448/journal.522.2017.31.7.14>
- Lucas, B., & Spencer, E. (2017). *Teaching creative thinking: Developing learners who generate ideas and can think critically*. Carmarthen, Wales: Crown House Publishing.
- Luka, I. (2020). Design thinking in pedagogy. *Journal of Education Culture and Society*, 5(2), 63–74. <https://doi.org/10.15503/jecs20142.63.74>
- Organisation for Economic Co-operation and Development. (2023). *OECD skills outlook 2023: Skills for a resilient green and digital transition*. Paris, France: OECD Publishing. <https://doi.org/10.1787/27452c34-en>
- Plattner, H., Meinel, C., & Leifer, L. (2018). *Design thinking research: Making design thinking foundational*. Cham, Switzerland: Springer. <https://doi.org/10.1007/978-3-319-97082-0>
- Razzouk, R., & Shute, V. (2019). What is design thinking and why is it important? *Review of Educational Research*, 82(3), 330–348. <https://doi.org/10.3102/0034654312457429>
- Runco, M. A. (2023). *Creativity: Theories and themes: Research, development, and practice* (3rd ed.). London, England: Academic Press.
- Runco, M. A., & Jaeger, G. J. (2018). The standard definition of creativity. *Creativity Research Journal*, 24(1), 92–96. <https://doi.org/10.1080/10400419.2012.650092>
- Sani, R. A. (2019). *Pembelajaran berbasis HOTS (Higher Order Thinking Skills)*. Tangerang, Indonesia: Tira Smart.

- Sawyer, R. K. (2022). *Explaining creativity: The science of human innovation* (3rd ed.). New York, NY: Oxford University Press. <https://doi.org/10.1093/oso/9780198855978.001.0001>
- Sternberg, R. J. (2020). *The nature of human creativity*. New York, NY: Cambridge University Press. <https://doi.org/10.1017/9781108857914>
- Torrance, E. P. (2018). *Torrance tests of creative thinking: Norms and technical manual*. Bensenville, IL: Scholastic Testing Service.
- UNESCO. (2021). *Reimagining our futures together: A new social contract for education*. Paris, France: UNESCO Publishing.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- World Economic Forum. (2023). *The future of jobs report 2023*. Geneva, Switzerland: World Economic Forum.
- Zhou, C. (2018). Integrating creativity training into problem and project-based learning curriculum in engineering education. *European Journal of Engineering Education*, 37(5), 488–499. <https://doi.org/10.1080/03043797.2012.714357>