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The Effect of *Ecoprint* Activities on the Fine Motor Development of Children Aged 5-6 Years

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Abstract
Fine motor development in early childhood is often suboptimal due to a lack of variety in learning media that can stimulate hand-eye coordination and finger skills. Based on initial observations at RA Al-Hidayah Palembang, 17 children aged 5–6 years were found to have below-standard fine motor skills, especially in writing, cutting, and pasting activities. This study aims to analyze the effect of ecoprinting activities, as a natural-material-based learning medium, on children's fine motor development. The research method used a quantitative approach with a one–group pretest–posttest design. The research sample consisted of 17 children selected through *purposive* sampling. Data were collected through observation, tests, and documentation, and then analyzed using a paired-samples t-test. The results showed a significant increase between the pretest and posttest scores, as evidenced by a t-value of −9.581, which is greater than the t-table value of 2.120, and a significance value of $p < 0.001$. These findings indicate that ecoprinting activities are effective in improving children's fine motor skills, especially in terms of accuracy, finger flexibility, grip strength, and visual-motor coordination. Therefore, ecoprint can be used as an alternative learning medium that is enjoyable, environmentally friendly, and capable of stimulating optimal fine motor skill development.

Keywords: Ecoprint, fine motor skills, early childhood

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INTRODUCTION

Early Childhood Education (PAUD) plays a crucial role in shaping the foundation of a child's overall development, encompassing cognitive, social-emotional, and motor skills (Nurachadijat & Selvia, 2023) . One aspect that requires special attention is fine motor development, as this ability is

directly related to a child's readiness for writing, drawing, cutting, and engaging in learning activities at the next level.

The development of fine motor skills in early childhood is one of the important components in the basic phase of the Merdeka Curriculum, which needs to be developed optimally before children continue to the next level of education. In the Merdeka PAUD Curriculum, the foundation phase covers three important elements, namely religious and moral values, identity, and the basics of literacy, numeracy, science, technology, engineering, and the arts. (As part of physical development controlled by the nervous and muscular systems, fine motor skills involve precise coordination between body movements, small muscles, and the nervous system to perform activities that require precision and hand-eye coordination (Masturoh et al., 2025) .

Fine motor development is very important for a child's overall development (Muniro & Rahman, 2023) . Fine motor skills involve the wrists, fingers, and eyes. Fine motor skills greatly affect the results, quality, and speed of performing daily tasks. Fine motor skills are vital for a child's development and are also essential for daily activities. Examples include buttoning clothes, brushing teeth, or learning activities such as pasting paper, cutting, and writing (Rahayu et al., 2023) .

A child's physical motor development is one of the most important developments in early childhood (Farida Mayar, 2021) . Teachers and parents should work together to develop these motor skills. Teachers and parents should stimulate children with various fun games and foster a sense of enjoyment in children so that they are interested in playing, and most importantly, by playing games, children will develop their motor skills without realizing it. Physical motor development is a process where an individual develops through responses that result in coordinated, organized, and integrated movements (Khadijah & Amelia, 2020) .

Good fine motor skill development is key to the success of early childhood learning, as it influences a child's readiness to participate in academic activities at the next level (Syofiyanti et al., 2024) Early childhood education facilities play an important role in providing stimulation through planned and enjoyable activities. The provision of appropriate learning media and resources can help children develop finger skills, hand strength, and visual-motor coordination. Thus, children can improve basic skills such as writing, drawing, or performing other creative activities that support school readiness. (Rachmi, 2017)

Teachers have a strategic role in supporting children's fine motor development through the application of varied and contextual learning media (Amalia, Wahono, Tri Kurniawati, 2025) . Fine motor skills are also related to the development of kinesthetic intelligence, which is the ability of

children to control body movements and use tools skillfully. (Well-developed fine motor skills also contribute to children's confidence in interacting with their surroundings. (Santrock, 2018) Examples of activities that can develop children's fine motor skills include cutting, fastening and unfastening buttons, and writing and drawing. (Akollo et al., 2023)

From initial observations at RA Al-Hidayah with 30 students, mainly aged 5-6 years, it was found that 17 children had suboptimal fine motor development. This was based on observational assessments of early childhood development at the school. This condition was not only evident in the children's difficulties in writing, cutting, pasting patterns, and coloring, but was also influenced by the lack of variety in the learning media used by teachers. Monotonous media makes learning activities passive, so that children do not get the right stimulation to develop their fine motor skills. This results in a lack of variety in the use of learning media that can support children's fine motor development. Teachers tend to use the same methods repeatedly, so that children are less actively involved in the learning process and play more on their own while the teacher explains.

Children's identities can be developed through *ecoprinting* activities, especially in terms of fine motor skills. Ecoprinting is a technique of coloring fabric using natural materials by sticking plants (leaves/flowers) in their original form onto the surface of a fabric (Subiyati et al., 2021). Children can create original patterns by attaching plants to fabric and pounding them with a wooden mallet using a method similar to the pudding technique. *Ecoprinting* depends on the interaction between the plant material and the type of fiber used. The method of processing the plants and the printing technique also play an important role in determining the patterns and colors produced (Louise Upshall, 2024).

Ecoprinting does not use chemical dyes; the dyes used are natural and environmentally friendly, derived from leaf pigments found around the children. There are two methods of *ecoprinting*: *the* pounding technique and the steaming method (Dewi, 2021) . Children can improve their accuracy, develop their creativity, and train their hand-eye coordination through this game. Additionally, by using natural materials, *ecoprinting* teaches children about environmentally friendly and sustainable art (Palupi et al., 2025) .

Research by Sa'ada & Munif, (2024) shows that *ecoprint* techniques effectively improve children's fine motor skills. Research conducted by Putri et al., (2021) also confirms that the use of natural materials provides children with opportunities to explore their environment and develop various aspects of their abilities. Ecoprint techniques that utilize natural materials involve activities that train coordination and small hand muscle strength, resulting in noticeable improvements from

the planning stage to the evaluation of activities. Similar findings were obtained in the research by , which showed that ecoprint batik activities increased the creativity of children aged five to six years, as indicated by an increase in scores from 9 to 17. Hypothesis testing with a significance value of 0.001 (< 0.05) confirmed that ecoprint has a significant effect on children's creativity development.

Children are expected to be able to use their motor functions to explore and manipulate objects around them as part of their self-development. "The researchers were interested in conducting this study because *ecoprinting* activities had never been implemented at RA Al-Hidayah Palembang as a method to stimulate children's fine motor development. Through enjoyable *ecoprint* activities that train fine motor skills, children can achieve optimal development and be well prepared to enter the next level of education. Based on these gaps and urgencies, this study was conducted to examine "The Effect of Ecoprint Activities on the Fine Motor Development of Children Aged 5-6 Years." The purpose of this study was to analyze the effect of ecoprint activities on improving the fine motor skills of children aged 5-6 years at RA Al-Hidayah Palembang.

METHODOLOGY

Type of Research

This study used a quantitative approach with a one-group pretest–posttest pre-experimental design. The research subjects consisted of only one group that was given a pretest, then given treatment in the form of ecoprint activities, and then given a posttest. This design was chosen due to the limited number of subjects and the inability to have a control group.

The purpose of this study was to determine the effect of ecoprint activities on the fine motor development of early childhood by comparing the pretest and posttest results. A quantitative approach was used because the entire process, from data collection to analysis, was based on numbers to evaluate the causal relationship between variables.

Table 1. Research Design

Pretest	*Treatment*	*Posttest*
O_1	X	O_2

Research Time and Place

This research was conducted during the 2024/2025 academic year at RA Al-Hidayah Palembang from May 19 to May 27, 2025. The research was conducted at RA Al-Hidayah

Palembang. The research location is located at Lr. Puspita, Suka Maju, Sukarami District, Palembang City, South Sumatra. RA Al-Hidayah has two classes, namely B1 and B2.

Research Objectives

The population of this study was all 30 children in Group B at RA Al-Hidayah Palembang. The research sample was determined using *purposive sampling* based on inclusion criteria, namely children aged 5–6 years, registered as active students in class B2, regularly attending during the research period, and obtaining permission from parents to participate. From this population, 17 children (10 boys and 7 girls) who met the inclusion criteria were selected as the research sample. Meanwhile, 13 other children were not included in the sample because they met the exclusion criteria, such as being underage (less than 5 years old), irregular attendance, or not obtaining permission from their parents. Thus, the research sample consisted of 17 children who met the research requirements.

Data Collection Techniques and Instrument Development

This study collected data through three main methods, namely observation, testing, and documentation. Observation was conducted to directly monitor the implementation of *ecoprint* activities and their impact on children's fine motor skills. Tests were used to measure fine motor skills before and after the activity in a structured manner, both through direct tests and non-test assessments. Documentation served as written and visual evidence to support the results of observations and tests, so that the data obtained was more complete and valid.

Data Analysis Techniques

Overall, the data analysis for this study was conducted quantitatively using a series of statistical tests to ensure the accuracy of the results. Validity and reliability tests were used to ensure the quality of the research instruments, while normality and homogeneity tests were conducted as prerequisites before testing the hypotheses. The results of the hypothesis testing were then used to empirically prove the effect of *ecoprint* activities on children's fine motor development.

RESULTS AND DISCUSSION

RESULTS

Type of Research and Research Design

This study used a Pre-Experimental Design with a One Group Pretest–Posttest Design. This design was carried out by providing treatment in the form of ecoprint activities, followed by measurements before and after treatment to determine the effect on children's fine motor development.

Table 2. *One-group pretest-posttest design*

Research Design	Pretest (O_1)	Treatment (X)	Posttest (O_2)
One Group	O_1	X	O_2

Explanation:

O_1 = Pre-test to determine the children's initial abilities.

X = Treatment in the form of ecoprint activities.

O_2 = Posttest after the children received the treatment.

Validity and Reliability Test

The validation test was conducted by calculating the correlation of each item with its total score. The researcher conducted a validation test on 17 children in class B2, who filled out the questionnaire individually, by testing the instrument that had been created. Based on the overall results, the value was > 0.482. This shows that all items in the assessment instrument are valid. Thus, all items can be used to measure the aspects specified in the study, as they meet the statistical validity requirements for the instrument.

To determine good reliability, this study used reliability criteria with a Cronbach's Alpha value > 0.60. The table generated from data analysis using SPSS version 29 shows the reliability test results. This research tool has a high level of reliability, as evidenced by a Cronbach's Alpha score of 0.753, which is higher than the minimum standard of 0.60. Because this instrument meets the known reliability standards, these results indicate that this instrument can be used as a valid measuring tool in research.

Table of Frequency Distribution of Pretest Results

Table 3. Frequency Distribution of Children's Fine Motor Development Pretest Scores

No	Value Interval	Frequency	Percentage	Category
1	44 – 51	3	17.6	Poor
2	52–59	6	35.3	Fair
3	60–67	5	29.4	Good
4	68–75	3	17.6	Very Good
Total		17	100	

Based on the table above, it can be explained that the pretest scores for fine motor development of children aged 5–6 years at RA Al-Hidayah Palembang were mostly in the adequate category, with 6 children (35.3%), while 5 children (29.4%) were in the good category. This shows

that before being given the ecoprint activity treatment, the children's fine motor skills were still at a moderate level.

Table of Average Pretest Scores

Table 4. Average Pretest Scores for Fine Motor Development in Children

Statistics	Score
Highest Score	72
Lowest Score	44
Total	958
Average (Mean)	56.2

Based on the table above, it can be seen that the average pretest score for children's fine motor development was **56.2**, which is in the **fairly good** category**.** The highest score obtained by the children was **72**, while the lowest score was **44**. These results show that before receiving treatment, the children had not yet achieved optimal fine motor skills.

Table of Frequency Distribution of Posttest Results

Table 5. Frequency Distribution of Children's Fine Motor Development Posttest Scores

No	Score Interval	Frequency	Percentage	Category
1	69 – 76	2	11.8	Fair
2	77–84	5	29.4	Good
3	85–92	6	35.3	Very Good
4	93–100	4	23.5	Very Good
Total		17	100	

Based on the table above, it can be explained that after being given the ecoprint activity treatment, most of the children were in the **very good** category**,** with **6 children (35.3%),** and **very good indeed,** with **4 children (23.5%).** This shows a significant increase in children's fine motor skills compared to before the treatment.

Posttest Average Score Table

Table 6. Average Posttest Scores for Children's Fine Motor Skills Development

Statistics	Score
Highest Score	97
Lowest Score	69
Total	1,487
Average (Mean)	87.5

Based on the table above, it can be seen that the average posttest score was 87.5, showing a significant increase compared to the pretest score (56.2). Thus, it can be concluded

that ecoprint activities have a positive effect on improving the fine motor skills of children aged 5–6 years.

Table 7. Normality Test Results

One-Sample Kolmogorov-Smirnov Test

			Unstandardized Residual
N			17
Normal Parameters[a,b]	Mean		.0000000
	Std. Deviation		2.70717884
Most Extreme Differences	Absolute		.153
	Positive		.088
	Negative		-.153
Test Statistic			.153
Asymp. Sig. (2-tailed)[c]			.200[d]
Monte Carlo Sig. (2-tailed)[e]	Sig.		.342
	99% Confidence Interval	Lower Bound	.329
		Upper Bound	.354

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.
e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Based on the normality test results, the significance value of 0.200 is greater than 0.05. Therefore, it can be concluded that the residual values are normally distributed.

Table 8. Homogeneity Results

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
hasil	Based on Mean	.001	1	32	.981
	Based on Median	.009	1	32	.926
	Based on Median and with adjusted df	.009	1	31.772	.926
	Based on trimmed mean	.001	1	32	.979

Based on the homogeneity test above, the significance of the data on children's fine motor development is 0.981 and the *Levene statistic* result is 0.01. The decision-making data in the homogeneity test using *SPSS* version 29 is the value of f_{hitung} > the significant value of 5% (a=0.05), so the result obtained is 0.981 > 0.05. Thus, H_0 is rejected and H_a is accepted. This result indicates that the final data on fine motor development in children is homogeneous.

Table 9. Results of the Paired Sample T-Test

Paired Samples Test

		Paired Differences					t	df	Significance	
					95% Confidence Interval of the Difference					
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			One-Sided p	Two-Sided p
Pair 1	pretest - posttest	-9.00000	3.87298	.93934	-10.99130	-7.00870	-9.581	16	<,001	<,001

The significant difference between the *pretest* and *posttest* results is shown by the results of the paired sample statistical analysis, which shows that the t-value (-9.581) is greater than the t-table (2.120) and the significance value (2-tailed) <0.001, which is less than 0.05. As a result, H_0 is rejected and H_a is accepted, indicating that ecoprint activities have a significant impact on the fine motor development of children at RA Al-Hidayah.

Activity Documentation

During the research, the researcher also documented various activities of the children while participating in *ecoprint* activities. This documentation serves to provide visual evidence of the children's involvement and active participation during the process. This document helps to illustrate the actual fine motor development of children during the activity, as well as providing supporting data for the research results.

Figure 1. The researcher introduces *ecoprint* activities to children

Figure 2. Children arranging leaves and flowers to form the desired pattern

Figure 3. Children press the fabric with a mallet filled with natural materials to transfer the colors and shapes of the natural materials onto the fabric bag

DISCUSSION

The results of the study show a significant increase in children's fine motor skills after participating in ecoprint activities. Based on the t-test, the t-count value = -9.581 is greater than the t-table = 2.120, so H_0 is rejected and Ha is accepted. This means that ecoprint activities have a significant effect on the fine motor development of 5-6-year-old children at RA Al-Hidayah Palembang. This improvement was evident in the indicators of arranging, grasping, pressing, flexibility, and precision of movement. Children who initially had difficulty sticking patterns, arranging leaves, and controlling the strength of their hands showed better skills and produced neater and more coordinated work after the treatment.

These results are in line with research conducted by Latifah & Ismet (2023) which explains that *ecoprint* batik activities have been proven to have an impact or influence on children's fine motor development. Additionally, research conducted by Alyannur & Sitorus (2024) states that ecoprint batik on leaves using the pounding technique has been proven to be very effective in developing the fine motor skills of early childhood at RA Bela Dina Binjai. This method not only successfully improves motor skills, but also provides holistic benefits in child development, including cognitive, creative, and environmental awareness aspects. Not only that, research conducted by (Martuty, 2024) shows that children's involvement in the *ecoprinting* process, from selecting leaves, arranging patterns, pressing, to transferring colors onto fabric, significantly improves their fine motor skills. These manipulative activities involve hand-eye coordination, finger strength, and fine motor control, which have a significant impact on improving children's fine motor skills.

This study shows that *ecoprinting* activities have been proven to improve the fine motor skills of early childhood. Through the stages of ecoprinting, such as selecting leaves, arranging patterns, pounding leaves, and pressing fabric with precision, children receive strong sensorimotor

stimulation, resulting in a gradual improvement in fine motor skills. This activity has been proven effective in improving children's manipulative abilities, including finger movement accuracy and grip strength (Ira Anggraeni, 2024) .

This study provides empirical contributions to the development of nature-based learning methods in early childhood education. *Ecoprint* techniques can serve as an alternative activity that is both enjoyable and educational for training children's fine motor skills. Theoretically, this research expands the understanding of the application of experimental methods in the context of early childhood education, particularly in assessing the influence of art-based activities on children's physical-motor aspects. Additionally, this research enriches the literature on the effectiveness of creative approaches in early childhood education in Indonesia.

Theoretically, the results of this study support the theory of child motor development, which states that fine motor skills can be improved through concrete activities that involve hand, finger, and vision coordination. Practically, ecoprinting activities can be applied as an alternative learning strategy in RA or kindergarten to develop children's basic skills. Teachers can use natural materials found around the school environment as learning media that are inexpensive, environmentally friendly, and attractive to children. Another implication is that this activity also fosters children's awareness of the environment through the use of natural materials.

This study has several limitations. First, the one-group pretest-posttest design did not use a control group, so a comprehensive comparison of the treatment effects could not be made. Second, the limited sample size of 17 children made it difficult to generalize the results of the study. Third, the study only lasted for seven meetings, so it was not yet possible to describe the long-term effects of ecoprinting on children's fine motor development ( ).

Future researchers are advised to use an experimental design involving a control group to obtain statistically stronger results. The sample size should be increased so that the research results are more representative. In addition, further research is needed to examine the effects of ecoprinting on other aspects such as children's cognitive, social-emotional, and creativity. Teachers and early childhood education institutions are expected to implement ecoprinting activities regularly as part of thematic learning so that children's fine motor development is more optimal and sustainable.

CONCLUSION

Based on the results of the study, it can be concluded that ecoprint activities have a significant effect on the fine motor development of 5-6-year-old children at RA Al-Hidayah

Palembang. Through these activities, children showed improvement in several important aspects, namely the ability to assemble, grasp, press, flexibility, and precision of movement. Children became more skilled and coordinated in using the small muscles of their hands and showed neater and more precise work results. Thus, ecoprint activities have been proven to be effective as a form of learning stimulation that can support the fine motor development of early childhood while also being an alternative creative learning medium in early childhood education environments.

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