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The Effectiveness of Matoa Skin Collage Media Based on Kampar Riau Local Wisdom in Enhancing Fine Motor Skills of Children Aged 5–6 Years

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ABSTRACT

This study was motivated by the suboptimal fine motor development of children aged 5–6 years and the limited use of local wisdom-based natural materials as learning media at RA Darul Taqwa, Karya Indah Village, Tapung District, Kampar Regency. The research aimed to examine the effect of matoa skin collage media on the fine motor development of children aged 5–6 years. A quantitative approach with a quasi-experimental non-equivalent control group design was employed, involving 26 children divided into experimental and control groups of 13 children each, selected through purposive sampling. Data were collected through observation and documentation, then analyzed using an independent sample t-test with SPSS 23. The results showed that the post-test mean score of the experimental group (26.07) was significantly higher than that of the control group (17.38), with a significance value of 0.000 (< 0.05) and a t-value of −18.094. This improvement occurred because the matoa skin collage activities trained finger coordination, fine muscle strength, and eye-hand coordination through enjoyable and contextual activities. Thus, matoa skin collage media has a positive and significant effect on the fine motor development of children aged 5–6 years and can serve as an alternative local wisdom-based learning medium that is economical and practical for RA/PAUD institutions.

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1. INTRODUCTION

Early childhood education is an effort to foster children's growth and development from birth to the age of six, including physical and non-physical aspects, in the golden age period that determines the quality of children's development in the next stage of life (Suryana & Hijriani, 2022). One of the aspects that needs serious attention at this time is fine motor skills, which refer to the ability to use small muscles in the fingers and hands, including grasping, doodling, cutting, and writing skills, and which form the basis for children's readiness to enter the next level of education (Sanenek et al., 2023). Fine motor delays remain a significant concern among preschool-aged children, with reported prevalence rates ranging from 12% to 18% in various countries, including Indonesia (Sari & Ferasinta, 2024; Amriani et al., 2024). If not adequately stimulated, these delays may affect children's writing readiness and learning concentration when they enter elementary school. This condition emphasizes the need for appropriate learning media to stimulate fine motor skills from an early age. In addition, fine motor delays also affect children's writing readiness and independence in daily activities (Hadiyanti et al., 2021).

Collage, which is the activity of attaching various materials to a drawing surface, is considered effective in stimulating children's fine motor skills because it trains precision and hand coordination (Anggraeni et al., 2021). Its effectiveness is supported by various studies using common materials such as paper and recycled materials, as well as natural materials such as eggshells, pineapple pulp, and loleba materials (Anggraeni et al., 2021; Akollo et al., 2023; Ismaniar et al., 2023; Saraaan & Ramadhani, 2024). Similar findings have also been reported in studies using loose parts materials and collages of other natural materials that consistently improved the eye-hand coordination of children aged 4–6 years (Alisah et al., 2022; Fathimah et al., 2022). In addition, research published in this journal has demonstrated that activities involving natural and local materials, such as weaving with banana leaves and using woven products, can significantly enhance fine motor skills in early childhood (Irmawati & Ichsan, 2021; Rusmaniah et al., 2022).

However, two main gaps are still found in these studies. First, the collage materials used are generally general or recycled materials and have not highlighted the local wisdom of a particular region, even though local wisdom-based media has been proven to provide more contextual learning for children (Maylita et al., 2025; Suryana & Hijriani, 2022). Second, most studies still use a one-group pretest-posttest design without a control group, so the observed improvement has the potential to be influenced by the child's maturation factor rather than solely by the treatment provided (Ariyanti & Damanik, 2023). Several studies that utilize natural materials or local wisdom show the potential of contextual media, but experimental designs with control groups remain relatively rare (Maylita et al., 2025; Pangestu et al., 2025).

The skin of the matoa fruit *(Pometia pinnata)* is a potential but untapped local natural material. This seasonal fruit leaves a large amount of thick, textured skin waste that has not been optimally processed (Tehuayo et al., 2023). Initial observations at RA Darul Taqwa in Karya Indah Village, Tapung District, Kampar Regency show that children's fine motor development is still low, characterized by most children who are not yet able to hold small

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objects with two fingers, grasp a pencil with a tripod grip, or open and close bottle caps properly, due to the lack of interesting and varied fine motor learning media in the institution. The use of matoa skin waste is in line with the principles of environment-based learning and the reduction of organic waste, while at the same time introducing children to local biodiversity. This condition is consistent with reports that many children aged 5–6 years are still at the immature stage of holding a pencil when media stimulation is less varied (Alisah et al., 2022; Irmawati & Ibrahim, 2023; Yanti, 2022).

2. METHODS

This study used a quantitative approach with a quasi-experimental design of the non-equivalent control group type. The subjects of the study were all children aged 5–6 years at RA Darul Taqwa, Karya Indah Village, Tapung District, Kampar Regency, totaling 26 children, divided into an experimental group (13 children, Al-Wahhab class) and a control group (13 children, Ar-Rashid class), selected using purposive sampling techniques. The selection of a non-equivalent control group design allows control of internal validity threats such as maturation, so that the differences that arise are more attributable to the treatment (Ariyanti & Damanik, 2023).

Data were collected through observation techniques using checklist sheets based on ten indicators of fine motor development, as well as documentation in the form of photos and videos during the learning process. Before being given treatment, both groups were given a pre-test; then the experimental group was given treatment in the form of matoa skin collage activities for six meetings, while the control group was not given this treatment, before finally both groups were given a post-test. Data were analyzed using an independent sample t-test assisted by the SPSS version 23 program, which was previously preceded by the Shapiro-Wilk normality test and Levene's Test for homogeneity of variance as prerequisites for the analysis. Indicators include: picking small objects, holding a tripod pencil, opening-closing bottles, sticking with precision, trimming edges, eye-hand coordination, finger pressure strength, wrist flexibility, independence, and precision in following patterns. The Shapiro-Wilk test was chosen because it is suitable for small samples ($n < 50$), while Levene's Test ensures the homogeneity of variance before the parametric t-test. The research design applied in this study is illustrated in **Figure 1.**

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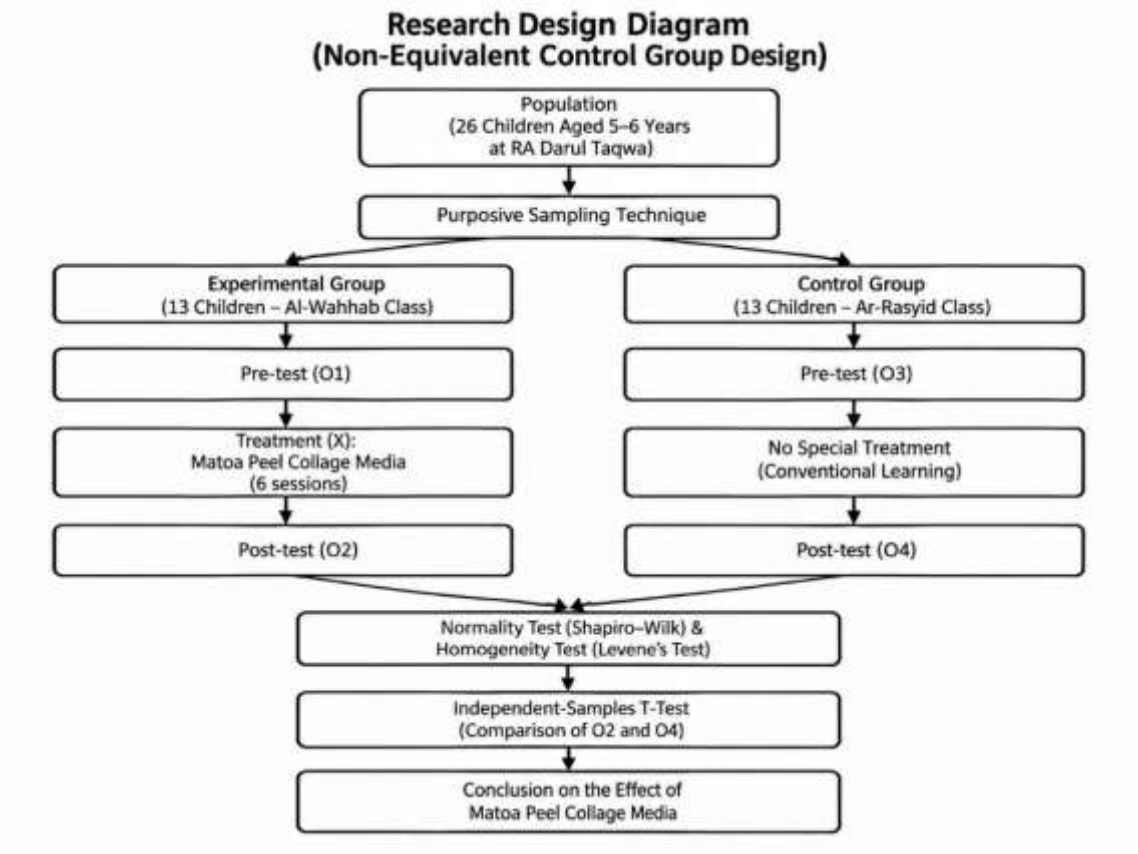


Figure 1. Non-Equivalent Control Group Design Research Chart

3. RESULTS AND DISCUSSION

3.1. Research Results

Pre-test data were collected from the experimental group and the control group totaling 13 children each. The recapitulation of the pre-test results is presented in **Table 1.**

Table 1. Recapitulation of Pre-test Scores for Children's Fine Motor Development

Statistics	Experimental Group	Control Group
Quantity	137	136
Average	10,53	10,46
Mode	11	10
Median	10,5	10,5
Maximum	12	12
Minimum	9	9

Source: Processed Data 2026

Based on Table 1, the pre-test scores of the experimental group and the control group were at a relatively balanced level, with an average difference of only 0.07 points. This shows that before being given treatment, the two groups had almost equal initial fine motor skills, making it worthy of further comparison at the data analysis stage after the treatment was administered.

After the experimental group was given treatment in the form of matoa skin collage activities for six meetings, the two groups were again given a post-test. The recapitulation of the post-test results is presented in **Table 2.**

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Table 2. Recapitulation of Post-test Scores of Children's Fine Motor Development

Statistics	Experimental Group	Control Group
Quantity	339	226
Average	26,07	17,38
Mode	26	17
Median	26	17
Maximum	28	19
Minimum	24	15

Source: Processed Data 2026

Based on Table 2, there was a significant difference between the experimental group and the control group after the treatment was administered. The experimental group obtained a total score of 339 with an average of 26.07, while the control group obtained a total score of 226 with an average of 17.38, resulting in an average difference between the two groups reaching 8.69 points. The maximum, minimum, mode, and median values in the experimental group were also consistently higher than in the control group, indicating that the distribution of scores in the experimental group was generally higher and more evenly after being treated using the matoa skin collage media.

Before the hypothesis test was carried out, a normality test was first carried out using the Shapiro-Wilk test to find out whether the pre-test and post-test data in both groups were normally distributed. The results of the normality test are presented in **Table 3.**

Table 3. Normality Test Results (Shapiro-Wilk)

Groups	Stages	Sig. (p)	Remarks
Control	Pre-test	0,182	Normal distribution
Control	Post-test	0,105	Normal distribution
Experiment	Pre-test	0,139	Normal distribution
Experiment	Post-test	0,133	Normal distribution

Source: Processed Data 2026

All significance values in the Shapiro-Wilk test for both pre-test and post-test data, both in the control group and in the experimental group, showed a number greater than 0.05. Thus, it can be concluded that the data of the results of the study in both groups are normally distributed, so that the analysis can be continued to the homogeneity test and the parametric hypothesis test.

Furthermore, a variance homogeneity test was carried out using Levene's Test to find out whether the variance of post-test data from the two groups was homogeneous. The results of the homogeneity test are presented in **Table 4**.

Table 4. Results of the Homogeneity Test (Levene's Test)

Testing Policy	Statistics Levene	df1	df2	Say.
By Mean	0,037	1	24	0,849
By Median	0,000	1	24	1,000
Based on Median (df adjusted)	0,000	1	24,000	1,000
Based on Trimmed Mean	0,047	1	24	0,830

Source: Processed Data 2026

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The results of the Levene test showed that all significance values, whether based on mean, median, median with degree of freedom adjustment, or trimmed mean, were above 0.05. Thus, the variance of data between the experimental group and the control group was homogeneous, so the basic assumptions for hypothesis testing with the t-test were met and further analysis could be carried out validly.

Hypothesis tests were carried out using independent sample t-tests to determine whether or not there was a significant difference in mean between the experimental group and the control group after being given treatment. The results of the independent sample t-test are presented in **Table 5.**

Table 5. Independent Sample T-Test Test Results

t	df	Sig. (2-tailed)	Average Difference	95% CI Lower Limit	95% CI Upper Limit
-18,094	24	0,000	-8,692	-9,684	-7,701

Source: Processed Data 2026

Based on Table 5, a calculated t-value of -18.094 was obtained with a degree of freedom (df) of 24 and a significance value (2-tailed) of 0.000. Because the significance value was less than 0.05, H0 was rejected and Ha was accepted, which means that there was a significant difference in mean between the experimental group and the control group. This result is also supported by the group statistics, namely the average post-test of the control group of 17.38 and the experimental group of 26.08. Thus, it can be concluded that the use of matoa skin collage media has a significant effect on the improvement of fine motor skills of children aged 5-6 years at RA Darul Taqwa, Karya Indah Village, Tapung District, Kampar Regency. Documentation of the collage activity is shown in **Figure 2,** which illustrates children attaching pieces of matoa fruit skin during the learning process.



Figure 2. Children attaching a collage of matoa fruit skin

3.2. Discussion

The results of the study prove that the use of matoa skin collage media has a positive and significant effect on the fine motor development of children aged 5–6 years at RA Darul Taqwa, Karya Indah Village, Tapung District, Kampar Regency, as shown by a significance value of 0.000 (< 0.05) in the independent sample t-test. These findings strengthen empirical evidence from various studies that show the effectiveness of collage activities in stimulating

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fine motor skills, both with paper materials, loose parts, and natural materials (Alisah et al., 2022; Fathimah et al., 2022).

These findings further support previous research demonstrating that collage activities can effectively stimulate fine motor skill development in early childhood, as evidenced by significant improvements among children aged 4–6 years at Al-Ashfiya Kindergarten in Malang City (Fadya et al., 2024). Similarly, Ristyaningrum & Indri (2024) found positive effects through culture-based collage media. Furthermore, collage activities have proven effective in improving fine motor skills at the Harapan Ummat early childhood education center (Ariyanti & Damanik, 2023). Other studies show that activities involving natural and local materials, such as weaving banana leaves and purun weaving, can improve fine motor skills in children aged 4–6 years (Irmawati & Ichsan, 2021; Rusmaniah et al., 2022). The main difference in the present study lies in the use of a control group design and the use of matoa fruit skin as collage materials based on local wisdom of Kampar Riau, which have not been examined in these previous studies.

The significant improvement in the experimental group can be explained by several main factors. First, the activity of repeatedly picking, gluing, and arranging the skin of the matoa trains finger coordination, fine muscle strength, and eye-hand coordination. Second, the thick and distinctive texture of the matoa skin provides a sensory stimulus that is different from collage materials in general, so that children obtain a richer tactile experience during the process of sticking and composing. Third, the enjoyable nature of the activities increases children's motivation and the frequency of practice, consistent with dynamic systems theory which posits that children's motor skills are built through perception of the environment that encourages repeated movement (Sanenek et al., 2023). Fourth, the role of the teacher's scaffolding during six meetings also determines the success of the intervention; this gradual assistance helps children achieve their abilities within their zone of proximal development, so that children who initially have difficulty attaching materials precisely become able to complete collage patterns independently. The unique texture and shape of matoa skin further stimulate sensory exploration and increase children's engagement, in line with findings on natural-material activities (Irmawati & Ibrahim, 2023).

The novelty value of this research lies in two aspects: the use of a control group design that ensures that the improvement in children's abilities is really caused by treatment and not by maturation factors, and the use of matoa fruit skin as collage materials based on local wisdom which have been wasted as seasonal waste and have never been studied in previous research. In addition, this research also contributes to the literature on the use of local fruit waste as a cheap and sustainable learning medium.

In general, the improvement of children's fine motor skills in the experimental group was seen in three main areas: strengthening the coordination of fingers and fine muscles in holding and manipulating small objects; improving hand movement control and eye-hand coordination that supports pre-writing readiness; and increasing children's independence in daily activities such as using eating utensils and opening bottle caps. These three areas are also supported by previous research demonstrating that collage activities using natural materials can promote literacy readiness and motor independence in early childhood

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(Ismaniar et al., 2023; Sumarayanti et al., 2023). Thus, matoa skin collage media is not only effective in stimulating children's fine motor skills, but also offers solutions for the use of local natural materials that are cheap, easy to obtain, and environmentally friendly for learning in early childhood education settings.

4. CONCLUSION

This study concluded that matoa skin collage media had a positive and significant effect on the fine motor development of children aged 5-6 years in RA Darul Taqwa, Karya Indah Village, Tapung District, Kampar Regency. The significant difference in the mean post-test between the experimental group and the control group (26.07 versus 17.38; p = 0.000) proved the effectiveness of the treatment given. The novelty of the research lies in the use of matoa skin waste as a collage medium based on local wisdom that has never been studied before, as well as the use of control group design that strengthens the validity of the findings. This media offers an economical, easy to obtain, fun, and contextual learning alternative so that it is feasible to apply in RA and PAUD institutions. These results support practical recommendations for RA/PAUD teachers to integrate locally sourced natural materials as an economical, contextual, and fun alternative to specific motor stimulation media. Follow-up research is recommended to test the effectiveness of similar media at a younger age or with true-experimental designs.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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