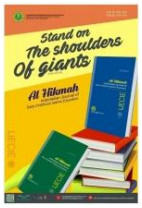
AL HIKMAH: INDONESIAN JOURNAL OF EARLY CHILDHOOD ISLAMIC EDUCATION
ISSN (P): 2550-2200, ISSN (E): 2550-1100,
VOL. 9 (2), 2025, PP. 287 – 297
https://journal.uaindonesia.ac.id/index.php/ijecie



Improving Children's Fine Motor Skills Through Natural Material Stringing Activities in Group A of Berlian Nupabomba State Kindergarten

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ARTICLE INFO

Article history:
Received September 21, 2025
Revised September 24, 2025
Accepted October 15, 2025
Available online December 1, 2025

Keywords:
Fine Motor Skills, Early Childhood, Natural Materials.

A B S T R A C T

Early childhood is known as a golden period of child development that requires appropriate stimulation so that all aspects of development, especially fine motor skills, can develop optimally. In reality, the development of fine motor skills in children is not optimal due to teachers' limitations in the use of media and innovative learning methods. The purpose of this study was to develop children's fine motor skills through stringing activities that utilize natural materials, namely banana leaves. This study applied the Classroom Action Research (CAR) method with two cycles, which included the planning, implementation, observation, and reflection stages. As research subjects, 20 children from group A were selected, consisting of 8 boys and 12 girls. Data collection was carried out through observation, interviews, and documentation, then analyzed qualitatively through the stages of reduction, presentation, and drawing conclusions. The results of the study showed a significant increase in children's fine motor skills, especially in aspects of speed, flexibility, and finger strength. Stringing activities with banana leaves were proven to be able to provide a fun and meaningful learning experience, as well as train children's focus and perseverance. Based on these results, it can be concluded that the use of natural materials in creative activities is effective as a learning strategy in early childhood education. The contribution of this research lies in strengthening empirical evidence regarding the effectiveness of nature-based media as an innovative alternative that is environmentally friendly while also supporting the development of fine motor skills in early childhood.

INTRODUCTION

In early childhood, children experience rapid growth and development, therefore appropriate stimulation is needed so that their motor skills can develop optimally and not be neglected (Agustin & Sari, 2023). According to Haywood and Getchell (2005), motor development is a process of gradual and continuous change in a child's motor skills as they grow older. At this stage, top of form children are in a crucial phase which is the foundation for the development of various aspects, including physical, cognitive, language, social, emotional, formation of self-concept, discipline, and independence (Indraswari, 2020). In this case, the school plays a role as an institution that strives to carry out a values-oriented educational process, so that it can support the overall growth and development of children (Harun, Jaedun, Sudaryanti, & Manaf, 2020). Early childhood is often referred to as the "golden age" because this period is a time of significant progress and plays a crucial role in

determining the direction of a child's development in subsequent stages. Therefore, the stimulation provided during this period will significantly influence a child's readiness to face subsequent stages of education and daily routines. Gallahue and Ozmun (2006) explain that children need a variety of physical activities appropriate to their age and developmental stage to help improve and support their optimal development. In this context, parental and school participation plays a crucial role in preparing children for primary education (Lumaurridlo, Retnawati, Kistoro, & Putranta, 2021). Motor development training for children, including both gross and fine motor skills, is crucial because it is closely linked to a child's physical condition and intellectual abilities. Gross motor skills generally develop more quickly because they involve large body movements, while fine motor skills require more intensive training through activities that require coordination of the small muscles in the fingers and wrists. Therefore, appropriate stimulation is necessary for optimal motor skills (Az-Zahra, Fauzi, & Andriani, 2022).

Fine motor skills are abilities that involve the integration of kinesthetic movement, hand-eye coordination, visual motor skills, and a high level of coordination and control of precise movements (Feder & Majnemer, 2007). Children's motor skills can develop better if they receive various stimuli from their surroundings and are given the freedom to move freely from an early age (Yılmaz & Sicim-sevim, 2020). Children's fine motor skills are abilities that involve coordination between small muscles, eyes, and hands in an integrated and highly precise manner, the development of which is greatly influenced by stimulation and the child's opportunity to move freely in their environment from an early age.

Fine motor skills are an important aspect that contributes significantly. These skills are crucial in developing a child's overall personality and also support their readiness to learn. Fine motor skills help children adapt to the school environment and support academic skills such as writing, drawing, and cutting, as well as artistic skills such as painting and stringing (Indarti, Wijayanti, & Koesmadi, 2023). In other words, fine motor skills are the gateway for children to master various skills that become increasingly complex over time. Therefore, fine motor stimulation should begin at an early age, considering that it is during this phase that the process of skill formation takes place significantly and is valuable (Hadiyanti, Elan, & Rahman, 2021).

However, the reality on the ground shows that fine motor development in early childhood has not developed optimally. This is evident from the results of the researcher's initial observations in Group A of Berlian Nupabomba State Kindergarten, which found problems with children being unable to participate in learning efficiently. One of the causes is that educators have not utilized educational play tools optimally, coupled with the use of inappropriate media and learning methods. This has an impact on delays in children's skills in aspects of fine motor skills, such as finger speed, movement flexibility, and grip strength. This problem indicates that teachers still need innovation and more effective learning strategies so that children can improve their fine motor skills optimally.

Novitasari also revealed that learning space arrangement based on the Brain-Compatible Classroom Teaching (BCCT) approach plays a significant role in encouraging children’s manipulative activities. A learning environment organized into activity centers allows children to explore, touch, sort, and manipulate real objects, which are essential for

stimulating fine motor development. Thus, the use of natural materials such as banana leaves in stringing activities is highly aligned with the principles of BCCT, which emphasize natural exploration (Nurul Novitasari, 2018).

In addition, Novitasari's research on entrepreneurship skills among early childhood teachers shows that teachers have great potential to develop creative learning media based on local resources, including natural materials. Teachers' creativity in utilizing inexpensive, easily accessible, and environmentally friendly materials supports innovative learning activities that stimulate children's fine motor skills. This serves as an important foundation for teachers to introduce stringing activities using banana leaves as an alternative medium that effectively supports fine motor development (N. Novitasari, 2019).

Various previous studies have emphasized the importance of natural material-based activities in supporting children's skills. One relevant activity is stringing, which involves arranging or stringing objects together to form a unified whole (Erwinda, Hartati, & Saleh, 2024). This activity requires children to move their fingers in a coordinated manner, thereby strengthening fine motor skills. Research shows that stringing banana leaves involves fine finger and wrist movements, which indirectly also trains children's focus and perseverance (Mulya & Fitriyani, 2024). Besides stringing, other nature-based activities such as weaving have also been shown to improve fine motor skills. Research conducted (Agustin & Sari, 2023) The findings at RA Al Amanah Kuningan in the 2023–2024 academic year further confirmed this. The findings showed an improvement in children's fine motor skills through stringing activities. The learning completion rate, which was initially only 40% in cycle I, increased to 85% in cycle II. These findings confirm that stringing activities using natural materials have great potential as an effective learning strategy for developing fine motor skills in early childhood.

However, a literature review reveals a significant research gap that needs to be addressed. Most studies only discuss stringing activities in general or using a variety of natural materials, without specifically highlighting specific natural materials that have significant potential and are easily accessible. However, the use of specific materials, such as banana leaves, has rarely been studied in depth. Banana leaves are a natural material that is abundant in the environment, inexpensive, environmentally friendly, and easy to shape, making them a potential innovative learning medium. This gap is what this study seeks to address by examining the extent to which the use of banana leaves in stringing activities can improve the fine motor skills of early childhood. Based on these issues, this study proposes a solution through the implementation of stringing activities using natural materials, namely banana leaves, as a creative, innovative, and enjoyable learning alternative. In addition to improving children's fine motor skills, this activity also encourages teachers to be more creative in designing, preparing, and using environmentally-based teaching materials (Akollo, Tarumasely, & Surur, 2023). This study aims to reveal the extent to which stringing banana leaves can help improve the fine motor skills of preschool children. This research is expected to make a significant contribution to the development of early childhood education, for teachers, principals, and other relevant parties. This research is expected to not only enrich the practice of nature-based creative learning but also provide alternative solutions to address obstacles to children's fine motor development in the field.

METHOD

This type of research is Classroom Action Research (CAR), which aims to improve children's fine motor skills through coconut pulp collage activities. This study uses the Kemmis and McTaggart model, which consists of four main stages: planning, acting, observing, and reflecting. The research was conducted in two cycles, with each cycle covering all four stages repeatedly to refine and improve the results of the actions in the next cycle.

The research subjects consisted of 20 children in group A, with 8 boys and 12 girls, all of whom were classically involved in the class. Data were collected qualitatively through observation, interviews, and documentation. Observations were conducted using assessment sheets to assess children's fine motor skills, including aspects of accuracy, flexibility, and finger strength. Interviews were conducted with the class teacher to obtain additional information regarding the learning process, obstacles encountered, and responses to the collage activity, while documentation was used to complete the data in the form of child attendance records, activity photos, and recording of facilities and infrastructure that support the implementation of learning.

The research instruments included observation sheets, interview guidelines, and activity documentation formats. The data in this study were analyzed using the Miles and Huberman qualitative analysis model, which includes three stages: data reduction, data presentation, and conclusion drawing in each cycle to determine the development of children's fine motor skills after the coconut pulp collage activity was implemented.

The tools used in this study included observation sheets, interview guides, cameras, and writing utensils. The research materials consisted of coconut pulp, drawing paper, glue, and scissors. Coconut pulp was chosen because it is readily available in the local environment, environmentally friendly, and effective as a fun, creative learning medium that stimulates children's fine motor development.

RESULTS

The research was conducted in Group A of Berlian Nupabomba State Kindergarten for three weeks, from July 16 to August 9, 2025. The focus of the research was to improve children's fine motor skills through natural material stringing activities assessed from three aspects: finger speed, finger flexibility, and finger strength. The learning activities took place in two cycles, each cycle consisting of four meetings.

1.1 Pre-Action

In the first week, researchers began their research activities by observing the fine motor skills of children in Group A of Berlian Nupabomba State Kindergarten. Observations focused on three aspects of development: finger speed, finger flexibility, and finger strength. These observations aimed to obtain an initial overview of the children's abilities before they were given learning activities through stringing natural materials.The results of observations at the pre-action stage are presented in the following table.

Table 1. Pre-Action Observation Results

Category	Observed activities						%
	A		B		C		Average
	F	%	F	%	F	%	

Very Well Developed (BSB)	**0**	**0**	**0**	**0**	**1**	**5**	**1.67**
Developing as Expected (BSH)	**4**	**20**	**2**	**10**	**2**	**10**	**13.33**
Starting to Grow (MB)	**4**	**20**	**3**	**15**	**4**	**20**	**18.33**
Not Yet Developed (BB)	**12**	**60**	**15**	**75**	**13**	**65**	**66.67**
Amount	**20**	**100**	**20**	**100**	**20**	**100**	**100**

Information :
A: Finger Speed Aspect
B: Aspect of Finger Flexibility
C: Finger Strength Aspect

Based on the findings in the table, the level of children's fine motor mastery is relatively low. It can be seen that children's fine motor skills are still predominantly in the undeveloped phase, namely 66.67%. The average achievement at the very well developed stage is only 1.67%, developing according to expectations is 13.33%, and starting to develop is 18.33%. In detail, in the aspect of finger speed, 60% of children are included in the undeveloped stage, in the aspect of finger flexibility, it even reaches 75% at the same stage, while in the aspect of finger strength, 65% of children have not developed. These data indicate that before the action was taken, the majority of children had not shown optimal fine motor development so that the implementation of cycle I was necessary.

1.2 Cycle I

The development of children's fine motor skills through stringing activities was observed again in the second week. The results are shown in the following table.

Table 2. Observation Results of Cycle I

Category	**Observed activities**						**% Average**
	A		**B**		**C**		
	F	**%**	**F**	**%**	**F**	**%**	
Very Well Developed (BSB)	**2**	**10**	**3**	**15**	**2**	**10**	**11.67**
Developing as Expected (BSH)	**8**	**40**	**6**	**30**	**7**	**35**	**35**
Starting to Grow (MB)	**4**	**20**	**4**	**20**	**4**	**20**	**20**
Not Yet Developed (BB)	**6**	**30**	**7**	**35**	**7**	**35**	**33.33**
Amount	**20**	**100**	**20**	**100**	**20**	**100**	**100**

Information :
A: Finger Speed Aspect
B: Aspect of Finger Flexibility
C: Finger Strength Aspect

Table 2 shows that children's fine motor development began to improve in cycle I compared to pre-action. The average achievement in the very well developed stage was 11.67% and developing as expected was 35%, while the beginning to develop stage was 20% and not yet developed was still quite high at 33.33%. This means that more than half of the

children, namely 46.67%, had achieved development according to the target, although there were still one-third of children who were not yet developed. These results emphasize the need to continue the action in cycle II to optimize the development of children's fine motor skills.

1.3 Cycle II

Entering the third week, researchers again conducted observations to assess children's fine motor skills through natural material stringing activities at Berlian Nupabomba State Kindergarten. Overall, the observations indicated progress in line with the teachers' expectations. Complete data from the Cycle II activity observations are presented in the table below.

Table 3. Cycle II Observation Results

Category	Observed activities						% Average
	A		B		C		
	F	%	F	%	F	%	
Very Well Developed (BSB)	16	80	15	75	15	75	76.67
Developing as Expected (BSH)	2	10	3	15	3	15	13.33
Starting to Grow (MB)	1	5	1	5	1	5	5
Not Yet Developed (BB)	1	5	1	5	1	5	5
Amount	**20**	**100**	**20**	**100**	**20**	**100**	**100**

Information :
A: Finger Speed Aspect
B: Aspect of Finger Flexibility
C: Finger Strength Aspect

Based on the table above, the results of observations in cycle II show a greater improvement than in cycle I. The average achievement of children in the Very Well Developed stage reached 76.67%, while Developing According to Expectations was 13.33%. Meanwhile, the Beginning to Develop and Not Yet Developed stages only left 5% each. Thus, more than 90% of children are already in the expected category, so it can be concluded that the actions of cycle II have been proven to be able to improve children's fine motor skills through stringing activities using natural materials.

To provide a clearer picture of the improvement in children's fine motor skills from the pre-action stage to cycle II, the following is a comparative graph of the average percentage of development in each category.

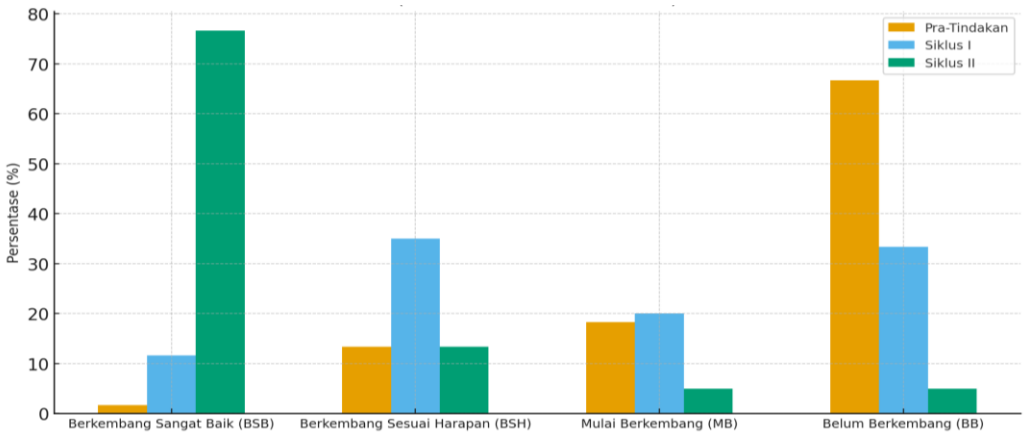

Figure 1. Comparison Chart of Presentation of Each Action

When compared to the initial conditions (pre-action), the increase in children's fine motor skills showed very significant results. The Very Well Developed (BSB) category increased from 1.67% to 76.67%, with an absolute increase of 75 percentage points and an effect size value (Cohen's h) of 1.87, which is included in the very large effect category. The Not Yet Developed (BB) category decreased from 66.67% to 5%, with a decrease of 61.67 percentage points and an effect size value of -1.46, which also shows a large effect on reducing the proportion of children who have not developed. Meanwhile, the Developing According to Expectations (BSH) category was relatively stable at 13.33%, and Starting to Develop (MB) decreased from 18.33% to 5% with an effect size value of -0.43, which is included in the small to medium effect category. Overall, the proportion of children achieving optimal development (BSB + BSH) increased from 15% to 90%, resulting in an average increase of 75%. Based on the interpretation of the effect size value, the activity of stringing natural materials had a very strong influence on improving the fine motor skills of group A children at Berlian Nupabomba State Kindergarten.

DISCUSSION

Based on the research results, children's fine motor skills were proven to increase significantly with stringing activities using natural materials, both from pre-action, cycle I, to cycle II. In pre-action, the majority of children were still classified as Not Developing in the three observed aspects, namely speed, flexibility, and finger strength. Quantitatively, as many as 66.67% of children were in the Not Developing category, while only 1.67% had reached Very Well Developed. This condition indicates that children are not yet accustomed to using small hand muscles in a directed manner because previously they had been more involved in passive activities such as watching and playing freely without structured instructions. According to Piaget's developmental theory, early childhood is in the preoperational stage which requires concrete and repeated stimulation for optimal motor skills development. This is in line with the findingsHusaen (2024)which concluded that the development of fine motor skills in early childhood tends to be less than optimal without concrete activity-based stimulation.

In cycle I, through the implementation of natural material stringing activities, significant improvements were seen. The percentage of children achieving Very Good

Development increased to 11.67%, and Developing as Expected to 35%, while the Not Developing category decreased to 33.33%. This data indicates that almost half of the children have begun to show expected development, although some still need intensive guidance. This improvement is comparable to research Jumadi (2025) which revealed that the activity of stringing beads can stimulate children's hand-eye coordination. In addition, research Suryana et al. (2024) strengthens this finding through the results that motor stimulation through creative play has a positive influence on the strength and endurance of children's finger movements.

Cycle II showed research results with very rapid improvement. Children who reached the Very Well Developed category increased drastically to 76.67%, while the Not Developed category decreased sharply to 5%, with an effect size (Cohen's h) of 1.87, indicating a very large effect. This rapid improvement occurred because children had undergone a motor adaptation process, where hand and finger coordination became stronger and movements became more efficient. Children also understood the pattern of stringing activities. This finding is consistent with research Azizah (2023), Baharun et al. (2020), And Nurlina & Marni (2024) which emphasizes that natural material-based activities are more meaningful because they provide multisensory experiences, thus facilitating the development of children's motor skills.

If viewed more broadly, the results of this study also support other studies that have found the benefits of stringing or similar activities in developing children's fine motor skills, such as research Aisyah et al. (2023), Karyadi et al. (2024), And Hasbin et al. (2021). The similarity of these results reinforces the research findings that simple creativity-based motor activities are effective in improving children's skills.

However, there are also studies that show different results. For example, research conducted by Hendraningrat & Fauziah (2021) emphasized that stimulation through the use of digital learning media in developing fine motor skills in early childhood is more engaging than conventional activities, because digital media presents interactive visualizations that can motivate children to focus more. Furthermore, according to the findings Saadah & Windiarti (2023), the use of digital media is an alternative learning activity while playing which is fun and in line with current developments, while some children easily get bored.

From this comparison, it can be concluded that the effectiveness of stringing activities using natural materials is greatly influenced by the child's readiness, teacher creativity, and consistency of implementation. The main contribution of this study is to strengthen the evidence that using natural materials as stringing media is not only environmentally friendly but also able to stimulate the speed, flexibility, and strength of children's fingers in a more natural and enjoyable way. Furthermore, this study provides an alternative strategy for learning fine motor skills that can be adapted by teachers in various early childhood education units using local resources.

The limitations of this study include its focus on a single school with a limited number of children, so the generalizability of these findings requires testing on a broader scale. Furthermore, this study only compared two cycles without examining the long-term effects of natural material stringing on children's development. Therefore, further research could be directed at testing long-term effectiveness, comparing it with other media (both digital and

conventional), and examining the relationship between fine motor development and children's cognitive and social-emotional abilities.

Overall, the results of this study successfully answered the research question, demonstrating that stringing natural materials is effective in improving fine motor skills in early childhood. These findings also enrich the body of early childhood education knowledge by providing an alternative nature-based approach and encouraging further research to test its effectiveness on a wider scale and in a wider range of contexts.

CONCLUSION

The findings of this study confirm that stringing activities with natural materials can significantly improve fine motor skills in early childhood in terms of speed, flexibility, and finger strength, as evidenced by the increase in results from pre-action to cycle II. This increase is in line with the theory of fine motor development which emphasizes the importance of small muscle coordination through manipulative and repetitive activities. Stringing activities with natural materials have been shown to support sensorimotor stimulation and hand-eye integration, making them an effective form of neuromotor training. Theoretically, these results strengthen the foundation that nature-based media supports children's development through meaningful multisensory experiences. Practically, early childhood education teachers are advised to utilize stringing activities with natural materials such as seeds, leaves, or small pieces of wood as a creative and environmentally friendly learning alternative. The limitations of this study lie in the context of only one school with a limited number of children, so the results cannot be generalized. Further research is recommended to test the effectiveness of this activity in the long term and on a wider sample.

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