
**Improving Kindergarten Children's Fine Motor Development through Montessori
Practical Life Activities Integrated with Project-Based Learning**

Norhasan* and Muhammad Dani Wahyudi

Universitas Lambung Mangkurat, Banjarmasin, Indonesia

[*sanahhasanahh22@gmail.com](mailto:sanahhasanahh22@gmail.com)

ABSTRACT

Fine motor competence is a foundational component of early childhood development because it supports children's readiness to participate in drawing, writing, manipulating learning materials, self-care routines, and early mathematical activities. This classroom action research aimed to describe teacher activity, children's learning activity, and children's fine motor development after the implementation of Montessori Practical Life activities integrated with Project-Based Learning (PjBL). The study was conducted in a kindergarten class in Banjarmasin, Indonesia, involving 14 Group A children, consisting of eight boys and six girls. The action was implemented in two cycles across four meetings. Data were collected through observation sheets, interviews, documentation, and a fine motor development rubric, and were analyzed descriptively using percentage achievement and category interpretation. The findings indicated continuous improvement across all observed dimensions. Teacher activity increased from 50% in Meeting 1 to 96% in Meeting 4, children's learning activity increased from 14% to 93%, and classical fine motor development increased from 36% to 100%. The results suggest that combining Montessori Practical Life and PjBL can create concrete, meaningful, child-centered, and product-oriented learning experiences that stimulate hand-eye coordination, finger control, concentration, independence, collaboration, and task completion. Nevertheless, the findings should be interpreted cautiously because the study involved one small class and did not use a comparison group. The study contributes practical classroom evidence on how everyday-life Montessori activities can be strengthened through project-based learning to support fine motor development in early childhood education.

Keywords: Classroom Action Research; Early Childhood Education; Fine Motor Development; Montessori Practical Life; Project-Based Learning

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INTRODUCTION

Early childhood education has a strategic role in preparing children for later learning because the first years of life are characterized by rapid growth in physical, cognitive, socio-emotional, language, and self-regulation domains. In this period, children learn most effectively through concrete experiences, purposeful play, direct manipulation of objects, and social interaction with teachers and peers. Indonesian early childhood classrooms, therefore, need learning designs that are not only enjoyable but also developmentally appropriate and measurable. In the context of kindergarten education, fine motor stimulation is particularly important because many classroom routines require children to coordinate small muscles of the hands and fingers with visual attention, body posture, and concentration ([Cameron et al., 2012](#); [Grissmer et al., 2010](#); [McClelland & Cameron, 2019](#)).

Fine motor skills should not be viewed merely as technical hand movements. They are connected with children's ability to cut, paste, draw, trace, button, pour, transfer objects, hold



writing tools, arrange materials, and complete self-care activities independently. Research has shown that fine motor skills are related to school readiness and early academic achievement, especially because children use their hands to represent letters, numbers, patterns, quantities, and spatial relations ([Dinehart, 2015](#); [Li et al., 2025](#); [Pitchford et al., 2016](#)). When children have limited opportunities to practice these skills, they may experience difficulty in participating actively in learning tasks, maintaining attention, completing worksheets, producing art products, or engaging in early literacy and numeracy activities.

Montessori Practical Life provides a relevant pedagogical foundation for fine motor stimulation. In Montessori education, Practical Life activities include everyday actions such as pouring, spooning, transferring, sweeping, folding, washing, cutting, buttoning, and arranging materials. These activities are designed not only to train independence but also to support order, concentration, hand-eye coordination, and control of movement ([Marshall, 2017](#); [Rule & Stewart, 2002](#)). The Montessori prepared environment allows children to interact with concrete materials, repeat meaningful tasks, correct mistakes, and gradually move toward greater autonomy. This approach is consistent with evidence that Montessori education can support academic and nonacademic outcomes when implemented with attention to fidelity, prepared materials, and child-centered engagement ([Demangeon et al., 2023](#); [Lillard & Else-Quest, 2006](#); [Lillard et al., 2017](#); [Randolph et al., 2023](#)).

Project-Based Learning (PjBL) can strengthen Montessori Practical Life by giving children a clear goal, a meaningful product, and opportunities to investigate, collaborate, make decisions, and reflect on what they have created. PjBL is widely described as an active, student-centered approach characterized by autonomy, constructive investigation, collaboration, communication, artifact production, and reflection ([Bell, 2010](#); [Blumenfeld et al., 1991](#); [Guo et al., 2020](#); [Kokotsaki et al., 2016](#)). Although PjBL is frequently discussed in primary, secondary, and higher education contexts, its core principles are also relevant to early childhood classrooms when projects are simplified, concrete, play-based, and supported by teacher scaffolding.

Preliminary observation in one kindergarten in Banjarmasin showed that children's activity and creativity in fine motor learning were still low. Some children had difficulty coordinating hand movements, completing fine motor tasks, and showing sustained attention during activities. Teacher stimulation was also not yet optimal because learning activities tended to be less varied and did not consistently provide repeated, meaningful, and concrete fine motor experiences. If this situation continues, children may not develop fine motor competence according to their developmental stage, and this may affect later participation in school activities. This problem indicates the need for a classroom intervention that combines the strengths of everyday-life fine motor activities and project-based engagement.

Previous Indonesian classroom studies have discussed Montessori activities, fine motor stimulation, and project-based learning separately, but the integration of Montessori Practical Life and PjBL for kindergarten fine motor development still needs stronger empirical documentation. The novelty of this study lies in designing Practical Life activities as child-centered projects, so children are not only practicing movements but also working toward concrete products and solving simple classroom problems. Therefore, this study aimed to describe teacher activity, children's activity, and children's fine motor development during the implementation of Montessori Practical Life activities integrated with Project-Based Learning in a kindergarten classroom in Banjarmasin.

METHODS

This study used classroom action research with a descriptive qualitative orientation supported by quantitative percentage analysis. Classroom action research was selected because the study focused on solving a practical classroom problem through cyclical planning, action, observation, and reflection. The design enabled the teacher and researcher to identify weaknesses in each meeting, refine the next learning activity, and evaluate whether the intervention improved teacher performance, children's learning activity, and children's fine motor development.

The study was conducted in a kindergarten in Banjarmasin, Indonesia. The participants were 14 children in Group A, consisting of eight boys and six girls. The class was selected because preliminary observation indicated that several children still needed stronger stimulation in fine motor activities. The identity of the school and children was anonymized to protect participant privacy.

The intervention was implemented in two cycles across four meetings. Each meeting integrated Montessori Practical Life activities with PjBL stages. The Practical Life component involved concrete activities requiring controlled hand and finger movements, such as transferring, pouring, arranging, cutting, pasting, and completing simple classroom products. The PjBL component guided children to understand the task, explore materials, work individually or in small groups, produce a simple product, and share the result. The teacher acted as facilitator by preparing materials, modeling the activity, giving short instructions, guiding children who needed support, and encouraging reflection after the activity.

Data were collected using observation sheets for teacher activity, observation sheets for children's learning activity, a fine motor development rubric, interviews, and documentation. Teacher activity was observed based on preparation, classroom organization, delivery of instructions, facilitation, scaffolding, use of media, feedback, and reflection. Children's activity was observed based on attention, participation, enthusiasm, cooperation, persistence, and task completion. Fine motor development was assessed using indicators related to hand-eye coordination, finger control, accuracy of movement, ability to manipulate materials, and completion of the assigned product.

The data were analyzed descriptively by calculating the percentage of achievement in each meeting and interpreting the results according to predetermined categories. The action was considered successful if teacher activity reached the Very Good category, children's activity reached the Active or Very Active category, and children's fine motor development reached at least the Developing as Expected category. Reflection was conducted after each meeting to identify aspects that needed improvement in the next meeting.

RESULT AND DISCUSSION

The classroom action research showed continuous improvement in teacher activity, children's learning activity, and children's fine motor development across the four meetings. The improvement can be seen in Tables 1-3 and Figure 1.

Table 1 Teacher Activity across the Four Meetings

Meeting	Percentage	Category
1	50%	Fair
2	60%	Good
3	82%	Good
4	96%	Very Good

Teacher activity increased continuously from 50% in Meeting 1 to 96% in Meeting 4. This indicates that reflection after each meeting helped the teacher improve classroom management, instruction, use of learning materials, and facilitation of children's participation.

Table 2 Children's Learning Activity across the Four Meetings

Meeting	Percentage	Category
1	14%	Less Active
2	43%	Moderately Active
3	86%	Active
4	93%	Very Active

Children's learning activity also increased across the meetings. The percentage rose from 14% in Meeting 1 to 93% in Meeting 4, showing that children became more engaged, more willing to manipulate materials, and more persistent in completing project tasks.

Table 3 Classical Achievement of Children's Fine Motor Development

Meeting	Percentage	Category
1	36%	Beginning to Develop
2	71%	Beginning to Develop
3	86%	Developing as Expected
4	100%	Developing Very Well

The classical achievement of children's fine motor development improved from 36% in Meeting 1 to 100% in Meeting 4. The greatest improvement occurred after the teacher refined the activity sequence, provided more concrete demonstrations, and gave children repeated opportunities to practice with the materials. Figure 1 shows a parallel upward trend among teacher activity, children's activity, and fine motor development. The pattern suggests that improvement in teacher facilitation was followed by higher child engagement, and higher engagement was accompanied by better fine motor achievement.

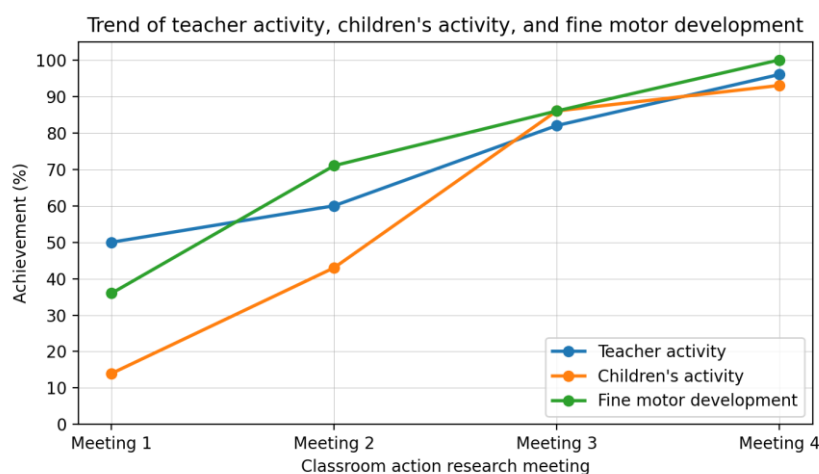


Figure 1 Trend of teacher activity, children's activity, and fine motor development

The findings demonstrate that the integration of Montessori Practical Life activities and Project-Based Learning was associated with consistent improvement in teacher activity, children's activity, and children's fine motor development. The improvement occurred gradually rather than instantly, which is typical in classroom action research because each meeting functions as a cycle of diagnosis, implementation, reflection, and refinement. In the first meeting, children were still adapting to the activity structure and some of them needed more guidance to understand how to manipulate the materials. In later meetings, the teacher improved the clarity of instructions, provided more concrete demonstrations, organized materials more effectively, and gave children more opportunities to repeat the activity. This process explains why the highest achievement appeared in the fourth meeting.

The increase in teacher activity from 50% to 96% indicates that the success of child-centered learning still depends strongly on teacher competence. Montessori and PjBL are often described as child-centered approaches, but child-centered learning does not mean that the teacher becomes passive. Instead, the teacher must design a prepared environment, select materials that match children's developmental level, introduce procedures clearly, observe children's progress, and provide scaffolding when children face difficulty (Marshall, 2017; Vygotsky, 1978). In this study, the teacher's reflection after each meeting helped transform the learning environment from a set of isolated fine motor tasks into a more purposeful sequence of activities. This finding is consistent with PjBL literature stating that effective project learning requires teacher guidance, well-aligned assessment, and a balance between children's autonomy and instructional support (Kokotsaki et al., 2016).

The teacher's improved performance also shows the importance of pedagogical decision-making in early childhood classrooms. Fine motor learning is sometimes reduced to routine activities such as coloring or tracing. However, the present intervention showed that fine motor activities become more meaningful when the teacher connects them with everyday life and a project goal. For example, pouring, transferring, cutting, arranging, and pasting are not only exercises for the hand muscles; they become purposeful actions when children use them to create a product or complete a classroom task. This reflects Montessori's view that Practical Life activities train independence, order, concentration, and coordination through meaningful everyday actions rather than abstract drills (Marshall, 2017; Rule & Stewart, 2002).

Children's activity increased substantially from 14% in the first meeting to 93% in the fourth meeting. This improvement can be explained by the nature of Montessori Practical Life materials, which invite children to manipulate concrete objects using real hand movements. Young children are more likely to participate when learning materials are visible, touchable, and connected with familiar daily routines. Montessori learning materials also encourage repetition, self-correction, and focused engagement, which support children's concentration and confidence (Lillard et al., 2017; Randolph et al., 2023). The increase in activity therefore suggests that the intervention succeeded in shifting children from passive recipients of instruction to active participants who explored materials, practiced movements, collaborated with peers, and completed tasks.

The PjBL element likely strengthened children's engagement because the activities had a visible goal and a concrete product. PjBL is characterized by inquiry, autonomy, collaboration, communication, reflection, and artifact production (Bell, 2010; Guo et al., 2020; Kokotsaki et al., 2016). In early childhood education, these principles need to be simplified into short, concrete, and playful activities. In this study, children were not asked to conduct complex research projects; instead, they were guided to solve simple practical tasks and produce objects through fine motor actions. This adaptation is important because kindergarten PjBL should remain developmentally appropriate. The project structure helped children understand why they were performing the activity and encouraged them to persist until the product was completed.

The improvement in children's activity also supports the idea that motivation and fine motor development are interrelated. Children who are interested in the task tend to repeat the movement, and repeated movement strengthens control, accuracy, and coordination. Conversely, children who experience success in manipulating materials often become more confident and willing to participate in subsequent tasks. This reciprocal relationship is important in early childhood classrooms because fine motor development requires practice over time. A single activity is rarely sufficient; children need repeated opportunities to handle tools, control pressure, coordinate both hands, and monitor the accuracy of their actions. The increasing activity percentages in this study indicate that the classroom became progressively more supportive for such repeated practice.

The improvement in fine motor development from 36% to 100% is consistent with international evidence linking fine motor practice with children's broader developmental and academic readiness. Rule and Stewart (2002) found that Practical Life materials can support kindergartners' fine motor skills, while Cameron et al. (2012) showed that fine motor skills and executive function both contribute to kindergarten achievement. Fine motor skills are also considered school-readiness indicators because children use manual control to draw, write, count, cut, sort, and represent concepts (Grissmer et al., 2010). The present findings therefore support the view that fine motor learning should be embedded in meaningful classroom activities rather than treated as a separate mechanical exercise.

The mechanism behind the observed improvement can be explained through several developmental processes. First, Montessori Practical Life activities strengthen hand-eye coordination because children must visually monitor objects while moving their fingers and hands. Second, the activities strengthen finger control and wrist stability because children manipulate small objects, tools, and materials. Third, the activities support bilateral coordination when children use both hands to hold, cut, paste, pour, or arrange materials. Fourth, the project

format supports planning and sequencing because children must follow steps from preparation to completion. These processes are consistent with the literature showing that fine motor development is closely related to visual-motor integration, attention, and executive function (Cameron et al., 2012; McClelland & Cameron, 2019; van der Fels et al., 2015).

The findings also have implications for early numeracy and literacy readiness. Pitchford et al. (2016) reported that fine motor skills predicted early mathematics more strongly than reading in the early primary years, suggesting that hand movements may support children's understanding of quantity, spatial relations, and symbolic representation. Dinehart (2015) also emphasized the role of handwriting and fine motor competence in early childhood education. In the present study, although the intervention did not directly measure literacy or numeracy outcomes, the improvement in fine motor development may create a stronger foundation for future writing, drawing, tracing, counting, matching, and patterning activities. Therefore, fine motor intervention in kindergarten should be understood as part of school readiness, not merely as art or craft practice.

The use of Montessori Practical Life also provides an important contextual advantage for Indonesian early childhood classrooms. Many Practical Life activities can be implemented using low-cost, familiar, and locally available materials. Teachers do not always need expensive commercial Montessori apparatus; they can use safe classroom objects such as spoons, bowls, cups, buttons, cloth, paper, seeds, water containers, child-safe scissors, and recycled materials, as long as the activity follows Montessori principles of order, repetition, independence, and purposeful movement. This is important for schools with limited resources. The approach is also culturally adaptable because many Practical Life tasks are connected to children's daily routines at home and school.

The integration of Montessori and PjBL appears to offer a complementary pedagogical model. Montessori Practical Life contributes structured, sequenced, hands-on activities that train independence and motor control. PjBL contributes meaningful goals, collaboration, creativity, and product completion. When combined, the two approaches help overcome a possible weakness of each approach if used alone. Practical Life activities may become routine if not connected to a meaningful classroom goal, whereas PjBL may become too broad if not supported by structured fine motor tasks. The combination therefore provides both structure and purpose. This interpretation is supported by project-learning theory, which emphasizes that meaningful artifacts and teacher scaffolding are central to successful learning (Blumenfeld et al., 1991; Chen & Yang, 2019; Guo et al., 2020).

The achievement of 100% in the fourth meeting should be interpreted as classroom-level success based on the predetermined rubric, not as evidence that the intervention will automatically produce the same result in all settings. Classroom action research is designed to improve practice in a particular class, and its strength lies in practical relevance rather than broad generalization. The small sample size, absence of a control group, and short intervention duration limit causal claims. However, the consistent upward trend across teacher activity, children's activity, and fine motor development provides reasonable classroom evidence that the intervention was beneficial for the participating children. Future studies should use larger samples, comparison groups, longer intervention periods, and more standardized fine motor assessments to test whether similar effects occur across different schools and age groups.

Another point for interpretation is the role of teacher reflection. The improvement did not occur simply because the teacher used the labels Montessori or PjBL. The improvement occurred because the teacher repeatedly refined the way the activity was implemented. This distinction is important for publication and practice. Educational models become effective only when teachers translate their principles into coherent classroom routines. In this study, reflection helped the teacher improve the arrangement of materials, adjust instructions, guide children who were hesitant, provide more time for practice, and maintain children's attention. This aligns with the view that the fidelity and quality of Montessori implementation influence children's outcomes (Lillard et al., 2017; Marshall, 2017).

The findings also suggest that fine motor development can be strengthened through a learning environment that integrates autonomy and structure. Children need freedom to explore materials, but they also need clear routines, safe tools, and teacher guidance. Too much teacher control may reduce children's initiative, while too little structure may make the activity unfocused. The intervention balanced these two needs by allowing children to manipulate materials and complete products while still following a prepared sequence. This balance is consistent with developmentally appropriate practice and with the sociocultural idea that children learn best when adults provide support within the zone of proximal development (Vygotsky, 1978).

For classroom practice, the study recommends that teachers design fine motor activities around meaningful daily-life projects. A teacher can begin by identifying a target fine motor indicator, selecting a Practical Life activity, connecting the activity with a product or problem, preparing materials in an orderly way, modeling the task briefly, allowing children to practice, and closing with reflection. Assessment should document not only the final product but also the process, including attention, persistence, coordination, tool use, and independence. Such assessment is more aligned with early childhood learning because children's development is visible in how they engage with materials and complete the task, not only in the neatness of the product.

Overall, the study strengthens the argument that Montessori Practical Life integrated with Project-Based Learning is a promising classroom strategy for developing fine motor skills in kindergarten. The approach is theoretically supported by Montessori education, active learning, project-based learning, and fine motor development literature. It is also practically feasible because it uses concrete activities that can be adapted to local classroom conditions. The main contribution of the study is its demonstration of how everyday Practical Life activities can be transformed into project-oriented learning experiences that increase teacher facilitation quality, children's active participation, and fine motor achievement.

CONCLUSION

This classroom action research demonstrated that Montessori Practical Life activities integrated with Project-Based Learning improved teacher activity, children's learning activity, and children's fine motor development in one kindergarten class in Banjarmasin. Across four meetings, teacher activity increased to the Very Good category, children's activity increased to the Very Active category, and classical fine motor development reached the Developing Very Well category.

The findings suggest that fine motor learning becomes more effective when children engage in concrete, meaningful, everyday-life activities that require repeated manipulation of materials and lead to simple project products. For teachers, the approach can be used as a practical strategy to create active, child-centered, low-cost, and developmentally appropriate fine motor learning. For school leaders, the findings can inform teacher development programs focused on Montessori-inspired Practical Life activities and project-based classroom design. For future researchers, the study can be extended through larger samples, longer interventions, standardized assessments, and comparison designs to strengthen evidence of effectiveness.

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