

The Use of Recycled Materials as Learning Media to Support Creativity and Fine Motor Skills in Children Aged 3–4 Year

Niken Setyoningsih¹, I. Ismail²

^{1,2} Institut Studi Islam Muhammadiyah Pacitan, Pacitan, Indonesia.
Email: nikensetyoningsih4@gmail.com¹, ismail@isimupacitan.ac.id²

ARTICLE HISTORY

Received: September 24, 2026
Revised: October 14, 2026
Accepted: October 16, 2026

DOI

<https://doi.org/10.52970/grdis.v6i4.2676>

ABSTRACT

This study describes the use of recycled materials as learning media to support creativity and fine motor skills among children aged 3–4 years at KB Sudirman. A descriptive qualitative approach was employed, involving children participating in learning activities and teachers as key informants. Data were collected through classroom observations, semi-structured interviews with teachers, and documentation of learning activities and children's work. Data were analyzed through data reduction, data display, and conclusion drawing, with credibility supported by technique triangulation. The findings indicate that recycled materials, including cardboard, plastic bottles, bottle caps, and paper rolls, provided opportunities for hands-on exploration and creative expression. Activities such as grasping, applying glue, sticking, arranging, folding, and decorating allowed children to practice hand movements and eye-hand coordination. Children also explored different colors, materials, shapes, and arrangements, producing varied work and expressing their ideas through their creations. Teacher guidance, encouragement, and appreciation helped children participate according to their individual abilities, although some required additional assistance and more time to complete activities. These findings suggest that recycled materials can provide accessible learning opportunities that support creative expression and fine motor practice in early childhood education. Their use should be accompanied by appropriate teacher supervision and careful selection of clean, safe, and age-appropriate materials.

Keywords: Recycled Materials, Learning Media, Fine Motor Skills, Creativity, Early Childhood Education.

I. Introduction

Early childhood education plays an important role in supporting children's physical, cognitive, social-emotional, and creative development. During the early years, children learn through active engagement with their surroundings, particularly when learning experiences allow them to explore, manipulate objects, and express their ideas. Developmentally appropriate learning therefore requires activities that respond to children's individual abilities and provide meaningful opportunities for play, discovery, and participation (National Association for the Education of Young Children [NAEYC], 2020). For children aged 3–4 years, learning environments should offer concrete experiences that encourage exploration while accommodating differences in developmental pace and learning needs. Fine motor skills and creativity are two important developmental capacities that can be supported through appropriately designed learning activities. Fine motor skills involve controlling the small muscles of the hands and fingers and coordinating their movements

with visual information. Activities such as grasping, folding, sticking, arranging, and manipulating objects provide opportunities to practice these movements. Creativity, meanwhile, can be expressed through children's ability to generate ideas, experiment with materials, make choices, and produce work that reflects their imagination. These capacities can be stimulated simultaneously when children participate in activities that combine physical manipulation with opportunities for independent exploration. Research on early childhood learning materials has examined the potential of such activities to support children's creative expression and motor development (Darmiatun & Mayar, 2020; Nurjanah & Muthmainah, 2023).

Recycled materials offer a practical learning resource for creating these experiences. Cardboard, paper rolls, plastic containers, bottle caps, and other reusable objects can be transformed into materials for collage, construction, decoration, and other creative activities. Their educational value extends beyond affordability because they can be combined and rearranged in different ways. This characteristic is related to the concept of loose parts, which emphasizes the use of open-ended materials that allow children to explore multiple possibilities rather than produce a single predetermined outcome. Research on loose-parts play has identified its relevance to children's creativity, problem-solving, and other cognitive processes, although the available evidence varies across studies and developmental outcomes (Cankaya et al., 2023, 2025). Recycled materials may therefore provide opportunities for children to engage with their environment while developing practical skills and expressing individual ideas. However, the educational value of recycled materials depends on how learning activities are organized and facilitated. Materials alone do not guarantee meaningful developmental experiences. Teachers need to select age-appropriate resources, demonstrate procedures when necessary, encourage children to make decisions, and provide assistance without taking over their work. Evidence from early childhood research indicates that loose-parts activities can be associated with children's creative development, while the design of the learning experience remains important to how children engage with the materials (Asih et al., 2022; Farikhah et al., 2022). Furthermore, studies examining recycled materials and fine motor activities have reported their practical use in classroom learning, providing a relevant basis for further investigation of how children interact with such resources (Agustina et al., 2019; Darmiatun & Mayar, 2020).

Despite these contributions, further contextual investigation is warranted. Existing studies have examined loose parts, recycled materials, creativity, or fine motor skills using different approaches and age groups. For example, Nurjanah and Muthmainah (2023) investigated the effects of loose-parts media on creativity and fine motor skills among children aged 5–6 years using a quasi-experimental design. Although their findings provide relevant evidence, the participants' age range and research design differ from those of the present study. A qualitative investigation involving children aged 3–4 years can complement this evidence by examining learning processes, including children's participation, material choices, attempts at manipulating objects, creative expression, and responses to teacher guidance. A systematic review by Cankaya et al. (2025) also highlights continuing methodological variation and limitations in the evidence concerning loose-parts play and children's cognitive development. Accordingly, the present study addresses a contextual and descriptive gap rather than claiming that recycled materials or their developmental relevance have not been studied previously. The research was conducted at KB Sudirman, where initial observations indicated that some children aged 3–4 years required assistance during activities involving sticking, arranging, folding, and constructing simple forms. Opportunities for children to explore different materials and create products based on their own ideas also needed to be expanded. These initial observations suggest the need for learning activities that combine fine motor practice with creative exploration. Nevertheless, these conditions should be understood as preliminary observations in the study setting rather than evidence that all children experience the same difficulties. Investigating the activities in their natural classroom context can help clarify how recycled materials are used, how children participate, and how teachers respond to individual learning needs.

Against this background, this study aims to describe the use of recycled materials as learning media to support creativity and fine motor skills among children aged 3–4 years at KB Sudirman. Specifically, it examines children's engagement with recycled materials, their observable fine motor actions and creative

expressions, and the role of teachers in facilitating learning. Using a descriptive qualitative approach, the study focuses on the learning process rather than measuring a statistically established causal effect. Its contribution lies in providing a context-specific account of how accessible recycled materials can be incorporated into early childhood learning while balancing creative freedom, developmental appropriateness, teacher support, and material safety. The findings are expected to inform teachers' decisions when designing practical, engaging, and age-appropriate activities that value both children's learning processes and their individual ways of creating.

II. Literature Review

2.1. Developmentally Appropriate Learning in Early Childhood Education

Early childhood education is grounded in the understanding that young children learn through active engagement with people, objects, and experiences in their immediate environments. Developmentally appropriate practice emphasizes responsive teaching, meaningful play, and learning experiences that consider children's developmental characteristics, individual differences, and sociocultural contexts (National Association for the Education of Young Children [NAEYC], 2020). For children aged 3–4 years, opportunities to explore tangible materials are particularly relevant because learning frequently involves sensory experiences, physical manipulation, experimentation, and communication.

Play-based learning provides opportunities for children to develop knowledge and skills while maintaining curiosity and active participation. Weisberg et al. (2016) explained that guided play combines children's initiative with intentional adult support, allowing learning experiences to remain purposeful without eliminating children's autonomy. Similarly, Zosh et al. (2018) emphasized that meaningful, socially interactive, engaging, and iterative experiences are important characteristics of learning through play. These perspectives suggest that early childhood learning media should be evaluated not only according to their instructional functions but also according to the opportunities they provide for exploration, decision-making, and interaction. The relationship between play and development nevertheless requires careful interpretation. Lillard et al. (2013) found that evidence concerning the developmental benefits of pretend play varies across outcomes and research designs. Consequently, participation in a play-based activity should not automatically be interpreted as proof of developmental improvement. A qualitative examination can instead identify how children engage with materials, attempt unfamiliar tasks, respond to challenges, and express their emerging abilities during naturally occurring classroom activities.

2.2. Recycled Materials as Open-Ended Learning Media

Recycled materials refer to previously used objects that are repurposed for educational activities rather than immediately discarded. In early childhood classrooms, these materials may include cardboard, paper rolls, plastic containers, bottle caps, and other objects selected according to their safety and developmental suitability. Their educational relevance extends beyond affordability because they can be manipulated, arranged, combined, and transformed into different constructions. Recycled materials are closely associated with the concept of loose parts, although the terms are not interchangeable. Recycled materials are defined by their previous use, whereas loose parts are characterized by their flexibility and capacity to support multiple forms of play. Cankaya et al. (2023) explained that loose parts can support exploratory, symbolic, and constructive play through opportunities to combine and transform materials. A recycled cardboard box, for example, may function as a construction component, a container, or an imagined object, depending on the child's intentions.

The educational possibilities of such materials depend partly on their affordances, or the actions that children perceive as possible when interacting with objects. Gibson et al. (2017), in their systematic review of loose-parts play interventions, identified promising opportunities for children's play experiences while also

highlighting limitations in the available evidence. More recently, Cankaya et al. (2025) reviewed research on indoor loose-parts play and cognitive development, reinforcing the importance of examining the specific characteristics of materials, play contexts, and developmental outcomes rather than assuming uniform benefits. Indonesian early childhood research also provides relevant evidence. Farikhah et al. (2022) discussed the use of loose-part learning approaches to encourage children's creativity, while Asih et al. (2022) examined loose-parts learning in relation to creativity and teachers' pedagogical competence. Together, these studies suggest that the educational value of open-ended materials depends on both the possibilities offered by the objects and the ways teachers facilitate children's engagement. However, findings obtained in different educational settings or age groups should not be directly generalized to children aged 3–4 years.

2.3. Fine Motor Skills and Manipulative Learning Activities

Fine motor skills involve the controlled movement of small muscles, particularly those of the hands and fingers, together with the coordination of visual information and purposeful movement. These abilities are relevant to daily activities such as grasping, positioning objects, drawing, manipulating tools, and completing simple construction tasks. Grissmer et al. (2010) identified fine motor skills as an important indicator associated with children's school readiness, highlighting their broader developmental significance. Fine motor performance involves several related but distinguishable components. Cameron et al. (2012) examined fine motor skills in relation to kindergarten achievement and emphasized the relevance of both motor coordination and visual-motor integration. In classroom activities, these components may be observed when children grasp materials, adjust their finger movements, apply adhesive, position objects, and coordinate their hands with what they see. Such behaviors provide useful observational evidence, although they do not constitute a standardized assessment of motor development.

Manipulative activities offer repeated opportunities to practice these movements. Darmiatun and Mayar (2020) investigated collage activities using discarded materials and reported improvements in fine motor performance within their classroom action research context. Nurjanah and Muthmainah (2023) also examined loose-part media in relation to creativity and fine motor skills among young children. These studies provide support for the educational relevance of material-based activities, but differences in participant age, research design, and assessment procedures must be considered when interpreting their findings. For children aged 3–4 years, fine motor participation may be demonstrated through attempts to grasp and place objects, coordinate both hands, manipulate materials with increasing control, and complete parts of an activity with varying levels of assistance. The quality of participation should therefore be understood developmentally. Requiring all children to produce identical products may obscure meaningful differences in their motor abilities, confidence, and learning needs.

2.4. Creativity Through Exploration and Material Transformation

Creativity in early childhood involves the expression of ideas, exploration of possibilities, and production of responses that reflect children's developing imagination and experiences. Runco and Jaeger (2012) described originality and effectiveness as central criteria in the standard definition of creativity. In early childhood education, however, these criteria require age-appropriate interpretation. A child's creative expression may be evident in a personally meaningful arrangement, an unexpected combination of materials, or an imaginative explanation of a product, even when the outcome is not objectively novel to adults. Creativity also involves cognitive and motivational processes that are influenced by the learning environment. Beghetto and Kaufman (2007) introduced the concept of mini-c creativity, emphasizing personally meaningful interpretations and discoveries that emerge during learning. This perspective is particularly relevant to preschool children because their creative development can be expressed through experimentation and individual meaning-making rather than sophisticated or technically accomplished products.

Research on creativity and learning environments further suggests that opportunities for exploration should be accompanied by appropriate support. Davies et al. (2013), in their systematic review, identified features of learning environments associated with creative development, including flexibility, appropriate resources, and supportive relationships. Within recycled-material activities, such conditions may enable children to select colors, combine objects, alter arrangements, and communicate the meanings of their creations. Open-ended learning media are relevant because they do not necessarily prescribe a single correct result. Cankaya et al. (2023) noted that loose-parts play can involve exploratory and constructive processes that allow children to experiment with alternative uses of objects. Nevertheless, the presence of flexible materials alone does not guarantee creative expression. Children also need sufficient time, encouragement, accessible choices, and opportunities to modify their initial ideas. Creativity should consequently be examined through children's actions and explanations as well as their completed products.

2.5. Teacher Scaffolding, Participation, and Material Safety

Teachers play an important role in organizing developmentally appropriate environments and responding to children's individual learning needs. Guided play requires educators to balance instructional intentions with children's opportunities to initiate activities, make decisions, and discover solutions (Weisberg et al., 2016). Excessive direction may restrict exploration, whereas insufficient assistance may prevent children from participating meaningfully in tasks beyond their current abilities. The concept of scaffolding helps explain how teachers can provide temporary support while preserving children's active involvement. Van de Pol et al. (2010) identified contingency, fading, and transfer of responsibility as important characteristics of scaffolding in educational interactions. Although their review was not limited to preschool recycled-material activities, these principles offer a useful interpretive framework. Teachers may initially demonstrate how to apply glue or position materials, reduce assistance when children become more confident, and encourage children to complete manageable tasks independently.

Teacher support also involves recognizing that children differ in attention, confidence, movement control, and preferred ways of participating. NAEYC (2020) recommends responsive teaching that respects individual developmental differences. In recycled-material activities, this may involve adjusting task complexity, offering larger or easier-to-handle objects, allowing additional time, and acknowledging children's efforts without imposing identical expectations. Material safety is an essential consideration, particularly for children aged 3–4 years. Reused objects must be clean, free from sharp edges, and appropriate for children's developmental abilities. Small detachable components, including some bottle caps, may present choking risks and require careful selection and close supervision. Educational affordability should therefore never take priority over physical safety.

2.6. Synthesis of Previous Research and Conceptual Position

The reviewed literature establishes three complementary perspectives. First, developmentally appropriate and play-based approaches emphasize children's active engagement, autonomy, and meaningful experiences (NAEYC, 2020; Zosh et al., 2018). Second, research on loose parts and recycled materials highlights the flexibility of everyday objects as resources for exploration and construction (Gibson et al., 2017; Cankaya et al., 2023). Third, studies of fine motor development and creativity indicate that manipulative and open-ended activities can provide relevant opportunities for practicing coordinated movement and expressing ideas (Grissmer et al., 2010; Nurjanah & Muthmainah, 2023). These perspectives are related but should not be treated as interchangeable. Evidence concerning cognitive development, creativity, and motor performance comes from studies with different participants, contexts, and methodological approaches. Moreover, a material that encourages exploration in one classroom may generate different patterns of participation in another. The teacher's facilitation, the characteristics of the materials, and the children's developmental readiness may all shape the learning experience.

Accordingly, this study conceptualizes recycled-material learning as an interaction among material affordances, children's exploratory and manipulative actions, creative expression, fine motor participation, and teacher scaffolding. At KB Sudirman, these dimensions are examined through children's observable activities, choices, coordination, attempts to solve practical problems, and levels of independence. This framework provides a basis for interpreting how recycled materials function as learning media for children aged 3–4 years without presuming that participation alone establishes a measurable causal effect on development.

III. Research Method

3.1. Research Design and Setting

This study employed a descriptive qualitative design to explore how recycled materials were used as learning media for children aged 3–4 years at KB Sudirman. This design was appropriate because the study focused on describing children's participation, fine motor activities, creative expression, and teacher facilitation in a natural learning environment. Rather than measuring the causal effect of recycled materials, the study examined the learning processes and behaviors observed during classroom activities. The research was conducted at KB Sudirman, where children participated in learning activities involving recycled materials, including cardboard, plastic bottles, bottle caps, paper rolls, and other available objects. These materials were used to create simple products through activities such as grasping, applying glue, sticking, arranging, folding, and decorating. The research setting provided a context for examining how children interacted with the materials and how teachers supported their participation.

3.2. Participants and Data Sources

The participants were children aged 3–4 years who participated in the learning activities at KB SUDIRMAN. Teachers involved in planning and facilitating the activities served as key informants. The number of participating children and teachers, the participant selection criteria, and the duration of their involvement should be specified in the final manuscript according to the research records. The data sources included children's actions during learning activities, classroom interactions, teacher explanations and reflections, and the products created by the children. These sources were used to examine three main aspects: children's engagement with recycled materials, observable fine motor behaviors and creative expression, and teacher facilitation during the learning process.

3.3. Data Collection

Data were collected through classroom observation, semi-structured teacher interviews, and documentation. Observation focused on children's interactions with materials, including their ability to grasp and position objects, coordinate hand movements with visual information, make choices, combine materials, and complete tasks with varying levels of assistance. Observations also considered differences in children's participation, attention, and independence. Semi-structured interviews were conducted with teachers to obtain information about the implementation of the activities, children's responses, the assistance provided during learning, and challenges encountered in facilitating the activities. Documentation consisted of photographs of learning activities and examples of children's work, subject to the permissions and ethical procedures applicable to the study. The three techniques provided complementary perspectives on the learning process and enabled the researcher to compare observations with teachers' accounts and documentary evidence. The final manuscript should specify the observation schedule, number and duration of sessions, interview procedures, and documentation process if these details are available in the research records.

3.4. Data Analysis

Data were analyzed using three interconnected stages: data reduction, data display, and conclusion drawing, following the analytical framework described by Sugiyono (2019). During data reduction, observation notes, interview information, and documentation were selected and organized according to their relevance to the research objectives. The data were then grouped around the main analytical categories: children's engagement with recycled materials, fine motor participation, creative expression, and teacher facilitation. During data display, the organized information was presented descriptively to identify patterns and differences across children's activities and data sources. The analysis considered observable behaviors, such as grasping, applying glue, positioning materials, experimenting with different arrangements, expressing ideas, and completing tasks independently or with assistance. Conclusion drawing involved interpreting these patterns in relation to the research objectives and checking whether the interpretations were supported by the available evidence.

3.5. Data Credibility

Credibility was supported through technique triangulation by comparing information obtained from observation, semi-structured interviews, and documentation. For example, descriptions of children's participation were examined alongside teachers' accounts and available records of the learning activities. This comparison helped identify areas of agreement and differences among the data sources. Interpretations were based on the available evidence, and variations in children's participation were considered rather than assuming that all children responded in the same way. The findings were therefore interpreted as a contextual description of children's experiences and observable behaviors during recycled-material activities, not as a standardized measurement of developmental gains or proof of a causal relationship.

3.6. Research Ethics

Because the study involved children aged 3–4 years, the research procedures should document the permissions obtained from the institution and parents or legal guardians, as applicable. The manuscript should also explain how children's identities and photographs were protected and how the safety of the materials was considered during classroom activities. Only procedures that were actually implemented should be reported in this section.

IV. Result and Discussion

4.1. Results

a. Children's Engagement With Recycled Materials

The activities involving recycled materials provided children aged 3–4 years with opportunities to interact directly with familiar objects. Materials such as cardboard, plastic bottles, bottle caps, and paper rolls attracted children's attention and encouraged them to touch, examine, select, and rearrange the available objects. At the beginning of the activities, some children required teacher guidance to select materials and understand how to use them. As the activities progressed, children were observed selecting objects, experimenting with different arrangements, and showing their completed work to teachers and peers. These activities enabled children to participate through direct manipulation rather than relying exclusively on verbal instructions or worksheets. The use of familiar objects also connected classroom activities with materials children might encounter in everyday life. Children's engagement was reflected in their physical interaction with the materials, their attempts to create products, and their willingness to share their work. These observations describe participation within the learning context; they do not establish that recycled materials are more effective than other learning media.

b. Fine Motor Activities and Eye–Hand Coordination

The recycled-material activities involved several movements requiring hand and finger control. Children picked up and held objects, applied glue, attached pieces, arranged bottle caps, folded paper, and decorated their products. Some children required assistance when controlling the amount of glue or positioning smaller components. Teacher demonstrations and opportunities to practice allowed several children to complete parts of the activities with greater independence. Children also attempted to position materials according to their intentions and adjusted their movements when an initial attempt did not produce the desired result. These behaviors provided observable examples of hand manipulation and eye–hand coordination during meaningful classroom tasks. The findings therefore indicate that recycled-material activities offered opportunities for fine motor practice. However, the observations should not be interpreted as standardized evidence of developmental improvement because no quantitative motor assessment or comparison group was reported.

c. Creative Expression Through Material Choices

Children expressed ideas through their choices and arrangements of materials. Some selected different colors, altered the placement of decorations, combined materials, or produced forms that differed from the teacher's example. Some children also named their products or described them through simple stories. These actions indicated that the activities allowed children to make choices and communicate personal meanings through concrete objects. Children differed in how readily they generated ideas. Some began experimenting independently, while others needed prompts or examples from the teacher. This variation suggests that open-ended materials do not eliminate individual differences in participation. Instead, they can provide different entry points for children to engage at their own levels of confidence and ability. The observed variation in products and actions offered evidence of creative expression within the activities, rather than a standardized measure of creativity.

d. Teacher Facilitation and Practical Constraints

Teachers supported children's participation through demonstrations, verbal guidance, encouragement, and limited assistance. When children encountered difficulties applying glue or attaching materials, teachers provided help that enabled them to continue rather than completing the entire task on their behalf. Teachers also appreciated children's products without directly comparing one child's work with another's. The activities nevertheless presented practical challenges. Some children became distracted, some needed more time to finish, and others required additional help with particular materials. These differences meant that the same task did not provide an identical level of challenge for every child. The selection of materials, the complexity of the activity, and the degree of adult supervision therefore remained important considerations. Recycled materials needed to be clean, safe, and appropriate for the children's age, with particular attention to small components and activities requiring adult assistance.

4.2. Discussion

a. Recycled Materials as Resources for Active Learning

The findings show that recycled materials provided a context for active engagement, direct exploration, and the transformation of familiar objects into simple learning products. Children handled the materials, examined their properties, selected components, and experimented with different arrangements. These behaviors are consistent with developmentally appropriate practice, which emphasizes responsive learning experiences that account for children's developmental characteristics and individual differences (National Association for the Education of Young Children [NAEYC], 2020). They are also consistent with the view that guided play combines children's initiative with intentional adult support (Weisberg et al., 2016). The findings can be further interpreted through the concept of loose parts. Loose parts are characterized by their capacity to be moved, combined, and used in multiple ways. Cankaya et al. (2023) reviewed literature on preschool children's loose-parts play and discussed its potential relationship with cognitive development. Cankaya et al. (2025) subsequently identified associations between open-ended play materials and several cognitive outcomes across the reviewed literature, including creativity and problem-solving. However, the

authors also reported methodological variation and studies that did not find positive associations. This evidence supports the relevance of examining how children use flexible materials, but it does not justify assuming that all recycled-material activities produce the same developmental outcomes.

The distinction between recycled materials and loose parts is important. Recycled materials are defined by their previous use, whereas loose parts are defined by their potential for flexible use. A discarded object does not automatically become an open-ended learning resource if children are expected to use it in only one prescribed way. In the present setting, the opportunities to select, arrange, combine, and modify materials were therefore as important as the fact that the materials had been reused. The observations also align with Gibson et al. (2017), whose systematic review found that the evidence for certain cognitive, social, and emotional outcomes of loose-parts interventions remained insufficient. This qualification is particularly relevant to the present study because its descriptive qualitative design documents children's experiences in a particular classroom rather than testing an intervention against a comparison condition. Its contribution lies in describing the learning processes and forms of participation that occurred in this context.

4.3. Fine Motor Practice Through Meaningful Manipulation

The fine motor findings indicate that recycled-material activities involved repeated manipulation of objects and coordination between visual attention and hand movements. Picking up objects, applying glue, attaching pieces, folding paper, and positioning decorations required children to control their movements while working toward a self-selected or teacher-supported goal. Such actions offer meaningful opportunities to practice hand and finger movements in a practical context. Fine motor skills are relevant to broader school readiness and classroom participation. Grissmer et al. (2010) identified fine motor skills as an important school-readiness indicator, while Cameron et al. (2012) examined the contribution of fine motor skills and executive function to kindergarten achievement. These studies provide a rationale for attending to fine motor participation in early childhood settings. They do not, however, demonstrate that a particular recycled-material activity will produce the same outcomes in all children.

Research on collage and used materials offers a more direct comparison. Darmiatun and Mayar (2020) examined collage using discarded materials in an early childhood classroom, while Maghfirah (2019) discussed the use of used materials to develop children's fine motor abilities. Kuraedah and Anhusadar (2020) examined printing activities using banana stems, and Wandu and Mayar (2019) discussed fine motor skills and creativity through collage activities. Collectively, these studies demonstrate the relevance of material-based and manipulative activities in early childhood education. The present findings complement this literature by describing the actions through which children engaged with the materials, including grasping, applying adhesive, positioning components, and adjusting their movements. These actions provide contextual information about fine motor practice that may be less visible when evaluation focuses only on the finished product. Nevertheless, the observed need for assistance should not automatically be interpreted as a developmental deficit. Children's performance may also depend on the task's complexity, familiarity with the materials, attention, and the support available at that moment. Accordingly, the findings are best understood as evidence that recycled-material activities created opportunities for fine motor practice. Claims of improvement would require clearer documentation of repeated observations, explicit criteria for evaluating change, or an appropriate assessment procedure. This distinction strengthens the methodological consistency between the descriptive design and the conclusions drawn from the findings.

4.4. Creative Expression and the Value of Open-Ended Tasks

The variation in children's choices, arrangements, and explanations suggests that the activities provided opportunities for creative expression. Some children changed the arrangement of materials or selected colors that differed from the teacher's example, while others combined objects or assigned meanings to their creations. These behaviors illustrate how children can communicate ideas through the manipulation and transformation of familiar materials. This interpretation is consistent with Beghetto and Kaufman's (2007) concept of *mini-c creativity*, which emphasizes personally meaningful interpretations and discoveries during learning. For children aged 3–4 years, creativity need not be judged exclusively by the novelty or technical quality of a completed product. It may also be reflected in an individual choice, an unexpected arrangement, or a simple explanation of what a child has created. Runco and Jaeger (2012) discussed originality and

effectiveness as central components of the standard definition of creativity, but these criteria must be applied carefully when interpreting the emerging creative expressions of very young children.

The role of the learning environment is also relevant. Davies et al. (2013), in a systematic review of creative learning environments, identified environmental and pedagogical features that can support creative development. Within the present activities, the opportunity to choose colors, combine materials, and modify arrangements appeared to create room for individual expression. The teacher's willingness to accept varied products rather than require identical outcomes was therefore an important contextual feature. Indonesian research also provides relevant points of comparison. Asmawati (2017) examined the development of early childhood creativity through integrated learning, while Mayar et al. (2022) investigated the relationship between the surrounding environment and children's creativity. Farikhah et al. (2022) discussed loose-part learning as an approach to encouraging creativity, and Nurjanah and Muthmainah (2023) examined loose-part media in relation to creativity and fine motor skills. These studies support the relevance of flexible materials and varied learning experiences, although differences in participant age, design, and outcome measures limit direct comparisons. The present findings add a process-oriented perspective: creative expression was visible not only in differences between finished products but also in children's decisions, experimentation, and explanations. At the same time, some children needed prompts before beginning. This suggests that open-ended materials alone may not be sufficient; children may also benefit from accessible choices, time to explore, and carefully calibrated adult support.

4.5. Teacher Scaffolding and Individual Differences

Teacher facilitation was a recurring feature of the learning process. Demonstrations, verbal directions, encouragement, and limited assistance helped children continue when they encountered practical difficulties. This pattern can be understood through the concept of scaffolding. Van de Pol et al. (2010) reviewed research on scaffolding in teacher–student interaction and identified the importance of responsive support that adjusts to learners' needs and gradually transfers responsibility. In this study, teachers did not always complete children's tasks for them. Instead, they provided help when children struggled with glue or with attaching components. Such support can be interpreted as an effort to maintain participation while allowing children to remain involved in the task. Weisberg et al. (2016) similarly emphasized the balance between adult guidance and child initiative in guided play. This balance is relevant because excessive direction may reduce children's opportunities to make decisions, whereas insufficient support may make activities inaccessible to some learners.

The reported differences in attention, completion time, and assistance requirements also have practical implications. An activity that is manageable for one child may be challenging for another. Teachers may therefore need to adjust the size of materials, simplify task sequences, offer additional time, or demonstrate a particular movement before inviting children to try independently. Such adjustments are consistent with developmentally appropriate practice (NAEYC, 2020). The findings should not be interpreted as demonstrating that teacher guidance independently caused improvements in creativity or motor skills. Rather, teacher facilitation formed part of the learning context in which children interacted with the materials. Future studies could examine how different forms of guidance relate to children's independence, persistence, and creative choices through systematic observation across multiple sessions.

4.6. Reuse, Environmental Awareness, and Material Safety

The use of discarded objects also connects classroom activities with the everyday environment. By transforming cardboard, paper rolls, bottles, and other materials into learning products, children encounter the practical idea that some objects can be reused instead of immediately discarded. For children aged 3–4 years, this message is most accessible through concrete experiences, such as selecting a used object and giving it a new purpose, rather than through abstract explanations of waste management. This environmental dimension should nevertheless remain a secondary interpretation unless environmental awareness was explicitly investigated in the data collection. The reported findings establish that reused objects were incorporated into learning activities; they do not demonstrate a measurable change in children's environmental attitudes or behavior.

Safety is equally important. The educational accessibility of recycled materials does not mean that every discarded object is suitable for preschool use. Materials must be inspected for cleanliness, sharp edges,

breakable parts, toxic residues, and components that may pose choking hazards. Small bottle caps and similar objects require particular care with children aged 3–4 years. Teachers must select materials according to developmental appropriateness and supervise their use throughout the activities. These considerations qualify the practical implications of the findings. Recycled materials may offer an economical and flexible alternative to commercially produced learning media, but affordability should not replace careful selection, preparation, and supervision. The educational value of the activity depends on the interaction among material properties, task design, children's abilities, and teacher support.

4.7. Contribution, Limitations, and Implications

The main contribution of this study is its contextual description of how children aged 3–4 years interacted with recycled materials during classroom learning at KB SUDIRMAN. The findings identify four connected dimensions: children's engagement with materials, fine motor actions, creative choices, and teacher facilitation. Rather than evaluating success solely through completed products, the study highlights observable processes, including exploration, manipulation, experimentation, and varying degrees of independence. This contribution should be interpreted in light of the research design. The study is descriptive and qualitative, and the available methods do not include standardized assessments, a control group, or quantitative pre–post measurements. The findings therefore cannot establish that recycled materials caused improvements in fine motor skills or creativity. They also should not be generalized automatically to all early childhood settings, especially where participant characteristics, available materials, teacher practices, and learning environments differ. The results nevertheless have practical implications for teachers. Recycled-material activities can be planned as flexible learning experiences in which children have opportunities to select, manipulate, combine, and modify objects. Teachers can support participation through demonstrations, open-ended prompts, encouragement, and assistance adjusted to individual needs. Planning should also account for differences in attention, task completion time, and motor control, while ensuring that all materials are safe and suitable for the children's age.

V. Conclusion

This study describes the use of recycled materials as learning media for children aged 3–4 years at KB SUDIRMAN. The findings indicate that activities involving cardboard, plastic bottles, bottle caps, paper rolls, and other reused objects provided opportunities for children to practice fine motor movements, coordinate their hands with visual information, and express ideas through material selection and product construction. Children's participation varied in terms of independence, attention, and the assistance required. These findings highlight the potential of recycled-material activities to accommodate both fine motor practice and creative expression through direct, hands-on experiences. In practice, teachers can use recycled materials to design flexible learning activities that encourage children to explore, combine, arrange, and transform objects according to their abilities and interests. Demonstrations, appropriate prompts, encouragement, and assistance adjusted to individual needs can help children remain actively involved without unnecessarily restricting their choices. Materials should be clean, developmentally appropriate, and carefully inspected to minimize safety risks. These implications emphasize that the educational value of recycled materials depends not only on the objects themselves but also on activity design, teacher facilitation, and attention to individual differences. This study is limited by its descriptive qualitative design and its focus on a single early childhood education setting, which restricts the transferability of the findings to other contexts. The study also did not report standardized developmental measurements, a comparison group, or quantitative pre- and post-intervention assessments; therefore, it cannot establish a causal effect of recycled materials on children's creativity or fine motor skills. Future research could examine children's participation across multiple sessions, employ clearly defined observational indicators, and incorporate standardized assessments or comparative designs to investigate developmental changes more systematically. Further studies across different early childhood settings could also explore how material characteristics and teacher facilitation relate to children's engagement, independence, and creative expression.

References

- Agustina, N., et al. (2019). [Informasi judul dan metadata publikasi perlu dilengkapi berdasarkan sumber yang digunakan.]
- Asih, N. S., Sugiyo, & Suminar, T. (2022). Pembelajaran sentra media loose parts meningkatkan kreativitas dan kompetensi pedagogik guru TK. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 6(5), 4581–4590. <https://doi.org/10.31004/obsesi.v6i5.2561>
- Asmawati, L. (2017). Peningkatan kreativitas anak usia dini melalui pembelajaran terpadu berbasis kecerdasan jamak. *Jurnal Pendidikan Usia Dini*, 11(1), 1–7. <https://doi.org/10.21009/JPUD.111.10>
- Astini, B. N., Nurhasanah, Rachmayani, I., & Suarta, I. N. (2018). Identifikasi pemanfaatan alat permainan edukatif dalam mengembangkan motorik halus anak usia dini. *Jurnal Pendidikan Anak*, 6(1). <https://doi.org/10.21831/jpa.v6i1.15678>
- Astuti, R., & Aziz, T. (2019). Integrasi pengembangan kreativitas anak usia dini di TK Kanisius Sorowajan Yogyakarta. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 3(2), 294–300. <https://doi.org/10.31004/obsesi.v3i2.99>
- Beghetto, R. A., & Kaufman, J. C. (2007). Toward a broader conception of creativity: A case for “mini-c” creativity. *Psychology of Aesthetics, Creativity, and the Arts*, 1(2), 73–79. <https://doi.org/10.1037/1931-3896.1.2.73>
- Cameron, C. E., Brock, L. L., Murrah, W. M., Bell, L. H., Worzalla, S. L., Grissmer, D., & Morrison, F. J. (2012). Fine motor skills and executive function both contribute to kindergarten achievement. *Child Development*, 83(4), 1229–1244. <https://doi.org/10.1111/j.1467-8624.2012.01768.x>
- Cankaya, O., Martin, M., & Haugen, D. (2025). The relationship between children's indoor loose parts play and cognitive development: A systematic review. *Journal of Intelligence*, 13(5), Article 52. <https://doi.org/10.3390/jintelligence13050052>
- Cankaya, O., Rohatyn-Martin, N., Leach, J., Taylor, K., & Bulut, O. (2023). Preschool children's loose parts play and the relationship to cognitive development: A review of the literature. *Journal of Intelligence*, 11(8), Article 151. <https://doi.org/10.3390/jintelligence11080151>
- Claudia, S., Widiastuti, A. A., & Kurniawan, M. (2018). Origami game for improving fine motor skills for children 4–5 years old in Gang Buaya Village in Salatiga. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 2(2), 143–148. <https://doi.org/10.31004/obsesi.v2i2.97>
- Darmiatun, S., & Mayar, F. (2020). Meningkatkan kemampuan motorik halus anak melalui kolase dengan menggunakan bahan bekas. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 4(1), 247–257. <https://doi.org/10.31004/obsesi.v4i1.327>
- Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., & Howe, A. (2013). Creative learning environments in education: A systematic literature review. *Thinking Skills and Creativity*, 8, 80–91. <https://doi.org/10.1016/j.tsc.2012.07.004>
- Debeturu, B., & Wijayaningsih, F. L. (2019). Meningkatkan kreativitas anak usia 5–6 tahun melalui media Magic Puffer Ball. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 3(1), 233–239. <https://doi.org/10.31004/obsesi.v3i1.180>
- Dewi, L. P. Y., Pudjawan, K., & Asril, N. M. (2015). Penerapan metode demonstrasi berbantuan media benda asli untuk meningkatkan perkembangan motorik halus anak. *Jurnal Pendidikan Anak Usia Dini Undiksha*, 3(1). <https://doi.org/10.23887/paud.v3i1.5875>
- Fakhriyani, D. V. (2016). Pengembangan kreativitas anak usia dini. *Wacana Didaktika*, 4(2), 193–200.
- Farikhah, A., Mar'atin, A., Afifah, L. N., & Safitri, R. A. (2022). Meningkatkan kreativitas anak usia dini melalui metode pembelajaran loose part. *WISDOM: Jurnal Pendidikan Anak Usia Dini*, 3(1). <https://doi.org/10.21154/wisdom.v3i1.3493>
- Fitriana, L. R., & Sudaryanti. (2024). The effect of loose part media on fine motor skills of children in group B. *Jurnal Pendidikan Anak Usia Dini Undiksha*, 12(3), 455–463.

- Gibson, J. L., Cornell, M., & Gill, T. (2017). A systematic review of research into the impact of loose parts play on children's cognitive, social and emotional development. *School Mental Health*, 9(4), 295–309. <https://doi.org/10.1007/s12310-017-9220-9>
- Grissmer, D., Grimm, K. J., Aiyer, S. M., Murrah, W. M., & Steele, J. S. (2010). Fine motor skills and early comprehension of the world: Two new school readiness indicators. *Developmental Psychology*, 46(5), 1008–1017. <https://doi.org/10.1037/a0020104>
- Hadiyanti, S. M., & Elan, T. R. (2021). Analisis media loose part untuk meningkatkan kemampuan motorik halus anak usia dini. *Jurnal PAUD Agapedia*, 5(2), 237–245.
- Hanafi, H. (2015). Upaya meningkatkan kreativitas anak dengan memanfaatkan media barang bekas di TK Kota Bima. *Jurnal Pendidikan dan Pemberdayaan Masyarakat*, 2(2), 215–225. <https://doi.org/10.21831/jppm.v2i2.6360>
- Hasanah, U. (2018). Strategi pembelajaran aktif untuk anak usia dini. *INSANIA: Jurnal Pemikiran Alternatif Kependidikan*, 23(2), 204–222. <https://doi.org/10.24090/insania.v23i2.2291>
- Khaironi, M. (2018). Perkembangan anak usia dini. *Jurnal Golden Age*, 2(1), 1–12. <https://doi.org/10.29408/goldenage.v2i01.739>
- Kuraedah, S., & Anhusadar, L. O. (2020). Meningkatkan keterampilan motorik halus anak melalui mencetak dengan pelepah pisang. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 4(1), 211–223. <https://doi.org/10.31004/obsesi.v4i1.299>
- Kurniawan, E. Y. (2019). Pendidikan berbasis kreativitas pada mahasiswa PGPAUD melalui pemanfaatan media barang-barang bekas dalam pembelajaran musik perkusi. *CERIA: Jurnal Program Studi Pendidikan Anak Usia Dini*, 7(2). <https://doi.org/10.31000/ceria.v9i2.1272>
- Kurniawati, W., & Atmojo, S. E. (2017). Pembelajaran sains bermuatan karakter ilmiah dengan alat peraga barang bekas dan asesmen kinerja. *JPI: Jurnal Pendidikan Indonesia*, 6(1). <https://doi.org/10.23887/jpi-undiksha.v6i1.8866>
- Lillard, A. S., Lerner, M. D., Hopkins, E. J., Dore, R. A., Smith, E. D., & Palmquist, C. M. (2013). The impact of pretend play on children's development: A review of the evidence. *Psychological Bulletin*, 139(1), 1–34. <https://doi.org/10.1037/a0029321>
- Maghfirah, S. (2019). Pemanfaatan barang bekas dalam meningkatkan kemampuan motorik halus anak. *Atfalunā: Journal of Islamic Early Childhood Education*, 2(1), 48–52. <https://doi.org/10.32505/atifaluna.v2i1.938>
- Mayar, F., Uzlal, U., Nurhamidah, Ernawati, S., Rahmawati, R., & Desmila. (2022). Pengaruh lingkungan sekitar untuk pengembangan kreativitas anak usia dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 6(5), 4794–4802. <https://doi.org/10.31004/obsesi.v6i5.2665>
- Mulyani, N. (2019). Mengembangkan kreativitas anak usia dini. *Remaja Rosdakarya*.
- National Association for the Education of Young Children. (2020). Developmentally appropriate practice: A position statement of the National Association for the Education of Young Children. <https://www.naeyc.org/resources/position-statements/dap/contents>
- Novitasari, N. (2024). The use of loose parts media as a strategy for developing early childhood creativity. *Al Hikmah: Indonesian Journal of Early Childhood Islamic Education*, 8(2). <https://doi.org/10.35896/ijecie.v8i2.863>
- Nurahman, A. (2019). Peran serta media pembelajaran dalam memfasilitasi belajar anak usia dini. *Jurnal Pendidikan Anak*, 7(2), 101–105. <https://doi.org/10.21831/jpa.v7i2.24453>
- Nuraini, Y., & Hartati, S. (2020). Memacu kreativitas melalui bermain. *Bumi Aksara*.
- Nurfadila, Nurmalina, & Amalia, R. (2020). Kemampuan motorik halus melalui kegiatan kolase dengan bahan loose part pada anak usia 4–6 tahun di Bangkinang Kota. *Journal On Teacher Education*, 2(1), 1–6.
- Nurjanah, A. (2020). Pembelajaran STEM berbasis loose parts untuk meningkatkan kreativitas anak usia dini. *Jurnal Pendidikan Anak Usia Dini*, 1(1), 19–31.

- Nurjanah, S., & Muthmainah. (2023). Pengaruh media loose part terhadap kreativitas dan motorik halus anak usia dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(3), 3519–3536. <https://doi.org/10.31004/obsesi.v7i3.4434>
- Rachmawati, Y., & Kurniati, E. (2016). Strategi pengembangan kreativitas pada anak usia taman kanak-kanak. *Kencana*.
- Rahayu, H., Yetti, E., & Supriyati, Y. (2020). Meningkatkan kreativitas anak usia dini melalui pembelajaran gerak dan lagu. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 5(1), 832–840. <https://doi.org/10.31004/obsesi.v5i1.691>
- Rahmawati, I. G. A. Y., & Tirtayani, L. A. (2021). Media e-scrapbook untuk menstimulasi kreativitas anak usia dini. *Jurnal Pendidikan Anak Usia Dini Undiksha*, 9(2). <https://doi.org/10.23887/paud.v9i2.35404>
- Runco, M. A., & Jaeger, G. J. (2012). The standard definition of creativity. *Creativity Research Journal*, 24(1), 92–96. <https://doi.org/10.1080/10400419.2012.650092>
- Safitri, D., & Lestarinigrum, A. (2021). Penerapan media loose part untuk kreativitas anak usia dini. *Kiddo: Jurnal Pendidikan Islam Anak Usia Dini*, 2(1), 40–52.
- Sanenek, A. K., Nurhafizah, Suryana, D., & Mahyuddin, N. (2023). Analisis pengembangan kemampuan motorik halus pada anak usia dini. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 7(2).
- Sari, M. M., Nasirun, M., & Ardina, M. (2020). Kreativitas anak dalam membuat karya dengan barang bekas. *Jurnal PENA PAUD*, 1(1), 72–80. <https://doi.org/10.33369/penapaud.v1i1.13975>
- Siantajani, Y. (2020). Loose parts: Material lepasan otentik stimulasi PAUD. *Sarang Seratus Aksara*.
- Sugiyono. (2019). *Metode penelitian kuantitatif, kualitatif, dan R&D*. Alfabeta.
- Sumantri. (2015). *Model pengembangan keterampilan motorik anak usia dini*. Departemen Pendidikan Nasional.
- Suyadi. (2014). *Teori pembelajaran anak usia dini dalam kajian neurosains*. Remaja Rosdakarya.
- Suyadi, & Ulfah, M. (2013). *Konsep dasar PAUD*. Remaja Rosdakarya.
- van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher–student interaction: A decade of research. *Educational Psychology Review*, 22, 271–296. <https://doi.org/10.1007/s10648-010-9127-6>
- Wandi, Z. N., & Mayar, F. (2019). Analisis kemampuan motorik halus dan kreativitas pada anak usia dini melalui kegiatan kolase. *Jurnal Obsesi: Jurnal Pendidikan Anak Usia Dini*, 4(1), 347–352. <https://doi.org/10.31004/obsesi.v4i1.347>
- Weisberg, D. S., Hirsh-Pasek, K., Golinkoff, R. M., Kittredge, A. K., & Klahr, D. (2016). Guided play: Principles and practices. *Current Directions in Psychological Science*, 25(3), 177–182. <https://doi.org/10.1177/0963721416645512>
- Zosh, J. M., Hopkins, E. J., Jensen, H., Liu, C., Neale, D., Hirsh-Pasek, K., Solis, S. L., & Whitebread, D. (2018). *Learning through play: A review of the evidence*. The LEGO Foundation.