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Improving Sensory-Motor Skills in 4-5 Year Old Children through Natural Material Center Learning

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Abstract

This study aims to describe the implementation of learning at the Natural Materials Center in stimulating the sensory-motor development of children aged 4–5 years. It also seeks to identify effective forms of play activities and examine the supporting and inhibiting factors influencing its implementation. This research employed a descriptive qualitative approach conducted at Kartika III–16 Depo Kindergarten, South Klaten, Central Java. The research subjects consisted of classroom teachers and children aged 4–5 years. Data were collected through observation, interviews, and documentation to obtain comprehensive information regarding learning activities and children's development. Data analysis was carried out through three stages: data reduction, data presentation, and conclusion drawing.The findings indicate that learning at the Natural Materials Center is effective in improving children's sensory-motor skills. Exploratory activities using natural materials such as leaves, sand, clay, water, and grains stimulated hand–eye coordination, strengthened finger muscles, and enhanced precision and concentration. Teachers played a crucial role as facilitators, motivators, and innovators in designing engaging, enjoyable, and developmentally appropriate activities. Supporting factors included teacher creativity in utilizing natural materials, children's enthusiasm for exploration, and active support from parents and the school. However, limited availability of natural materials and differences in children's motor abilities were identified as inhibiting factors.This study demonstrates that learning at the Natural Materials Center not only enhances sensory-motor development but also contributes positively to children's cognitive, socio-emotional, language, and character development in early childhood education.

Keywords: Sensorymotor Skills, Early Childhood, Natural Materials Center, Nature-Based Learning

Introduction Section

The main pillar of improving the quality of future human resources is early childhood education, or PAUD *(Pendidikan Anak Usia Dini)*. At this stage, all of a child's potential—which includes cognitive, social, emotional, linguistic, and physical-motor components— begins to grow and develop rapidly. Early childhood education, as defined in Law Number 20 of 2003 concerning the National Education System, is an educational effort that aims to prepare children from birth to six years of age by providing educational stimulation to support their physical and spiritual growth and development, as well as ensuring their readiness to enter the next level of education. In essence, the goal of early childhood education is to support the overall development of children, with a focus on nurturing all aspects of growth and development (Werdiningsih, 2022). The term "golden age" is often used to describe early childhood. Rapid growth is a characteristic of this period. For further development, stimulation is very important in all conditions of growth (Rijkiyani, Syarifuddin, & Mauizdati, 2022). Because children's brains develop to 80% of their full potential at this age, every learning activity has a major impact on the development of their skills and personalities. Therefore, early childhood education should be planned to meet children's developmental needs, rather than academic requirements for reading, writing, and arithmetic (calistung), which is a common mistake in this sector. Learning to read, write, and count at an early age can actually hinder normal brain development and have a negative impact on children's mental and emotional well-being. Early childhood education should emphasize the importance of fun and meaningful play and encourage children to explore their surroundings.

Because sensorimotor development lays the foundation for the development of other skills, development. This is a crucial area that requires a lot of attention throughout the golden age. Children can achieve fine motor development through motor development, which offers many opportunities for movement, educational experiences, and sensorimotor activities involving large and small muscles (Gay, Taib, & Haryati, 2020). Children who experience optimal sensorimotor

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development have an understanding of the world, comprehend concepts of size, shape, and space, and learn to control their bodies to perform various tasks such as writing, grasping, and walking steadily. Cognitive, linguistic, social, emotional, physical-motor, moral, and religious values are some elements of this development (Pratiwi, Kurnia, & Nopiana, 2017). Therefore, children's academic readiness and future life skills are built upon their sensorimotor skills.

According to preliminary findings by researchers at Kartika III-16 Depo Kindergarten in South Klaten, Central Java, some children aged 4-5 years still face challenges in their sensorimotor development. Activities that require eyehand coordination, including cutting, stringing beads, or pasting pictures, appear to be challenging for certain children. In addition, some children seem to lack confidence in activities that require large body movements, including jumping, walking straight ahead, or throwing a ball effectively. Teachers said that the lack of motor stimulation in children could be caused by a number of factors, including a lack of variety in exploration-based activities and a lack of learning materials. In addition, most classroom activities are still teacher-centered and do not maximize children's active participation in the learning process. Findings from initial interviews with classroom teachers support this condition, showing that most children are less active in performing tasks that require hand dexterity and motor coordination. Although they receive less organized instruction to build their sensorimotor skills, children are more enthusiastic in free play activities. This shows that teaching approaches and strategies in kindergarten still need to be modified to better meet the developmental needs of young children. In addition, observations show that the school environment is rich in natural resources that can be used as teaching aids, including sand, stones, soil, leaves, and water. Teachers have not fully incorporated these resources into children's daily activities, so their use is still limited.

This situation necessitates a more contextual, organic, and experiential approach to learning. Center-based learning—more specifically, the Natural Materials Center—is one relevant strategy that gives children the opportunity to explore various natural materials in their environment. According to (Nurhasanudin & Santika, 2021), the center method is an early childhood learning model that can be used both inside and outside the classroom. It includes various play activities organized according to children's skills and themes that have been developed and created in advance, all while utilizing appropriate equipment. Children can engage in activities at the natural materials center with a variety of tools appropriate to their needs, including dry and water-based tools and materials (Pratiwi, Kurnia, & Nopiana, 2017). Children can simultaneously develop their fine and gross motor skills, tactile senses, and visual observation through these activities. The child-centered learning approach is called center learning. Play centers and circle time are the main places where learning takes place. To aid children's development in three different forms of play—sensorimotor (functional) play, role play, and construction play—play centers are children's play spaces equipped with a variety of play equipment (Marwah, 2017). Children can stir sand, shape clay, group grains, or pour water into various containers. These simple exercises help children focus and be more accurate while strengthening their grip and training the coordination of the small muscles in their hands. However, substantial muscles and body balance are trained by activities that require substantial body movements, such as shoveling sand or lifting water containers. Therefore, the Natural Materials Center encourages children's creativity, curiosity, and connection with nature, in addition to supporting sensorimotor development.

Play-oriented learning, or learning through play and playing through learning, is at the core of early childhood education (Rozalena & Kristiawan, 2017). When children are actively engaged in interesting activities, they learn most efficiently. Therefore, Natural Materials Center programs need to be planned with a light approach that combines aspects of observation, inquiry, and discovery. Children can develop their ability to pay attention to the texture, weight, shape, and color of objects around them by playing with natural materials. They also learn how to solve basic problems, such as how to stack stones so they don't fall over or how to keep clay from drying out too much. Together, these processes help children develop their social, motor, and critical thinking skills. Because many teachers still do not fully understand how to maximize the potential of the Natural Materials Center to encourage child development, this research is crucial. Based on preliminary findings, some educators still believe that learning with natural materials is only suitable for ordinary play activities, without realizing its pedagogical and therapeutic benefits for child development. In fact, these exercises can naturally improve children's balance, coordination, manual dexterity, and sensory awareness. Therefore, further research is needed to determine how the establishment of Natural Material Centers can significantly improve children's sensory motor skills.

Additionally, preparing children to reach academic milestones is closely related to optimal motor development. Them, making this research crucial. Children with strong hand-eye coordination will find it easier to learn to write, draw, and use writing instruments correctly. On the other hand, children with fine motor deficits often have difficulty engaging in advanced academic tasks. Therefore, this research not only advances children's physical development but also builds a crucial foundation for future academic achievement. In fact, the Natural Materials Center also provides a platform for fostering moral principles such as accountability, teamwork, and environmental awareness. Children learn to share tasks, support each other, and appreciate the work of their peers when they collaborate in small groups to create art using natural materials. Through connection and teamwork in fun learning activities, these moral and social qualities develop organically. Thus, the Natural Materials Center serves as a place for character development from an early age, in addition to providing opportunities to practice motor skills.

Teachers' creativity in planning lessons, managing classrooms, and monitoring student growth is very important for the effectiveness of learning at the Natural Materials Center (Ningsih, Prasetyo, & Hasanah, 2022). Throughout the activities, teachers act as motivators, facilitators, and monitors of children's growth. In addition to providing guidance,

teachers give children the opportunity to try new things, make choices, and solve problems on their own. Therefore, teachers must understand the stages of child development, the basics of learning through play, and the integration of sensory-motor activities into all learning activities. In addition, a positive school climate is essential for successful learning centered on the Natural Materials Center. Safe open areas, a variety of natural materials, and supporting facilities such as play equipment, containers, and cleaning supplies are necessary for the school. Children's curiosity and enthusiasm for exploration will increase in a dynamic atmosphere. In addition, it is important for parents to encourage their children's learning activities at home. Simple activities such as gardening, cooking together, or playing with sand can help parents maintain sensorymotor stimulation at home (Ekawaty & Ruhaena, 2020).

More generally, this study is expected to address public ignorance about the importance of early sensorimotor stimulation sensory-motor stimulation for children. Many educators and parents place more emphasis on intellectual abilities than on motor and physical development. However, the foundation of holistic child development is a balance between cognitive and physical dimensions. By introducing learning through the Natural Materials Center, the early childhood education paradigm is expected to shift towards being more enjoyable, natural, and aligned with the developmental needs of young children. This research is also expected to enrich scientific knowledge in the field of early childhood education, particularly regarding the application of center-based learning. The findings of this study will provide an empirical summary of the effectiveness of the Natural Materials Center in developing the sensorimotor skills of four- to five-year-old children. The findings of this study can also be used as assessment and innovation materials to help teachers create more diverse, flexible, and child-centered learning models.

Theoretically, this study is based on Piaget and Montessori's theories of child development, which highlight the value of direct experience in the learning process. Piaget argues that infants build their knowledge through contact with their environment (Hasby, Malora,, Widyastutik, & Anggraeny, 2023), while Montessori emphasizes that manipulative and exploratory activities are important for children's motor development (Anggraini, Hasanah, & Zahro, 2025). By giving children the opportunity to learn through hands-on activities that stimulate their senses and body movements, the Natural Materials Center is a direct representation of both ideas. This study aims to bridge the gap between theory and practice in early childhood education with a strong theoretical foundation and empirical findings in the field. Although many early childhood education institutions are aware of this concept, they have not yet utilized it to its full potential. This study will provide specific examples of how to plan, implement, and assess activities in the Natural Materials Center in a way that best supports children's sensorimotor development. In addition to benefiting educators and educational institutions, this study is expected to increase parents' understanding of the importance of natural materials-based play activities. Armed with this information, parents can play a more active role in creating a home environment that supports their children's development. When done consistently and with focus, simple sensorimotor tasks such as watering plants, making dough, or playing with clay can be beneficial.

The above description leads us to conclude that early childhood education at the Natural Materials Center has great potential to improve children's sensorimotor skills, especially those aged between 4 and 5 years. This method fosters emotional bonds between children and their natural environment, in addition to offering valuable educational opportunities. Children who receive appropriate stimulation will develop into independent and imaginative adults who are ready to face new challenges. Therefore, the study "Improving Sensory-Motor Skills in Children Aged 4–5 Years Through Natural Materials Center Learning" is very important. It is hoped that this study will significantly advance the field of early childhood education, both theoretically and practically. The findings of this study will be used as a guide to create attractive, contextual, and effective early childhood learning strategies. These findings will also encourage other early childhood education institutions to create natural environment-based learning programs that promote optimal and sustainable sensorimotor development.

Literature Review

As a basis for expanding theoretical knowledge and gaining an overview of the amount of research that has been conducted on related subjects, researchers reviewed a number of previous studies relevant to this research problem. The purpose of reviewing previous studies was to prevent duplication of findings while revealing research gaps that require further investigation. By conducting this literature review, researchers can understand the strengths, weaknesses, and potential opportunities for progress in the field of early childhood education—particularly those related to the development of sensorimotor skills through learning based on the Natural Materials Center. To obtain a theoretical basis relevant to this research problem, the researchers reviewed previous studies and also referred to books and other scientific works on early childhood development. Some of the previous studies that were the main references in this study were conducted by (Azizah, 2023) in a journal entitled *"The Effect of the Natural Materials Center Learning Model on the Fine Motor Development of Young Children Early Childhood*," published in *INNOVATIVE: Journal of Social Science Research*, Vol. 3(3). The results of the study show that the use of the natural center learning model can affect children's fine motor development. Another study was conducted by (Sari, 2021) through the journal *Golden Age PAUD* Vol. 4(2), entitled *"Stimulating Children's Motor Development Through Play Activities in Nature Centers."* The results of this study confirm that an exploration-based approach to playing in natural environments can improve eye-hand coordination and balance in

children aged 4-5 years. Through activities such as walking on uneven surfaces, collecting natural objects, or playing with water, children gain multisensory experiences that significantly strengthen their gross and fine motor skills.

Furthermore, (Niati, 2019) in her study entitled *"The Role of Teachers in Stimulating Motor Skills in Early Childhood through Natural Materials Centers"* highlights the importance of the role of teachers as designers of activities that are appropriate for the developmental stage of children. Teachers not only act as facilitators, but also as observers who are able to provide appropriate stimulation through the use of natural materials. This study confirms that sensorymotor activities in the Natural Materials Center will achieve optimal results if teachers have the ability to manage a learning environment that is safe, creative, and challenging for children. Meanwhile, research conducted by (Nurmalasari, 2022) entitled *"Natural Materials Centers can Develop Fine Motor Skills at Permata Bunda Kindergarten, Kedamaian District, Bandar Lampung"* also shows relevant results. Learning through the Natural Materials Center provides significant stimulation for children's fine motor development, although the results are not yet fully optimal. Children show improved eye-hand coordination and finger movements, but still have difficulty grasping and controlling the movements of both hands. These findings confirm that the use of the Natural Materials Center as a learning medium is very important in providing concrete and meaningful learning experiences for early childhood.

Based on these four studies, it can be said that the development of motor skills in early childhood can be significantly improved through learning at the Natural Materials Center. The integration of fine and gross motor skills, and how both can be developed simultaneously through play activities at the Natural Materials Center, has not received much attention in previous studies, with most studies still focusing on fine motor features. This gap provides the basis for future research, which will focus on the holistic development of sensory motor skills in children, including the integration of sensory functions and motor responses. A framework that shows the logical relationship between problems, theories, and suggested solutions is needed to understand the direction and rationale behind this research. The importance of early childhood sensory motor development and the value of Natural Material Center-based learning in promoting this process form the basis for the development of this framework. It is hoped that this research will be able to explain, using a welldefined framework, how contextual and experience-based learning strategies can promote child development in the best possible way. Early childhood development is a critical period that significantly influences subsequent educational achievement. Every element of child development—physical, cognitive, linguistic, social, emotional, and moral—develops rapidly and is interrelated during this period. Sensorimotor skills are one of the components that form the basis for the development of other abilities. Children who have developed their sensorimotor skills well are usually better able to focus, control their body movements, and adapt to various learning environments. Therefore, one of the main needs in early childhood education is appropriate stimulation for this element.

However, the reality on the ground shows that many 4-5 year olds still experience difficulties with their motor skills or experience delays. Children often have difficulty cutting, writing, drawing, and maintaining balance when participating in physical activities such as jumping and running, according to observations made in a number of early childhood education facilities. An overly academic and less exploratory learning style, a lack of learning materials that encourage motor development, and a lack of appropriate physical activity can contribute to this condition. As a result, children's sensory-motor development is not stimulated to its full potential. In this case, learning center-based learning offers an effective strategy to provide children with more organic and meaningful learning opportunities. The Natural Materials Center is one type of learning center that is important for developing sensory-motor skills. Children can interact directly with natural materials such as sand, soil, water, leaves, seeds, and stones in this center. Squeezing, pouring, stirring, sculpting, and arranging these materials are examples of exploratory activities that provide children with multimodal experiences that improve the precision, coordination, and strength of their small and large muscles.

Learning at the Natural Materials Center enhances children's cognitive and emotional development in addition to providing physical stimulation. Through the activities they participate in, children learn to observe, categorize, and solve basic problems. Children practice critical thinking and problem-solving techniques, for example, when they try to stack stones so they don't fall or combine soil and water to create a certain texture. In addition, these activities encourage independence, curiosity, and collaborative skills among friends. In addition to the materials used, the teacher's ability to create meaningful and useful activities is very important for successful learning in the Natural Materials Center. Teachers act as facilitators, helping children experiment and explore without taking away the fun aspects of play. In order for children to explore freely without fear or pressure, teachers must also be able to provide a clean, safe, and conducive learning environment. The sensory-motor stimulation of children through activities at the Natural Materials Center is therefore influenced by Teacher involvement. To support these learning outcomes, parental involvement is just as important as teacher involvement. Activities at home, such as gardening, cooking together, or playing with sand, can help parents maintain the stimulation provided at school. Cooperation between teachers and parents will provide good continuous stimulation for children's growth. Thus, everyday experiences at home strengthen children's sensorimotor development, which is not only formed in the school environment.

The above explanation clarifies that learning through the Natural Materials Center has significant potential to improve the overall sensorimotor skills of early childhood education. However, there are still problems in its implementation in the field, including inadequate facilities, lack of training for teachers, and low utilization of natural materials as teaching aids. To better understand how the Natural Materials Center can be implemented, what types of activities are most effective, and how teachers and the environment can encourage the success of this learning, this

research is very important to conduct. The objective of this study, which focuses on "Improving Sensorimotor Skills in 45 Year Old Children Through Learning at the Natural Materials Center," is to explain how the activities are implemented, what types of stimulation are offered, and what aspects help or hinder learning. In addition to finding an adaptive, entertaining, and developmentally relevant learning model for young children, this study aims to enhance theoretical and practical references for educators designing nature-based learning strategies.

Research Method

One technique for conducting research based on original and distinctive studies is qualitative research (Yusanto, 2020). This study uses descriptive qualitative methodology with the aim of comprehensively describing how the use of learning at the Natural Materials Center can improve the sensorimotor skills of children aged 4 to 5 years at Kartika III–16 Depo Kindergarten in Glodogan, South Klaten, Central Java. The purpose of research that aims to understand symptoms that do not need to be quantified or that cannot be measured accurately is what defines the qualitative method (Abdussamad, 2021). The focus of this study is on how children's sensorimotor development manifests itself through play activities such as pinching, grabbing, pouring, arranging, and investigating natural things. The children in group A and the classroom instructor, who actively participated in the learning activities, were the subjects of the study. Three main methods were used to collect research data: documentation, interviews, and observation. One direct method of collecting data on various topics is through interviews (Lianjani, 2018). The researcher conducted observations by visiting the field directly (Bulan, 2016). Observations were made to see how children participated in activities. Teachers and principals were interviewed to obtain detailed information about learning practices and factors that facilitated and hindered learning. Written information and photographs of related activities were obtained through documentation. According to Miles and Huberman's proposal, data analysis was conducted interactively in three stages: data reduction, data presentation, and conclusion drawing (Islamarinda, 2018). By comparing the findings from observation, interviews, and documentation, triangulation of sources and methodologies maintained data validity. With the help of interview guides and observation sheets tailored to the research focus—such as learning implementation, teaching techniques, activity efficacy, and their impact on child development—the researcher herself acted as the main research instrument. It is hoped that this research will offer a deeper understanding of the importance of Natural Materials Center learning in improving children's sensorymotor development and serve as a guide for educators in developing imaginative, useful, and appropriate early childhood learning activities.

Research Results and Discussion

The researcher conducted in-depth interviews with teachers in Class A as the main source of information on the use of nature-based learning at Kartika III-16 Depo Kindergarten. The purpose of these interviews was to collect data on the planning, implementation, tactics, and effectiveness of learning in improving the motor and sensory skills of four- to five-year-old children. The interviews were also used to identify the obstacles and facilitators encountered by teachers during learning activities, as well as how they innovated in creating teaching materials from natural materials. Aspects of learning implementation, teacher strategies, activity effectiveness, supporting and inhibiting factors, innovation, child involvement, learning environment, learning impact, and teacher reflections on the implementation of natural materialbased learning were some of the research indicators used to formulate interview questions.

Planning topics and selecting appropriate natural materials, such as leaves, sand, clay, and grains, are the first steps in implementing activities at the natural materials center. Through activities such as shaping, gluing, mixing, and sorting materials, children are given the opportunity to explore directly. Especially when they can touch and feel the texture of these materials, children react enthusiastically. and seem to enjoy the activity. Teachers must overcome various problems, including the scarcity of some natural elements and differences in student skills, which require various types of assistance. Teachers use basic experiments and inquiry as part of their play-based learning strategy. Each activity is tailored to the children's skills and interests. For example, more experienced children are encouraged to create artwork using natural materials, while less experienced children are directed to perform easy tasks such as pouring or gluing. To increase the children's excitement, teachers also provide incentives in the form of praise and gifts. The children's accuracy, focus, finger strength, and hand-eye coordination showed significant improvement after several exercises. The children showed greater independence in using spoons and small scissors. The children's work and activities were observed directly for assessment. The encouragement of the principal, the instructors' ingenuity in utilizing available local resources, the children's excitement, and the enthusiasm of parents in providing supplies are examples of supporting elements. Insufficient time for all activities and the limited availability of some natural materials during certain seasons were obstacles.

Teachers use natural clay and colored sand to create sensory games and leaf collages, in among other innovative media. These media are designed to meet the needs of children and the subjects taught. For example, stringing beads helps children practice their fine motor skills. To ensure that children feel actively involved, teachers also allow them to

make toys. During activities, teachers observe firsthand how children use their hands, collaborate with peers, and complete tasks. To monitor each child's progress and select follow-up activities, observation notes are used. Most children show high interest and active participation. The structure of the facility allows children to walk freely and creates a safe and open environment. In order for children to move freely, each item is placed in its proper place. Small equipment and work tables help develop fine motor skills, while significantly improving gross motor skills. Instructors ensure that the room is clean and that equipment is available. Through cooperation and sharing of materials, activities at the natural materials center not only improve motor skills but also social skills, expand children's vocabulary through conversations about textures and shapes, and encourage independence in completing tasks. Children also develop an appreciation for nature and their surroundings. According to the teachers, these exercises are beneficial and enjoyable for children. With the help of more extensive facilities and better teacher training, they are confident that this program can be expanded. To foster children's love for the environment from an early age, they also hope that these natural materialsbased activities will become a sustainable part of the curriculum.

Children aged 4-5 years benefit greatly from using the Natural Materials Center to improve their fine motor and sensory skills, according to research conducted at Kartika III-16 Kindergarten, Depok. Children can develop multisensory experiences that improve their hand-eye coordination, finger strength, and accuracy when performing controlled movements through exploratory activities involving direct contact with various natural materials, including sand, leaves, clay, and grains. These results are consistent with (Azizah, 2023) research, which found that the fine motor development of early childhood is greatly influenced by learning based on Natural Material Centers. Azizah emphasized that children's fine motor skill development can be improved naturally and enjoyably through activities that allow them to touch, reach for, and hold natural objects. Teachers at Kartika III-16 Kindergarten in Depok play an important role in creating activities that are appropriate for the developmental stage of their students. Teachers make lesson plans before activities begin, which include selecting resources, determining topics, and adjusting activities to meet the needs of each student. This illustrates how educators ensure that activities are safe and meaningful by acting as active observers and facilitators. This position reinforces (Niati, 2019) findings, which highlight how important it is for educators to be able to oversee an innovative and challenging learning environment. Niati emphasizes that the extent to which educators can combine exploratory activities with a child-centered approach determines the success of learning at *the Natural Materials Center.*

Children's reactions to the Natural Materials Center activities were very positive, according to field observations. In each The children are enthusiastic and engaged in the activities. They enjoy holding clay, arranging small stones, and sticking dry leaves to create basic works of art. In addition to encouraging fine motor skills, these activities give children the opportunity to practice social and emotional competencies, including sharing, cooperating, and waiting for their turn. This condition reinforces (Sari, 2021) findings, which state that children aged 4 to 5 years can develop balance and handeye coordination through game-based exploration of the natural environment. Sari emphasizes that children's physical and mental readiness for more challenging learning activities is positively influenced by direct experiences gained through engagement with nature. The philosophy of constructivism, which states that children construct their own knowledge through real experiences and interactions with the environment, is also demonstrated by the Natural Materials Center learning program at Kartika III–16 Kindergarten in Depok. Instructors are not the only source of information; they are merely facilitators and guides. This supports Piaget's theory that active exploration of the world around young children is the most effective way for them to learn. Children develop their motor skills while learning new concepts about texture, color, and shape through activities such as combining sand and water or making patterns with grains. Learning with natural materials provides children with a real-world environment in which to develop their logical and sensorimotor thinking skills naturally.

Teachers faced a number of challenges in implementing the program, including a lack of natural materials in some seasons, varying levels of student skill, and very little time for in-depth investigation. Teachers showed a high degree of ingenuity in adapting the program, so these challenges did not pose any significant difficulties. Teachers used similartextured substitute materials when certain materials were difficult to find, such as using pieces of linen cloth for leaves or small stones for dry seeds. These efforts demonstrate teachers' ability to adapt to real-world situations. These results are consistent with (Nurmalasari, 2022) research, which found that, although not yet optimal, learning at the Natural Materials Center (SPN) significantly stimulated children's fine motor development. Differences in individual results were influenced by time and resource constraints. Teachers at Kartika III-16 Kindergarten in Depok use learning techniques that focus on the concept of learning by doing, which is teaching children by letting them experience things firsthand. Teachers give children many opportunities to try new things and learn new things using the resources they have. Without worrying about making mistakes, children are free to experiment with various materials, shapes, and combinations of objects. This method has been proven to increase children's self-esteem, curiosity, and problem-solving skills. This supports the findings of (Azizah, 2023) study, which found that when Natural Materials Center-based activities directly involve children in the learning process, it helps them develop a sense of responsibility and self-confidence. Similar tactics have been used by teachers at Kartika Kindergarten, who combine group and individual activities to simultaneously foster social and emotional development.

The learning space at the Natural Materials Center is designed to give children flexibility to walk around, explore, and interact with their surroundings. A love of nature is nurtured and a peaceful learning environment is created thanks to the design and use of adaptive natural materials. Teachers arrange resources in transparent, easily accessible containers

so that children can choose what they want. This arrangement encourages Montessori-based education, which emphasizes the importance of a prepared environment—one that encourages children's independence and curiosity. In this case, education at the Natural Materials Center helps children build their character and sense of social responsibility from an early age, in addition to providing a means for motor stimulation. Hurlock's (1978) theory of development, which states that repetitive activities requiring eye-hand coordination promote optimal fine motor development, can also be used to explain the growth in fine motor skills seen at Kartika III–16 Kindergarten in Depok. Children who regularly participate in activities at the Natural Materials Center show significant improvement in their ability to grasp, pinch, press, and control hand movements accurately. These findings are in line with the research of (Sari, 2021) and (Nurmalasari, 2022), who found that children's fingers and wrists can develop small muscles through repeated stimulation from nature-based games. These muscles serve as the foundation for writing skills and other academic activities in the future.

Additionally, a key element in the effectiveness of this learning process is parental involvement. Many parents. Helping their children practice at home, providing materials from home, and actively participating in school activities, according to teachers. The results of (Niati, 2019) study, which highlights the importance of cooperative relationships between educators and parents in creating a learning environment that encourages child growth, are supported by this partnership. Children gain consistent and continuous learning experiences when stimulation at home and at school is maintained, leading to faster and more stable motor development. Taking all things into consideration, the findings of this study support previous research showing that Natural Material Center-based learning is a successful strategy for improving the sensorimotor skills of early childhood. In addition to being relevant to the studies of (Azizah, 2023), (Sari, 2021), (Niati, 2019), and (Nurmalasari, 2022), these findings also provide a useful contribution, showing that exploratory activities utilizing natural materials can produce comprehensive and meaningful learning experiences when teachers are creative, the environment is supportive, and parents are involved. The cognitive, social-emotional, linguistic, and character development of children are all supported by this learning, alongside their physical growth. Therefore, in current early childhood education, the Natural Materials Center is a relevant, contextual, and effective learning approach.

Conclusion

The implementation of learning through the Natural Materials Center has successfully improved the sensory motor skills of children aged 4-5 years, according to the findings of a study conducted at Kartika III-16 Depo Kindergarten. Natural materials such as leaves, clay, sand, and grains can be used in exploration activities to provide children with direct experiences that improve their finger strength, hand-eye coordination, and fine motor skills. Teachers play an important role in this situation because they are the discoverers, motivators, and facilitators of imaginative and entertaining activities. Teachers can tailor activities to the needs and abilities of each child by starting with careful lesson planning. Children's sense of freedom, responsibility, and cooperation are also nurtured during the learning process when participatory play-based learning strategies are used. The children's excitement, the teachers' creativity, and the active involvement of parents and schools are key elements that contribute to the success of these activities. The three work together to create a friendly, safe, and entertaining learning environment. On the other hand, inhibiting variables include the scarcity of some natural resources and variations in each child's motor skill level. However, with continuous parental support and creative teaching, these challenges can be overcome. Taking all things into consideration, education at the Natural Materials Center is beneficial for children's cognitive, social-emotional, linguistic, and character development, in addition to their sensory and fine motor skills. Thus, natural materials-based learning techniques can be a useful tactic for maximizing early childhood development in all aspects.

Recommendations

Researchers offer the following suggestions based on field findings and research. First and foremost, teachers are expected to incorporate more creative elements into natural materials center activities, such as creating artwork from natural materials, rather than just focusing on simple things like pouring or shaping. Second, teachers must receive training to improve their capacity to create sensory-motor exercises that are appropriate for the child's developmental stage. Third, parental and school support is essential to maintain continuity of activities at home and to provide resources and facilities. Finally, it is recommended that more research be conducted to examine other areas of development, such as language or social-emotional, which can also be improved through activities in natural material centers. Thus, this education not only focuses on motor skills but also has the potential to influence early childhood development comprehensively and in the long term.

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