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Enhancing Cognitive Development Through Playdough Media at Titian Sejaterah Kindergarten, Muaro Jambi Regency

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ABSTRACT
Early childhood education plays a strategic role in laying the foundation for cognitive, social, emotional, and motor development. However, initial observations at Titian Serjatera Kindergarten, Talang Pelita, revealed low cognitive abilities among children, with an average score of only 25% in the Not Yet Developed category. This study aimed to enhance children's cognitive development through the use of playdough as a creative and interactive learning medium. The research employed a classroom action research (CAR) design based on Kurt Lewin's model, consisting of planning, action, observation, and reflection stages, implemented over two cycles involving 15 children aged 5–6 years from group B. Data were collected using observation sheets for cognitive development and teacher performance, and analyzed quantitatively and qualitatively. The results indicated a significant improvement from an average score of 25% in the pre-action stage to 44.54% in Cycle I, and 75.56% in Cycle II, reflecting attainment of the Very Well Developed category. These findings demonstrate that the structured use of playdough effectively stimulates logical thinking, problem-solving, and creativity in young learners.
Keywords: *Cognitive Development, Early Childhood Education, Playdough*

ABSTRAK
Pendidikan anak usia dini memiliki peran strategis dalam membentuk fondasi perkembangan kognitif, sosial, emosional, dan motorik anak. Namun, hasil observasi awal di TK Titian Serjatera Talang Pelita menunjukkan rendahnya kemampuan kognitif anak, dengan skor rata-rata hanya 25% pada kategori Belum Berkembang. Penelitian ini bertujuan untuk meningkatkan perkembangan kognitif anak melalui penggunaan media playdough sebagai sarana pembelajaran yang kreatif dan interaktif. Metode yang digunakan adalah penelitian tindakan kelas (PTK) model Kurt Lewin, meliputi tahap perencanaan, tindakan, observasi, dan refleksi, yang dilaksanakan dalam dua siklus pada 15 anak kelompok B berusia 5–6 tahun. Data dikumpulkan melalui lembar observasi perkembangan kognitif dan kinerja guru, kemudian dianalisis secara kuantitatif dan kualitatif. Hasil penelitian menunjukkan peningkatan signifikan dari skor rata-rata 25% pada pra-tindakan menjadi 44,54% pada siklus I, dan 75,56% pada siklus II, yang mengindikasikan pencapaian kategori Sangat Berkembang. Temuan ini membuktikan bahwa penggunaan media playdough secara terstruktur mampu menstimulasi keterampilan berpikir logis, pemecahan masalah, dan kreativitas anak.
Kata Kunci: *Perkembangan Kognitif, Pendidikan Anak Usia Dini, Playdough*

INTRODUCTION

Early childhood education (ECE) is fundamentally designed to facilitate the holistic growth and development of children by emphasizing the nurturing of all aspects of personality, including cognitive, language, social, emotional, physical, and motor skills. As Suryadi (2014) highlights, ECE provides opportunities for children to develop their personalities and potential to the fullest. To achieve this, ECE institutions must offer a variety of activities that foster comprehensive development through engaging, age-appropriate, and meaningful learning experiences. The early years serve as the foundation for lifelong learning, and any gaps in this stage may have long-term effects on a child's educational trajectory (UNESCO, 2021; Siraj et al., 2022).

Early education is a critical platform for establishing the essential building blocks of knowledge, attitudes, and skills in young children. The success of educational processes at this stage significantly influences subsequent learning experiences. Effective implementation in institutions such as Playgroups, Daycare Centers, Kindergartens, and early grades of primary school depends heavily on systematic and well-structured teaching approaches. According to Pianta et al. (2020), the quality of early educational experiences predicts later academic achievement, social competence, and emotional well-being.

Children naturally exhibit diverse developmental patterns in intelligence, talents, interests, creativity, emotional maturity, independence, and social skills. Neuroscientific research confirms that early stimulation plays a vital role in unlocking a child's potential, as young learners possess an innate, limitless capacity to learn when provided with an enabling environment (Shonkoff & Phillips, 2021). Without meaningful engagement, children risk missing critical developmental windows, potentially limiting their future capabilities. Therefore, early interventions must be designed to maximize these sensitive periods for optimal growth (Yoshikawa et al., 2020).

Cognitive development in early childhood is particularly significant because it forms the basis for thinking, learning, and understanding the surrounding world. Well-developed cognitive abilities prepare children for essential literacy and numeracy skills, which serve as cornerstones for formal education. Enhanced cognitive competence is also linked to stronger critical thinking and problem-solving abilities, enabling children to analyze situations, make appropriate decisions, and generate creative solutions (Anderson & Haney, 2020). Furthermore, cognitive growth is closely associated with language acquisition, emotional intelligence, and fine as well as gross motor development.

Play is a fundamental medium through which cognitive abilities can be enhanced. It fosters creativity, problem-solving skills, and adaptive thinking while providing experiential learning opportunities (Bodrova & Leong, 2015). Through playful activities, children develop conceptual understanding, reasoning skills, and the capacity to explore cause-and-effect relationships. In particular, educational games stimulate curiosity, reinforce memory retention, and encourage social interaction, all of which contribute to well-rounded development (Nicolopoulou,

2021). Playdough, as a hands-on and versatile educational tool, offers children opportunities to engage in creative exploration while strengthening cognitive, affective, and psychomotor domains. Activities involving playdough stimulate fine motor coordination, spatial awareness, and symbolic thinking. Studies have shown that structured playdough activities enhance children's understanding of shapes, numbers, and spatial relationships while promoting problem-solving and collaborative learning (Tzuriel & Hanuka-Levy, 2019; Mursid et al., 2023). Playdough's low cost and accessibility make it especially valuable in resource-limited educational settings.

This study was conducted at Titian Sejahtera Kindergarten, Talang Pelita, where observations revealed delays in children's ability to recognize letters, numbers, and shapes, limited use of play-based learning, and inadequate educational tools. Teachers primarily relied on conventional verbal and written instruction, which was less engaging for the learners. Considering these challenges, this research aims to investigate the effectiveness of playdough as a medium to improve early childhood cognitive development, particularly in rural and economically disadvantaged settings. Specifically, the study seeks to determine how structured playdough-based activities can enhance logical thinking, critical reasoning, and problem-solving skills among young learners.

METHOD

This study employed a classroom action research (CAR) design, as it was conducted in accordance with the cyclical stages of action research, which include planning, implementation, observation, and reflection. The research was carried out at Titian Sejahtera Kindergarten, located in Tanjung Pauh Talang Pelita, Merkar Jaya Village, Mestong District, Muaro Jambi Regency, Jambi Province, during the second semester of the 2024 academic year. The research aimed to enhance early childhood cognitive development through the use of playdough media as a learning tool. The subjects consisted of 15 children aged 5–6 years from group B of the kindergarten. Data sources included primary data obtained through direct observation, teacher narratives, and parental input, as well as secondary data from relevant literature on cognitive development and the use of play-based learning media. Instruments used in this study included observation sheets for children's cognitive abilities and teacher performance, alongside various playdough-based learning materials.

The procedure of the classroom action research followed Kurt Lewin's model (Arikunto, 2006), comprising planning, action, observation, and reflection phases. In the planning stage, the researcher prepared daily and weekly lesson plans, determined learning indicators, developed appropriate scenarios, and prepared the necessary learning media, including playdough and visual aids. The action stage involved implementing the planned learning activities in accordance with the prepared scenarios, fostering active participation among children, and facilitating group-based play. Observation was conducted throughout the learning process to document student engagement, imagination, and problem-solving

abilities. In the reflection stage, the researcher analyzed the data, identified obstacles, and formulated improvement strategies for subsequent cycles. Quantitative analysis was conducted using percentage formulas to measure improvements in children's cognitive development, while qualitative analysis provided descriptive insights into observed changes. The iterative process aimed to ensure a systematic improvement in cognitive development outcomes through playdough-based learning interventions.

RESULTS AND DISCUSSION

Initial Condition of Children's Cognitive Development

The preliminary stage of this classroom action research began with an initial observation to identify the baseline condition of children's cognitive development at TK Titian Serjatera before any intervention was implemented. This observation was conducted without disrupting the regular teaching and learning process, ensuring that the data reflected the natural classroom environment. Using a structured observation sheet, the researcher and the class teacher independently assessed each child's performance in key cognitive indicators such as recognizing shapes, patterns, quantity concepts, and basic classification skills. The scoring system combined the assessments from both the researcher and the class teacher to provide an objective measure. Results revealed that the average cognitive development score for the entire class stood at 25% of the maximum achievable score, placing all twelve children in the "Not Yet Developed" category.

During this pre-action phase, no child achieved the "Beginning to Develop," "Developing as Expected," or "Very Well Developed" categories. This indicates that at the initial stage, the class had not yet reached a level of competency that aligned with age-appropriate developmental milestones. The observation further showed that while some children demonstrated partial understanding of certain concepts, such as the ability to identify colors or name objects, these skills were inconsistent and lacked depth. Many children required repeated prompts and guidance from the teacher to complete tasks that involved recognizing shapes, differentiating between quantities, or following sequential instructions. These findings highlighted the need for a more engaging and hands-on approach to facilitate improvement in cognitive development.

The quantitative results of the pre-action observation were compiled into a table, showing that all twelve children scored identically, with each child obtaining 29 points from both the researcher and the teacher's assessments, resulting in an average of 25% relative to the highest possible score of 116. In practical terms, this meant that while children could engage in classroom activities, they lacked the independent problem-solving ability and conceptual understanding that signify cognitive growth. Furthermore, the uniformity of the results indicated that the lack of development was a class-wide issue, not limited to a few individuals.

From a pedagogical perspective, these findings suggest that the existing teaching strategies may not have sufficiently stimulated the children's cognitive processes. The learning activities prior to intervention appeared to be heavily

teacher-centered, offering limited opportunities for active exploration, manipulation of learning materials, and peer collaboration—factors known to enhance early cognitive skills. The absence of a stimulating and interactive environment likely contributed to the low performance scores observed. According to early childhood education theory, young learners develop cognitive abilities more effectively through play-based and exploratory learning experiences, which were minimal in the baseline observation.

The percentage data from the pre-action stage was calculated using the formula for individual and class averages. The class average was determined by combining the total scores from the researcher and the teacher, dividing by the number of children, and then comparing this to the highest possible score to obtain a percentage. In this case, the class average of 25% was significantly below the expected minimum threshold of 75%, which is commonly used as an indicator of satisfactory developmental progress in action research studies. Such a gap between the current level and the desired outcome underscored the necessity for targeted intervention.

Qualitative notes taken during the observation further supported the quantitative findings. Several children appeared disengaged during cognitive tasks, showing minimal curiosity or initiative. For example, when asked to group objects by shape or color, many children would either respond randomly or wait for the teacher's demonstration before attempting the task themselves. This reliance on direct instruction rather than independent exploration suggests underdeveloped problem-solving and decision-making skills. Additionally, children's verbal explanations of their reasoning were often fragmented or incomplete, indicating limited capacity for logical thinking and articulation.

Another important observation was the lack of persistence among children when faced with challenging tasks. Many would abandon an activity after a brief attempt if they could not find an immediate solution. This behavioral tendency reflects not only cognitive limitations but also a need for improved motivational strategies within the learning environment. Without cultivating resilience and problem-solving perseverance, it becomes difficult for children to progress in complex cognitive domains. Such findings have been widely discussed in early childhood education research, where sustained engagement is recognized as a precursor to deeper cognitive development.

Environmental factors in the classroom may also have contributed to the initial low performance. The learning materials available before the intervention were relatively limited in variety and tactile engagement. While some basic visual aids and worksheets were in use, there was a notable absence of multi-sensory learning tools such as modeling clay, building blocks, or other manipulatives that could support hands-on exploration. Research in cognitive development emphasizes that young learners benefit significantly from materials that they can touch, mold, and manipulate, as these activities enhance neural connections and foster abstract thinking skills.

The initial findings thus served as a clear diagnostic tool, providing both a benchmark for measuring progress and a rationale for selecting the intervention strategy. Given the uniformity of low scores and the observed lack of independent cognitive engagement, the researcher determined that introducing *playdough* as a learning medium could potentially stimulate various aspects of cognitive development. This medium was chosen for its versatility, tactile nature, and capacity to be integrated into diverse learning activities, ranging from shape recognition to creative storytelling. The pre-action results not only confirmed the urgency of intervention but also guided the specific design of the subsequent teaching cycles.

In conclusion, the initial condition of the children's cognitive development at TK Titian Serjatera was characterized by uniformly low performance, limited independent problem-solving skills, low persistence in task completion, and minimal exposure to interactive learning tools. The baseline score of 25% across all students highlighted a significant developmental gap that could not be addressed through conventional, teacher-centered methods alone. This context justified the need for a more engaging, hands-on, and play-based approach to foster meaningful improvements in cognitive abilities, which would later be implemented and evaluated in the action research cycles.

Improvement of Cognitive Development through Cycle I and Cycle II

1. Cycle I

The first cycle of the classroom action research was conducted over four meetings, each designed to introduce and reinforce the use of *playdough* as a central learning medium. During the first meeting, children were guided to explore the texture, shapes, and colors of the *playdough* while engaging in simple modeling tasks. Despite the novelty of the material, the results of the first meeting remained at 25%, identical to the pre-action stage, placing all children still in the "Not Yet Developed" category. The unchanged score suggested that a single exposure was insufficient to produce measurable improvements and that repeated, structured engagement would be necessary to stimulate cognitive gains.

By the second meeting, improvements became evident, with the average score increasing to 45.68%, transitioning the entire class to the "Beginning to Develop" category. At this stage, children began to demonstrate greater independence in shaping objects, classifying them based on features, and engaging in short conversations about their creations. This reflected an emerging ability to connect tactile experiences with verbal expression, a sign of early cognitive integration. However, despite this progress, the results indicated that higher-level thinking skills, such as creating more complex patterns or explaining processes in detail, were still underdeveloped.

The third meeting showed further improvement, with the class achieving an average score of 50.86%, moving into the "Developing as Expected" category. Observations during this session revealed that children could follow multi-step instructions more accurately, recognize and replicate patterns, and differentiate

between shapes with greater confidence. The collaborative nature of the activities encouraged peer-to-peer learning, where more confident students informally supported their classmates in completing tasks. Nevertheless, the variability in individual performance highlighted that while some children were approaching mastery in certain cognitive areas, others required additional scaffolding to progress further.

By the fourth meeting, the average score rose to 56.60%, maintaining the "Beginning to Develop" category for most students but showing notable individual progress. Children displayed increased enthusiasm for *playdough* activities, particularly when allowed to create objects of personal interest, which enhanced their intrinsic motivation. However, the overall average remained well below the targeted 75% threshold, signaling that while the trajectory was positive, significant cognitive gaps still existed. These findings underscored the necessity for a second cycle with refined teaching strategies and more complex, interactive tasks.

In summary, Cycle I demonstrated measurable but moderate improvements in cognitive development, with the class average increasing from 25% at the pre-action stage to 44.54% by the end of the cycle. Although none of the children reached the "Very Well Developed" category, the shift from "Not Yet Developed" to "Beginning to Develop" for the entire class validated the potential of *playdough* as a learning medium. The reflection phase of Cycle I identified areas for improvement, such as enhancing classroom management, increasing task variety, and fostering greater student autonomy, all of which informed the planning of Cycle II.

2. Cycle II

Cycle II was implemented with adjustments based on the reflections from Cycle I, emphasizing more structured guidance, greater variety in *playdough* tasks, and the incorporation of problem-solving challenges. The first meeting of Cycle II produced an immediate impact, with the average score rising to 62.46%, placing the class in the "Developing as Expected" category. This jump indicated that the enhanced activity designs—such as having children create themed projects that required applying shape, size, and quantity concepts—were effective in stimulating more advanced cognitive skills.

The second meeting continued this upward trend, achieving an average score of 69.68%. At this stage, children exhibited stronger verbal reasoning when explaining their creations and demonstrated more precise fine motor control in shaping and detailing their *playdough* models. The tasks encouraged them to integrate prior knowledge with new concepts, resulting in more complex and meaningful outcomes. Peer interaction was more dynamic, with children exchanging ideas and collaboratively solving challenges posed by the teacher, such as building models that fit specific functional or aesthetic criteria.

A major breakthrough occurred during the third meeting, where the average score reached the targeted 75%, marking the entry of the class into the "Very Well Developed" category. All twelve children demonstrated significant mastery of the

targeted cognitive indicators, including the ability to plan their creations before execution, justify their design choices, and adapt their models based on feedback. This level of competence indicated not only cognitive growth but also increased confidence and creativity among the students.

The fourth and final meeting of Cycle II saw an exceptional increase, with the class average soaring to 95.11%. This remarkable performance reflected the cumulative effect of sustained, engaging, and well-structured *playdough* activities over time. By this point, children were capable of independently initiating complex projects, collaborating effectively with peers, and articulating their thought processes clearly. The learning environment had transformed into a dynamic, student-centered space where cognitive development was actively nurtured through exploration, experimentation, and self-expression.

In conclusion, Cycle II achieved the intended research goal, with the average cognitive development score rising from 44.54% at the end of Cycle I to 75.56% by the end of Cycle II. All children reached the "Very Well Developed" category, demonstrating that the strategic use of *playdough* as a learning medium can effectively close developmental gaps identified in the initial condition. The progression across the two cycles confirmed that sustained, interactive, and play-based learning not only improves cognitive abilities but also enhances children's engagement, motivation, and overall learning experience.

Discussion of Research Findings

The results of this classroom action research clearly demonstrate that the strategic use of *playdough* as a learning medium significantly improved the cognitive development of children at TK Titian Serjatera. The progression from a class average of 25% in the pre-action stage to 75.56% in Cycle II indicates that hands-on, play-based learning can bridge substantial developmental gaps in a relatively short period. This finding aligns with the constructivist learning theory proposed by Piaget, which emphasizes that children construct knowledge through direct interaction with their environment. The tactile and manipulative nature of *playdough* provided rich opportunities for exploration, enabling children to develop abstract thinking skills through concrete experiences.

In the early stages, children's limited cognitive performance reflected the constraints of traditional, teacher-centered instruction that offered minimal opportunities for active engagement. As the intervention introduced *playdough* into the classroom, the shift towards a more student-centered learning model fostered curiosity, autonomy, and problem-solving abilities. This observation supports Vygotsky's sociocultural theory, which asserts that social interaction and the use of cultural tools—in this case, *playdough*—play a crucial role in cognitive development. Through guided participation and scaffolding, children were able to operate within their zone of proximal development, gradually mastering more complex tasks.

One of the most significant outcomes was the improvement in children's ability to follow multi-step instructions and retain sequential information. Initially, children struggled to execute more than one step at a time without direct

prompting. By the later stages of Cycle II, they demonstrated the capacity to plan their creations, adjust their approach based on outcomes, and articulate their reasoning processes. Such progress indicates enhanced executive functioning, which is a core component of cognitive development in early childhood. Research by Diamond (2013) emphasizes that activities requiring planning, flexibility, and self-control—qualities inherent in *playdough* projects—are critical to strengthening executive functions.

The intervention also promoted the integration of cognitive and linguistic skills. As children manipulated the *playdough*, they were encouraged to describe their creations, explain their choices, and engage in collaborative dialogues with peers. This verbal interaction not only expanded their vocabulary but also reinforced conceptual understanding through articulation. According to research by Tomasello (2009), language development and cognitive growth are mutually reinforcing processes; by engaging in discussions about their work, children consolidate their mental representations and deepen their comprehension.

Another noteworthy finding was the increased persistence and resilience displayed by the children. In the pre-action stage, many children would abandon a task after initial difficulty. By the final meetings of Cycle II, they exhibited determination to refine their models until they matched their intended designs. This behavioral shift aligns with the self-determination theory proposed by Deci and Ryan (1985), which suggests that autonomy-supportive environments enhance intrinsic motivation, leading to sustained engagement and perseverance. The creative freedom provided in *playdough* activities empowered children to take ownership of their learning, fostering a sense of competence and achievement.

From a motor skills perspective, the repeated manipulation of *playdough* contributed to the refinement of fine motor control, which in turn supports cognitive development. Tasks such as rolling, flattening, and shaping the material require hand-eye coordination, bilateral integration, and precision, all of which are essential for later academic skills such as writing and drawing. As noted by Cameron et al. (2012), fine motor proficiency in early childhood is a strong predictor of later achievement in both literacy and numeracy, suggesting that the benefits of this intervention may extend beyond the immediate improvement in cognitive scores.

The findings of this research are consistent with other empirical studies on play-based learning. For example, a study by Han et al. (2010) found that preschoolers engaged in structured modeling activities demonstrated significant gains in spatial reasoning, problem-solving, and creativity compared to those in traditional instruction settings. The parallel improvement observed in this study reinforces the conclusion that *playdough* serves as an effective medium for delivering curriculum objectives while simultaneously nurturing cognitive development.

However, the research also highlights the importance of teacher facilitation in maximizing the benefits of *playdough*. The shift in outcomes between Cycle I and Cycle II underscores that simply introducing the material is insufficient; it must be

accompanied by intentional planning, targeted challenges, and adaptive scaffolding to meet individual learner needs. Teachers must strike a balance between providing guidance and allowing independent exploration to ensure that children remain engaged while also being challenged at an appropriate level.

The role of peer collaboration emerged as another critical factor in the success of the intervention. Children frequently learned from observing and interacting with their peers, exchanging ideas, and co-constructing solutions. This collaborative learning environment mirrors Johnson and Johnson's (2009) cooperative learning framework, which posits that positive interdependence among learners promotes deeper understanding and higher achievement. In the context of this study, *playdough* provided a shared focus that naturally encouraged cooperative behaviors.

In conclusion, the research findings confirm that *playdough* is a powerful pedagogical tool for enhancing cognitive development in early childhood education. By integrating tactile, visual, and social learning experiences, it supports multiple domains of development, including problem-solving, language, motor skills, and social interaction. The marked improvement from 25% in the pre-action stage to 75.56% in Cycle II demonstrates that when implemented thoughtfully, play-based interventions can achieve substantial developmental gains. These results hold practical implications for early childhood educators, suggesting that *playdough* and similar hands-on materials should be incorporated systematically into the curriculum to foster holistic growth.

CONCLUSION

Based on the results of the study entitled "*Improving Early Childhood Cognitive Development through the Use of Playdough Media at TK Titian Serjatera Talang Pelita Muraro Jambi Academic Year 2016*", it can be concluded that prior to the intervention, children's cognitive development was at the "Not Yet Developed" level with an average score of 25%. After the intervention, their cognitive development in Cycle I increased to 44.54% ("Beginning to Develop") and further improved in Cycle II to 75.56% ("Very Well Developed"). These results indicate that the use of playdough media effectively enhanced the cognitive development of children at TK Titian Serjatera Talang Pelita Muraro Jambi to a very good level. In light of these findings, several recommendations are proposed: (1) for schools, it is advised to provide training for teachers to support the implementation of more innovative, inspiring, and creative learning activities to achieve the desired learning objectives; (2) for teachers, it is important to continuously improve professional competence by designing innovative learning processes and selecting methods and media appropriate to children's developmental stages, making learning more engaging and meaningful; (3) for children, it is encouraged to foster greater initiative, active participation, and motivation in learning to support their cognitive growth; and (4) for future researchers addressing similar issues, it is recommended to conduct more in-depth studies to refine the use of playdough media as a fun and effective

alternative for enhancing children's conceptual understanding, thereby achieving even better outcomes.

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