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SCIENCE EXPERIMENTAL STRATEGIES IN DEVELOPING THE DIMENSION OF CREATIVITY IN 5-6 YEAR-OLD CHILDREN AT MONA SCHOOL SEMARANG KINDERGARTEN

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Abstract

Science experiment activities as a strategy to foster creativity in children aged 5-6 years at TK IT Mona School Semarang. This study aims to analyze the strategy of science experiments in fostering creativity in children aged By using a descriptive qualitative approach, this study provides an in-depth understanding of learning phenomena in the natural environment. Science learning is carried out through a descriptive qualitative approach, providing children with the opportunity to learn directly through simple experiments such as volcanic eruptions and mixing rainbow colors. The program activities are created to encourage critical thinking supporting direct observation to provide meaningful experiences for children. The results of the study indicate that children's active involvement in trying, observing, and drawing conclusions has a positive impact on increasing creativity, especially in aspects of fluency, flexibility and the ability to generate new ideas. The teaching strategies used by teachers, including well-planned activities, open-ended questions, initial demonstrations, have proven effective in helping children think creatively and are able to transform curiosity into concrete scientific understanding. In addition to mastering technical aspects, children also show progress in being responsible and following instructions. Overall, this study concludes that science experiments are an effective, fun, and relevant method for developing creativity in early childhood education environments to integrate the development of cognitive, motor, and social-emotional skills.

Keywords: *Science experiments; children's creativity; early childhood.*

INTRODUCTION

Science learning for early childhood should be designed with experimental activities that can foster enthusiasm for learning, scientific attitudes, and expressive abilities. This is consistent with research findings showing that implementing science materials through a combination of science domains successfully strengthens children's scientific process skills and scientific attitudes. This study aims to explain how science experiments are used as a strategy to foster creativity in early childhood learners. Children's creativity is

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impacted by traditional learning methods by filling gap analysis through observations of long-term behavioral change processes. This also underscores the uniqueness of this study in combining science experiments as a strategic approach to fostering independent thinking and original ideas at the IT Mona School Kindergarten in Semarang. This study focuses on how simple experiments can provide hands-on learning experiences that encourage children to explore, think creatively, and develop their ability to organize ideas and solve problems. The study's findings are projected to provide recommendations for early childhood educators to implement science-based learning through effective, fun, and age-appropriate experiments. (Suryadarma, 2017)

Based on the research findings, it was found that volcano and rainbow science experiments have been proven effective in enhancing creativity in children aged 5-6 years. This gives children the opportunity to explore on their own, which helps them generate new ideas, think critically more fluently, and be more flexible in solving problems through fun and hands-on learning experiences. (Ilyas, 2023) showed that it increases the creativity of children aged 5-6 years. This helps them express original ideas bette Independently recognizing various textures and creating various shapes by exploring fun natural materials.

Creativity can encourage children to learn and work harder, so that one day they can create new things that exceed our expectations. An introduction to the world of science for early childhood is a key foundation for stimulating intellectual curiosity, creativity, and critical thinking skills from an early age. This research focuses on experiments on volcanic eruptions and rainbows because both are new science learning activities that have never been used at Mona School Kindergarten. Based on initial observations, children in Kindergarten B3 demonstrated strong curiosity and enthusiasm. This indicates that these children are mentally prepared and naturally drawn to exploratory science activities. This also marked their first experience that stimulated their critical thinking and curiosity about natural phenomena. By conducting simple experiments, children are given the opportunity to explore, observe, and understand the relationships between the causes and effects of various phenomena. This approach aligns with active learning methods that view children as learners, not simply recipients of information. Children's motivation and self-management skills in learning science play a crucial role in their ability to understand concepts and develop scientific attitudes.

Scientific Creativity Theory is the ability to generate new and original ideas in science, which are then transformed into scientific knowledge through logical reasoning. Science experiments help foster creativity by engaging children in real-life, hands-on experiences, challenging their curiosity, encouraging problem-solving, and allowing them to try and even fail in a safe environment. This helps develop fundamental creative attitudes such as imagination, curiosity, and the ability to ask questions, which are crucial for future innovation. Science learning allows children to actively participate in experiments and discover their own concepts, which can increase their enthusiasm for learning and foster creativity. Early childhood science experiments are an effective way to train creative thinking skills and develop children's self-management skills from an early age. (Islam et al., 2020) Children always want to experience what is in their surroundings when they see something new and different. Science learning based on experimental activities can shape scientific thinking patterns and critical curiosity about the phenomena around them.

Students learn to connect cause and effect, understand the process of change, and have an open attitude towards new things. Learning strategies that focus on exploration and small group discussions can increase learning motivation and encourage the emergence of original ideas. Thus, the use of science experiments for children aged 5–6 years can be a strategic solution to overcome less participatory instructional methods oriented towards educators. The problem-solving plan in this study focuses on developing a simple, nature-based experimental learning activity model that is relevant to the child's context and appropriate to their world. The role of the teacher is as a facilitator who creates a fun learning environment and provides stimulus in the form of open questions and challenges that encourage children to think creatively. (Seechaliao, 2017) In essence, the creativity of early childhood is very much needed in their lives to create something new, unik, unique, funny, so that everyone is interested and amazed so they don't copy their friends' work.

This approach is expected to improve children's ability to generate new ideas, conduct simple scientific explorations, and express their understanding through play and experiments. Therefore, the findings of this study are intended as a strategic reference for early childhood educators implementing science experiments as an effective strategy to enhance creativity in early childhood. (Al-harbi, 2020) Several challenges in developing early childhood creativity stem from the school and family environments. Creativity is an important part of children's development because it encourages them to generate new ideas, experiment, and build understanding through direct experience. Science experiments provide children with opportunities to explore, observe, and understand the cause and effect relationships of the phenomena they encounter. This active learning approach views children as active participants in the learning process, which helps foster their curiosity, creativity, and critical thinking skills. (Skills, 2020)

Experiments in the early developmental phase are an effective way to train critical and creative reasoning skills while also helping children develop self-management skills from an early age. Real-world-based learning, as discussed in the research, aligns with the needs of students in their golden age who acquire knowledge through exploration, recreational activities, and interaction with their environment. Therefore, context-based experiments not only help children understand basic science concepts but also stimulate their sense of exploration and creative ideas. By providing space for students to practice simple observations, teachers can create meaningful and enjoyable learning experiences that support creativity from an early age. (Setiawan, 2022) With this model, children are expected to develop creative thinking skills such as generating new ideas, trying various ways to solve problems, and expressing their understanding through meaningful and hands-on activities. Furthermore, the context-based experiment model helps teachers create a learning environment that encourages curiosity, the courage to try new things, and independence in exploration.

METHODOLOGY

This study uses a descriptive qualitative approach. This approach was chosen because it aims to directly describe the implementation of science experiment activities as a strategy to foster creativity in early childhood while understanding and describing phenomena that occur in the natural environment. The study was conducted at TK IT Mona School, located at Jl. Palir Utama Raya, Podorejo, Ngaliyan District, Semarang City, Central Java

(50187), on September 29 to November 12, 2025. The subjects of this study were 16 students of group B3 at TK IT Mona School as research objects carried out using a purposive sampling method to deepen qualitative data, where the diversity of children's characteristics who are active verbally and motorically facilitate researchers in identifying the phenomenon of aha moments and differences in creative solutions in depth that are directly involved in the science experiment activities of Mount Eruption and Rainbow. This location was chosen because TK IT Mona School has implemented science game activities, so it is relevant to the focus of the study.

Researchers act as the primary tool by conducting self-involved observations to ensure the authenticity of information, which is then analyzed interactively by reducing data, presenting comparative narratives over a long period of time, and drawing validated conclusions simultaneously to ensureaccuracy of the findings. Data collection techniques include observation, interviews, and documentation. Data analysis techniques are carried out in stages through three main stages, namely data reduction (selecting and summarizing substantial data), data compilation (in a structured descriptive format), and drawing conclusions that are carried out continuously with verification of findings to ensure the accuracy of the research results. The process of drawing conclusions is validated simultaneously. Data are obtained through observations that follow the guidelines for creativity indicators and semi-structured interviews with class teachers, which are then analyzed longitudinally using descriptive narratives to evaluate the comparison of changes in children's creative behavior across sessions with the aim of building qualitative inference logic that shows a stable increase over time.

RESULTS AND DISCUSSION

The implementation of scientific experiments is one of the pillars of learning instruction at TK IT Mona School Semarang. Through an exploration-based approach, students are facilitated to directly explore the material using simple, fun, and safe experiments. This scientifically proven learning method is very effective in developing and enhancing the creativity of children aged 5-6 years. Efforts to increase the creativity of children aged 5-6 years through a scientific experiment approach at TK IT Mona School Semarang, by emphasizing a change in attitude from a dependent mindset to an independent one and offering practical impacts for PAUD educators in managing a safe and efficient inquiry learning process. The implementation of the scientific inquiry approach has been concretely proven to be able to encourage creativity in children aged 5-6 years through active participation in solving problems. This success is not only seen in the final results of the creation, but also in changes in children's mindsets that become more critical and unique. This approach motivates students to engage intensively in the stages of scientific inquiry, which simultaneously helps develop critical thinking, problem-solving skills, and the ability to generate original ideas. (Age & Based, 2025) This approach goes beyond simply mastering fundamental scientific literacy; it also actively sparks their natural curiosity at ages 5–6. By actively participating in the process of experimenting, observing, and drawing conclusions, children learn that science can be discovered within themselves.

The excellence of science experiments at IT Mona School Kindergarten is evident in how the teachers make learning a meaningful experience. Children are encouraged to participate in various exciting experiments, such as volcanic eruptions and mixing

rainbow colors. These activities help them think creatively, express ideas, and develop problem-solving skills. Through these activities, the school not only builds children's cognitive abilities but also strengthens their character traits such as self-confidence, a willingness to experiment, and the ability to collaborate with friends. The children were very enthusiastic about the science experiments because this was the first time they had conducted such activities. Even after returning home, they were still eager to try them on their own at home. This shows that science experiments have a significant impact on enhancing early childhood creativity, reinforcing the idea that science experiments are a powerful learning strategy. (Sari & Fauziyah, 2022)

Observations during the fourth week at Mona School IT Kindergarten showed that the teaching team was thoroughly prepared to carry out the planned science experiments. As early as 6:00 a.m., the teachers were already at the research site, preparing tools and materials, reflecting the children's early school journey. Neatly arranged desks created a mini-laboratory that sparked curiosity. Equipment and materials such as used plastic bottles, sunlight, red and rainbow food coloring, baking soda, and vinegar were neatly arranged. This thorough preparation ensured nothing was missed, creating the perfect stage for children to explore the world of science. The first volcano science experiment activity began by dividing the children into groups of boys and girls to encourage harmonious teamwork. The teacher began by telling a story about the majesty of volcanoes, explaining how the Earth's core holds hot liquid that seeks an outlet. The children sat cross-legged in an orderly manner, their eyes sparkling with attention as they absorbed every word. As the experiment began, the atmosphere became lively. Little hands worked together to insert the materials into the volcano model. A sweet tension filled the air as the last drop of vinegar was added. Suddenly, a stunning chemical reaction occurs, thick red bubbles slowly rising, flowing down the model volcano like glowing lava. Surprised screams and joyful laughter immediately erupt. For children, witnessing a volcanic eruption in person is an unforgettable visual wonder, transforming abstract theory into a tangible sensory experience.

Without a pause in the excitement of the second rainbow science experiment, the children moved on to a second, more colorful experiment. The teacher gently explained how the primary colors can mix to create a beautiful rainbow. Each group enthusiastically mixed the various colors in a prepared container. The results were impressive, as colored bubbles began to rise and connect, forming a soft rainbow gradient on the experimental table. Throughout the activity, the classroom was filled with lively discussion. Questions such as "Why are the bubbles rising, teacher?" and "Why aren't the colors all mixed?" came from the children's mouths. The teacher answered each question with simple yet informative explanations, building a foundation for critical thinking from an early age. Once everyone was finished, it was time for a group photo to mark the end of the activity. The children's enthusiasm did not wane. They continued to mix, stir, and observe carefully. However, they accepted that the time was over. With remarkable independence, the children began to work together to clean up the remaining experimental materials. The tables, once covered in colorful spills, were once again clean and tidy under their responsible little hands.

In this science experiment, the children demonstrated clear strength. Children were able to work together in groups to mix simple chemicals and boldly ask critical questions about

the colored bubbles that emerged. They successfully connected what the teacher explained with hands-on practice, such as carefully dripping vinegar to create a stunning lava-like simulation. In addition to being skilled at the technical aspects of the experiment, the children also demonstrated complete independence in cleaning up equipment and were responsible for cleaning up spilled colors on their desks without repeated prompting. The balance between understanding scientific theory and the ability to clean up after the activity demonstrates that they have achieved an excellent level of emotional and intellectual maturity. This science experiment became a dynamic space for creativity because the children did not just follow rigid steps but also explored things on their own by mixing colors and observing the textures of the bubbles they created. Children's creativity shone through as small hands enthusiastically mixed and combined the primary colors to create gradients. A stunning rainbow demonstrates that children can experiment beyond simple instructions. Furthermore, the children's creative side is demonstrated through their ability to organize themselves well in groups to create their first collaborative experiment, intelligently sharing roles in placing materials into a model volcano. This teamwork transformed simple items like used bottles and kitchen utensils into impressive scientific masterpieces, demonstrating that their creativity has developed through problem-solving and strong teamwork.

Science learning at this school is conducted in a practical and fun way through hands-on experiments and direct observations. Focusing on experiment-based methods is a powerful strategy for maximizing creative potential because it systematically teaches children to actively explore, solve problems, and generate new, original ideas. (Pelaksana et al., 2023) Children not only witness fascinating chemical reactions, such as in the Volcano experiment, where baking soda reacts with vinegar to mimic natural phenomena, but they also learn complex physics concepts such as light and pressure. For example, in the Rainbow Formation experiment, these activities actively encourage children to engage and creatively understand scientific principles. Science experiments in schools are conducted practically, allowing children to participate directly in trying various things and observing. Learning science in a concrete and practical way helps children understand ideas through direct experience and also fosters their creativity. This suggests that conducting practical science experiments is an effective strategy for developing creativity in children aged 5-6 years. (Wisnu et al., 2021)

The learning strategies used by teachers during early childhood science activities are based on game-based learning methods to focus on simple exploration and inquiry to foster creativity in early childhood learners. The implemented instructional approach combines innovative media, free exploration, and group collaboration, effectively making science experiments a great way to foster creativity. This is because they provide real-life experiences that balance the cognitive and emotional aspects of children's development. (Fajriani & Liana, 2019) Teachers begin the sessions by using warm-ups and curiosity triggers, asking open-ended questions such as "Do you know why volcanoes erupt?" or "When do rainbows usually appear?" to activate children's prior knowledge and encourage them to make initial guesses. Afterward, teachers provide short demonstrations followed by opportunities for children to try things themselves (independent exploration), which helps spark creativity and problem-solving skills. This structured yet flexible approach allows children to learn actively, develop critical thinking, and strengthen the courage to express imagination and opinions. Using science learning strategies based on

simple exploration and experimentation activities can help increase children's participation, curiosity, and independent thinking. Therefore, science experiment strategies have proven to be a powerful approach to developing children's creativity. (Hafizah & Hartati, 2021)

The implementation of science experiment activities, particularly those involving Volcanoes and Rainbows, has demonstrated high effectiveness in fostering creativity in the golden age group of learners. This achievement is confirmed by significant progress in benchmarks of children's intellectual thinking capabilities, such as fluency and flexibility. Science experiments not only teach scientific concepts but also serve as an important tool for teachers to assist, guide, and encourage children aged 5-6 years in developing their creative potential. (Rocmah et al., 2020) This improvement was driven by teacher learning strategies that focused on simple exploration and investigation through stages such as initial perceptions that spark curiosity, early demonstrations, and many opportunities for independent exploration that encourage original trial and error. These strategies align with the mission goals of early childhood education for young learners not only to understand simple natural phenomena and practice cause-and-effect observations, but also to actively develop scientific attitudes and a sense of wonder about their surroundings. This makes science activities a holistic way to foster children's creative and critical thinking skills. This shows that conducting science experiments in the classroom is not only easy to do but also effective in helping children aged 5-6 years develop their creativity. (Fajriyyah et al., 2023) During the experiment, children showed responses with active involvement using all senses, a high level of curiosity, and initial attempts to connect the causes and effects of what was seen directly. The first words that would show awe and spontaneous questions, indicate increased motivation, curiosity, and the successful development of imagination that have been triggered by the science experiments that have been carried out. Through fun science experiments, children develop critical thinking and creativity while directly practicing basic scientific process skills such as observing, classifying, and communicating. (Izzuddin, 2019)

Besides enhancing creativity and the effectiveness of teaching strategies, science experiments also significantly contribute to children's overall development. Activities such as pouring vinegar, mixing ingredients, and using a small pipette support children in strengthening fine motor skills and coordinating gaze and hand movements, which are essential for preparing them for writing. The creativity and effectiveness of early childhood learning can be significantly supported through science experiments that are part of the STEAM approach. This encourages hands-on involvement and problem-solving skills. (Ananda et al., 2023) Conducting experiments in small groups helps develop social and teamwork skills. Children learn to share tools, take turns, and explain their findings to classmates. Collaborating and helping foster teamwork, while simultaneously building self-confidence and a deep enjoyment of learning. The use of experimental methods in science learning is highly recommended because it not only helps build conceptual understanding but also develops important affective and cognitive aspects that are very much needed to foster creativity. (Harahap et al., n.d.)

In the science play process, the teacher demonstrates careful planning and creative practice starting with the preparation phase where the teacher cleverly uses simple, safe, and easy-to-find materials (baking soda, vinegar, food coloring), even making a small

mountain model from used bottles to increase visual appeal. All tools and materials for this science experiment activity are prepared before learning begins in the morning. In science play, the teacher's role is very important as a motivator and demonstrator who encourages active participation and curiosity in children aged 5-6 years, creating a supportive environment where they can explore and understand science concepts. (Sativa & Buahana, 2024) Classroom activities begin with an introduction that arouses intellectual curiosity based on open interactive dialogue followed by a short demonstration and most importantly the teacher gives children a lot of freedom to explore and try to modify the steps themselves, which encourages creativity and flexible thinking. An early childhood teacher needs to have different strategies that help children understand and more importantly develop their creativity melalui proses bermain ilmiah yang mendorong eksplorasi mandiri pada anak usia dini.(Farabi, 2023)

The activity concludes with a light discussion to summarize the observations and at appropriate times the teacher connects the natural phenomena seen with religious values as a way to strengthen the holistic learning experience and foster a sense of wonder. The light discussion is not only a closing activity but also a metacognitive strategy used by the teacher to ensure that the active science experiment process is internalized by the children as a creative idea or concept. (Nurjannah & Fitrianingtyas, n.d.) The success of science experiment activities is greatly influenced by the teacher's well-organized planning, which allows children to express themselves, explore textures, and be creative. Therefore, teacher planning in science games has been shown to play an important role in developing the creativity of children aged 5-6 years. (Yunesti, 2023) Examining the science experiment approach at TK IT Mona School Semarang to stimulate the imagination of children aged 5 to 6 years, with a focus on changing the mindset from dependent to independent and contributing new thoughts regarding the significance of psychological safety zones and self-correction methods in the inquiry-based learning process.

CONCLUSION

Science experiment activities at Mona School IT Kindergarten, Semarang, are highly effective in helping 5-6 year-old children develop their creativity. This effectiveness is supported by teacher strategies that focus on exploration and play, which directly improve children's thinking speed and flexibility. During science experiments, children demonstrate active engagement, intellectual curiosity, and awe, motivating them to think critically and share their own discoveries. Science experiment activities are a successful, holistic approach that helps develop children's creative, cognitive, motor, and social abilities. The implementation of science experiments at Mona School IT Kindergarten, Semarang, is a comprehensive method that successfully encourages creativity in 5-6 year-old children. The teacher's approach, which focuses on exploration and play, has proven effective in increasing children's thinking speed, agility, and originality in ideas. In addition to influencing cognitive aspects, these activities successfully transform curiosity into concrete scientific understanding, while also developing children's character and motor skills in using experimental tools and materials. These experimental activities successfully transform children's curiosity into concrete scientific understanding. Children are not only skilled in mixing various materials, but are also able to follow instructions wisely and show high responsibility in cleaning the science experiment area.

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