

Introduction to Basic Science in Early Childhood Through the Exploration Method of Surrounding Materials at TK Sosial Wagola

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ABSTRACT

This study employed a Classroom Action Research (CAR) design conducted with 14 children in Group B2 at TK Sosial Wagola. The intervention was implemented in two cycles, each consisting of four learning sessions. The success of the study was indicated by an improvement in children's ability to recognize basic science concepts through the application of an exploration method using materials available in the surrounding environment, as well as increased children's participation in learning activities. The results showed a significant improvement in children's basic science recognition abilities, increasing from an average of 13% in the pre-action stage to 74% in Cycle I and reaching 93% in Cycle II. Introducing basic science from an early age is crucial as it fosters curiosity and develops children's critical and logical thinking skills.

Introduction

Early childhood education can be understood as an effort to create an environment that facilitates children's learning, development, and

self-growth. The goal of early childhood education is to stimulate children so that they are able to maximize their potential (Watini, 2019). As stated by Suryadi, essentially, early childhood education is structured to support children's holistic development or to emphasize the growth of every aspect of a child's personality. Thus, early childhood education provides opportunities for children to achieve their full potential and develop their personalities. Therefore, cognitive, verbal, social, emotional, physical, and motor development elements must be accommodated within early childhood education settings (Fathia, 2019).

In terms of brain and cognitive development, early childhood is considered a golden period. Children at this age possess high curiosity and enjoy exploring their environment. Hence, early childhood is an ideal period to introduce basic science concepts (Nurhaliza et al., 2023; Mardotillah & Hanif, 2024). Basic science refers to the study of natural phenomena and how these phenomena interact. Science education from an early age offers several advantages, including fostering curiosity, enhancing children's critical and logical thinking abilities, helping them develop awareness of the world around them, and preparing them to learn more complex science concepts in the future.

Literally, science is defined as the study of natural phenomena. Conceptually, science is described as a conceptual framework that can be further examined and interconnected through a series of observations and experiments. Science can be viewed as encompassing

dimensions of process, product, and attitude (Putri, 2019; Festiyed, 2019). Science as a process refers to the means of acquiring knowledge; science as a product includes facts, concepts, laws, theories, and principles; and science as a scientific attitude refers to the values, beliefs, and perspectives that must be upheld by scientists in the pursuit or creation of new knowledge (Izzuddin et al., 2019).

Young children can be effectively introduced to basic science through an exploratory approach involving materials found in their surrounding environment (Raharjo, 2025). Through observation, direct interaction, and experimentation with nearby objects, this approach enables children to learn concretely. The exploration method is classified as a learning method commonly known as the field trip method. One teaching strategy that allows children to observe objects closely is the exploration technique (Pangastuti & Qumillaila, 2017). Furthermore, according to Rachmawati and Kurniati, through exploratory activities, children can observe, investigate, understand, experience, and ultimately create something meaningful based on their discoveries (Faida et al., 2020).

Based on observations conducted at TK Sosial Wagola, science learning had not been optimally implemented, as it was limited to writing and coloring activities and lacked exploration of materials from the surrounding environment. Children were not maximally facilitated to learn actively and independently because science activities were conducted only inside the classroom and focused mainly on numbers,

colors, and shapes. This indicates a lack of teachers' understanding regarding the importance of diverse learning experiences. Consequently, children's cognitive development was not well developed, particularly in critical thinking, symbolic thinking, problem-solving, as well as social and communication skills. Children experienced difficulties in understanding abstract concepts and facing challenges independently. Insufficient stimulation and an uncondusive learning environment further exacerbated this condition. The inconsistency in introducing science through exploration also reflects low awareness of the importance of early childhood science education, which may reduce children's interest and thinking abilities.

According to Harefa and Sarumaha (2020), science is organized or systematic information that can be widely applied and consists of accumulated results of observations and experiments. Understanding science from a child's perspective constitutes the definition of science for early childhood. If science is viewed solely from an adult perspective, misunderstandings may occur regarding the nature of science for young children, which can significantly affect how they absorb scientific knowledge.

The following competencies are included in basic science process skills for early childhood education (Risnawati, 2020):

1. **Observation skills**, namely children's ability to use all their senses to describe the characteristics of objects.
2. **Comparison skills**, referring to children's ability to identify

similarities and differences between observed objects.

3. **Classification skills**, which involve children's ability to group objects based on observed and compared characteristics.
4. **Measurement skills**, namely children's ability to measure or assess objects.
5. **Prediction skills**, referring to children's ability to estimate or predict an event.
6. **Communication skills**, which involve children's capacity to express the knowledge they have acquired.

According to Izzuddin et al. (2019), early childhood learning process strategies include five systematic steps:

1. **Observing**, where children use all their senses to observe surrounding objects;
2. **Questioning**, where children are encouraged to ask questions to develop critical attitudes;
3. **Collecting**, where children repeat learning experiences such as collecting objects to be arranged;
4. **Associating**, where children connect prior and new knowledge; and
5. **Communicating**, where children convey opinions, explain their work, or respond to questions, thereby strengthening understanding and communication skills.

Various studies indicate that environmental exploration and the use of natural materials are effective approaches for introducing science

concepts to early childhood learners. Dewi et al. (2019) found that environmental exploration-based learning significantly influenced kindergarten children's science abilities. Through a quasi-experimental design, the study demonstrated that exploratory activities enhanced observation skills, concept recognition, and scientific understanding.

Dhaifi et al. (2022) also supported these findings through classroom action research, showing that engaging children in environmental exploration activities such as observing, planting, and caring for plants significantly improved science knowledge, with learning outcomes increasing to 88.23%. Similarly, Umboh and Kasih (2022) emphasized that environmental exploration using plants as learning media significantly enhanced children's science abilities, with scores increasing from 42% to 92%.

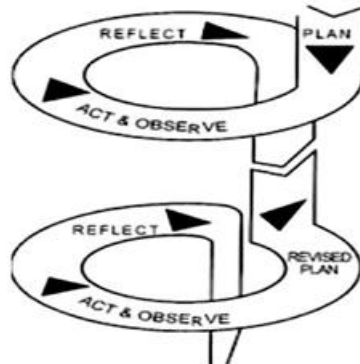
From a science literacy perspective, Febriandani et al. (2025) emphasized that children's science abilities encompass not only conceptual mastery but also critical thinking, simple phenomenon analysis, and application of knowledge in daily life. Their literature review recommended exploration of materials and environments as effective strategies for developing early science literacy.

Previous studies predominantly focused on environmental exploration rather than the exploration of surrounding materials available in local school contexts. Therefore, this study addresses this research gap by focusing on the exploration of simple surrounding materials.

Methods

This study employed a Classroom Action Research (CAR) approach based on the spiral model developed by Kemmis and McTaggart. This model consists of four main stages: planning, action implementation, observation, and reflection, which are conducted repeatedly across two cycles. The research was carried out collaboratively between the researcher and the classroom teacher, with the primary objective of improving early childhood understanding of basic science through the exploration of materials found in the surrounding environment.

Figure 1. Classroom Action Research Design Based on the Kemmis and McTaggart Model



The subjects of this study were 14 children from Group B2 at TK Sosial Wagola, consisting of seven boys and seven girls. Each cycle consisted of a series of activities, including the preparation of Daily Learning Implementation Plans (RPPH), preparation of tools and materials for exploration activities, and the development of observation

instruments.

During the implementation stage of **Cycle I**, the teacher provided initial motivation to the children, connected the learning material to the children's prior experiences (aperception), and facilitated learning activities according to the prepared RPPH. Throughout the learning process, the researcher conducted observations of both teacher and children's activities. Reflection was carried out at the end of each cycle to evaluate the effectiveness of the actions taken and to design improvements for the subsequent cycle. Cycle II served as a follow-up to the evaluation of Cycle I, with improvements in learning strategies, such as the use of more varied media and the involvement of group work to enhance children's participation.

Data Collection Techniques

The data collection techniques used in this study included:

1. Observation

Observation was used to record the level of involvement of both children and teachers during the process of introducing science concepts.

2. Interviews

Interviews were conducted with teachers and children to obtain information regarding their experiences and responses throughout the learning process.

3. Documentation

Documentation included data on the number of children and

photographs of activities that supported the research process.

The research instrument consisted of an observation sheet in the form of a checklist, which was used to record children's developmental progress during learning activities.

Data Analysis Techniques

Data analysis was conducted through three stages:

1. **Data reduction**, which involved filtering and simplifying data to ensure relevance to the research focus.
2. **Data presentation**, which involved organizing data in the form of structured narratives to facilitate interpretation.
3. **Conclusion drawing**, which involved formulating final conclusions based on the analyzed data to determine the level of success of the implemented actions.

To measure children's development in recognizing basic science concepts, the assessment formula proposed by **Anas Sudjono** was used. The assessment was based on four achievement categories: Not Yet Developed (BB), Beginning to Develop (MB), Developed as Expected (BSH), and Very Well Developed (BSB), with a score range of 1 to 4. Data validity was ensured by comparing observational data with actual conditions observed in the field. The development of basic science recognition in early childhood was analyzed using the following assessment formula:

Figure 2. Assessment Formula According to Anas Sudjono

$$P = \frac{f}{N} \times 100\%$$

Result and Discussions

Before the Implementation of the Action

The researcher conducted an initial observation of the science learning process in Group B2 at TK Sosial Wagola. Based on the observation results, it was found that children's ability to understand basic science concepts was very low. Children tended to be passive, showed minimal interest, and were not yet able to observe or classify simple objects. All students (100%) were categorized as **Not Yet Developed (BB)**, with an average achievement of only **13%**. This condition indicates that previous learning approaches had not addressed exploratory aspects that align with the characteristics of early childhood learners. As emphasized by Izzuddin et al. (2019), children are more likely to optimally understand science through direct interaction and concrete experiences. The data are presented as follows:

Table 1. Pre-Action Analysis of Children's Ability to Recognize Basic Science

Table 2. Recapitulation of Pre-Action Children's Ability to Recognize Basic Science

In the observation indicator, children had not demonstrated accuracy in observing objects, colors, or shapes. In the comparison indicator, children were still confused when identifying differences between two objects and often mentioned irrelevant aspects. Children were also

unable to group objects based on specific characteristics (classification) and were not yet able to verbally communicate their findings.

Description of Data After Classroom Action

Cycle I

After the implementation of actions in Cycle I, there was a significant increase in children's involvement. The learning method applied was the exploration of surrounding materials, in which children were engaged in real activities such as observing leaves, grouping stones, creating collages from natural materials, and planting mung bean seeds. These activities were designed according to active and concrete learning principles. Based on observations, the average achievement increased to 74%. Children began to demonstrate greater accuracy in observing (e.g., identifying differences in leaf colors) and were able to distinguish object textures, such as soil and stones.

More specifically, 50% of children were categorized as **Very Well Developed (BSB)**, 43% as **Developed as Expected (BSH)**, and 7% as **Beginning to Develop (MB)**. Teachers reported that children appeared more enthusiastic and active during the learning process, with several children beginning to ask questions and comment on the objects they explored. This indicates that the exploration method successfully stimulated curiosity and encouraged children to engage in simple scientific processes, as affirmed by Faida et al. (2020), who stated that exploration enables children to learn by touching, experiencing, and

drawing conclusions.

Table 3. Recapitulation of Children's Ability to Recognize Science After Cycle I

Cycle II

Reflection from Cycle I resulted in several improvements that were applied in Cycle II. For example, teachers placed greater emphasis on small-group collaboration to encourage peer learning and provided more attractive and varied media, such as magnifying glasses, water trays, and drawing paper for leaf printing. In Cycle II activities, children were not only encouraged to observe but also to verbally report their observations. Teachers provided stimuli through open-ended questions to encourage children to think and communicate their findings.

During Cycle II, children were involved in advanced exploration activities using natural materials, such as identifying types of leaves based on shape and color, comparing soil textures, classifying stones and twigs, and predicting the outcomes of prints or plant growth. This approach successfully fostered children's curiosity and analytical abilities more deeply.

At the end of Cycle II, the results showed a significant improvement. The average achievement increased to **93%**, with all participants (100%) reaching the **Very Well Developed (BSB)** category. Children were able to mention differences between objects, group objects based on shape and color, and explain their findings using simple sentences. Some

children even began making predictions, such as stating that seeds planted in dry soil would not grow.

Table 4. Recapitulation of Children's Ability to Recognize Science After Cycle II

This condition reflects that an exploration-based approach using surrounding materials not only enhances cognitive aspects but also develops children's language, social, and emotional skills. These findings align with Risnawati (2020), who emphasized that science introduction in early childhood should be delivered through active and meaningful activities to ensure comprehensive learning experiences.

Discussion

According to Izzuddin et al. (2019), science education from an early age offers several benefits, including fostering curiosity, enhancing children's critical and logical thinking abilities, building awareness of the surrounding world, and preparing children to learn more complex science concepts in the future. Introducing science through the exploration of surrounding materials also provides numerous benefits. This aligns with Faida et al. (2020), who argued that children can observe, investigate, understand, experience, and ultimately create meaningful outcomes through exploratory activities.

Based on the research findings, several important outcomes emerged. These were evidenced by children's attendance, focus, and active involvement during the classroom action research process, which

introduced science through the observation of surrounding objects. The purpose of introducing science to children in Group B2 at TK Sosial Wagola through the exploration method was to enhance their knowledge and understanding of basic scientific principles. Overall, students responded enthusiastically and positively to learning activities that introduced science through exploratory approaches.

Each learning session showed improvement, as indicated by observations and reflections conducted before the intervention, as well as during Cycle I and Cycle II. The improvement in children's recognition of basic science concepts through the exploration of surrounding materials across the pre-cycle, Cycle I, and Cycle II stages is illustrated in the following bar chart:

Figure 1. Comparison of the Average Ability of Children in Recognizing Science

The research findings indicate a significant improvement in children's basic science recognition at each phase of the activity implementation. This growth demonstrates the effectiveness of the exploration method using surrounding materials in fostering children's scientific thinking. At the pre-action stage, children's science recognition averaged 13%, placing them in the **Not Yet Developed (BB)** category. This condition indicates that science process skills—such as observing, comparing, classifying, and communicating findings—had not been incorporated into previous learning practices. Children had not been given opportunities to learn directly from their environment.

After Cycle I, children's basic science recognition abilities increased significantly, with an average achievement of 74%. Only 7% of children were categorized as **Beginning to Develop (MB)**, 43% as **Developed as Expected (BSH)**, and 50% as **Very Well Developed (BSB)**. This improvement was attributed to learning approaches that allowed children to experience scientific processes concretely, such as exploring leaves, stones, water, and plant seeds. Children became more active and engaged, demonstrating high curiosity and the ability to communicate their observations in simple terms.

Reflection from Cycle I informed improvements in Cycle II, particularly in grouping strategies, the use of more varied exploration media, and increased teacher involvement as active facilitators. In Cycle II, the average achievement increased further to 93%, with all children (100%) reaching the **Very Well Developed (BSB)** category. All children showed improvement across six basic science indicators, ranging from observing and classifying objects to verbally communicating their findings.

The improvement from Cycle I to Cycle II indicates that learning through exploration of surrounding materials enhances social interaction in group learning, activates children's cognitive capacities, and provides deeper meaning to the learning process. These findings are consistent with constructivist theory and Piaget's theory, which state that young children acquire knowledge through active interaction with their social and physical environments.

Furthermore, the proportion of children based on developmental categories across the pre-action, Cycle I, and Cycle II stages is presented in the following table. The four assessment categories used in this study were **Not Yet Developed (BB)**, **Beginning to Develop (MB)**, **Developed as Expected (BSH)**, and **Very Well Developed (BSB)**.

Table 5. Recapitulation of the Improvement in Children’s Ability to Recognize Science

At the pre-action stage, all children (100%) were classified as **Not Yet Developed (BB)**, indicating that no effective science instruction had been implemented. After applying the exploration approach in Cycle I, significant improvements occurred: 50% of children were classified as **Very Well Developed (BSB)**, 43% as **BSH**, and 7% as **MB**. This demonstrates that children’s recognition of basic science began to improve as a result of the teaching strategy.

A more optimal improvement occurred in Cycle II, where all children (100%) achieved the **Very Well Developed (BSB)** category. This indicates that improvements in learning strategies during Cycle II—such as enrichment of exploratory activities and the use of more varied media—were highly effective in developing basic science process skills in early childhood.

Thus, this table reinforces the finding that the exploration method using surrounding materials can gradually and measurably enhance children’s cognitive development, progressing from an undeveloped state to a very well-developed level within a relatively short time

through appropriate instructional approaches.

Conclusion

The findings of this study demonstrate that the application of the exploration method using surrounding materials effectively enhances early childhood children's ability to recognize basic science concepts. At the pre-action stage, all children were categorized as *Not Yet Developed (BB)*, indicating limited exposure to meaningful science learning experiences. Following the implementation of Cycle I, children's achievement increased significantly to 74%, reflecting improved engagement, observation skills, and initial development of basic science process skills. Further refinement of instructional strategies in Cycle II resulted in an even more substantial improvement, with an average achievement of 93% and all children reaching the *Very Well Developed (BSB)* category.

These results indicate that exploration-based learning provides concrete, meaningful, and developmentally appropriate experiences that support children's cognitive growth, curiosity, and foundational scientific thinking. By allowing children to actively observe, compare, classify, predict, and communicate their findings, the exploration method facilitates holistic learning that integrates cognitive, language, social, and emotional development. Therefore, the exploration of surrounding materials can be considered an effective pedagogical approach for introducing basic science concepts in early childhood education settings and is recommended for wider implementation in

similar learning contexts.

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