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Planting-Based Learning for Naturalistic Intelligence Development in Children Aged 5–6: A Qualitative Study

Rika Widya[1], Salma Rozana[2], Manshuruddin[3]
[1,2,3] Universitas Pembangunan Panca Budi, Medan, Indonesia

Abstrak

Penelitian ini bertujuan untuk menganalisis implementasi pembelajaran berbasis bercocok tanam dalam mendukung pengembangan kecerdasan naturalis anak usia 5–6 tahun pada kelompok B di TK Aminah Hamdi. Penelitian ini menggunakan pendekatan kualitatif deskriptif dengan melibatkan 14 anak sebagai partisipan. Data dikumpulkan melalui observasi, wawancara dengan guru kelompok B dan kepala sekolah, serta dokumentasi. Analisis data menggunakan model interaktif Miles, Huberman, dan Saldaña yang meliputi kondensasi data, penyajian data, serta penarikan dan verifikasi kesimpulan. Hasil penelitian menunjukkan tiga temuan utama. Pertama, interaksi langsung dengan tanah, bibit, dan tanaman memberikan pengalaman sensorik konkret yang mendorong eksplorasi serta rasa ingin tahu anak terhadap objek alam. Kedua, kegiatan menyiram dan merawat tanaman secara rutin memberikan kesempatan berulang bagi anak untuk melatih tanggung jawab dan menunjukkan kepedulian terhadap lingkungan. Ketiga, pengamatan terhadap pertumbuhan tanaman memberikan kesempatan kepada anak untuk mengenali perubahan, membandingkan karakteristik tanaman, dan membedakan ciri-ciri objek alam yang dapat diamati. Temuan ini menunjukkan bahwa pembelajaran berbasis bercocok tanam menyediakan lingkungan belajar kontekstual yang mengintegrasikan eksplorasi langsung, pembiasaan perawatan tanaman, dan pengamatan terhadap objek alam. Melalui kegiatan tersebut, anak memperoleh kesempatan untuk mengembangkan kemampuan mengenali dan memahami lingkungan alam sebagai salah satu dimensi kecerdasan naturalis. Penelitian ini menegaskan relevansi kegiatan bercocok tanam yang dilakukan secara berkelanjutan sebagai alternatif pendekatan pembelajaran dalam pendidikan anak usia dini.

Kata Kunci: pembelajaran berbasis bercocok tanam; kecerdasan naturalis; pendidikan anak usia dini; pembelajaran berbasis alam; berkebun

Abstract

This study aims to analyze the implementation of planting-based learning in supporting the development of naturalistic intelligence among children aged 5–6 years in Group B at Aminah Hamdi Kindergarten. This study employed a descriptive qualitative approach involving 14 children as participants. Data were collected through observation, interviews with the Group B teacher and school principal, and documentation. The data were analyzed using the interactive model developed by Miles, Huberman, and Saldaña, which consists of data condensation, data display, and conclusion drawing and verification. The findings reveal three main aspects of planting-based learning. First, direct interaction with soil, seeds, and plants provides children with concrete sensory experiences that encourage exploration and curiosity about natural objects. Second, regular watering and plant-care activities provide repeated opportunities for children to practice responsibility and demonstrate concern for their surroundings. Third, observing plant growth provides opportunities for children to recognize changes, compare plant characteristics, and distinguish visible features of natural objects. These findings indicate that planting-based learning provides a contextual learning environment that integrates direct exploration, routine plant care, and observation of natural objects. Through these activities, children have opportunities to develop their ability to recognize and understand the natural environment, which represents an important dimension of naturalistic intelligence. This study highlights the relevance of sustained, hands-on planting activities as an alternative learning approach in early childhood education.

Keywords: planting-based learning; naturalistic intelligence; early childhood education; nature-based learning; gardening

Corresponding Author
Rika Widya, Universitas Pembangunan Panca Budi, Indonesia
Email: rikawidya@dosen.pancabudi.ac.id

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1. Introduction

Early childhood education is an important stage in supporting children's cognitive, socio-emotional, and physical development, as well as their ability to understand their surrounding environment. One aspect that requires particular attention is naturalistic intelligence, defined as the

ability to recognize, distinguish, and classify elements of the natural world, including plants and other living organisms (Gardner, 2011). Developing this ability requires learning experiences that provide children with opportunities to observe, explore, and interact directly with the natural environment. Ardoin and Bowers (2020) demonstrated that environmental education in early childhood has the potential to support children's cognitive and affective development and strengthen their connection with nature. Kiviranta et al. (2024) also identified various opportunities for outdoor learning to support children's holistic development through multisensory experiences, practical activities, and interactions with the environment. These findings underscore the importance of designing learning experiences that connect children with the natural world through structured activities appropriate to their developmental characteristics (Salmi et al., 2024).

The need for learning activities that facilitate direct interaction with nature is also evident in the learning practices at Aminah Hamdi Kindergarten. Preliminary observations were conducted in December 2025 involving all 14 children aged 5–6 years in Group B, using an observation checklist to examine their interactions with the natural environment and environmentally responsible behaviors. The observations revealed that nature-themed learning activities tended to take place indoors and relied on artificial learning materials. Children's opportunities to touch soil, observe plants, care for vegetation, and recognize environmental changes through direct experience remained limited. The observations also documented behaviors such as picking ornamental plants indiscriminately and littering. Mockovčáková and Barrable (2024) identified several factors associated with children's connection to nature, including experiential, environmental, family-related, and individual factors. In the context of Aminah Hamdi Kindergarten, planting-based learning may serve as an alternative approach to expanding these opportunities, provided that the activities are adapted to the school's conditions and supported by appropriate teacher guidance.

Planting-based learning involves a sequence of activities in which children become familiar with planting media and seeds, plant seeds, water and care for plants, and observe plant growth. These activities provide opportunities for children to engage their senses, ask questions, notice changes, and identify the characteristics of natural objects. McMillen et al. (2019) examined the sustainable integration of garden education into Head Start classrooms, while Jeong et al. (2025) investigated gardening activities in relation to children's familiarity with plants. Fadlillah et al. (2023) also emphasized the relevance of agricultural knowledge in early childhood education. These studies indicate that gardening can provide a meaningful learning context in which children interact directly with natural objects (Cosco et al., 2022).

Research on nature-based learning also indicates that such activities can provide opportunities for children to understand their environment through direct experience. Johnstone et al. (2022), in a mixed-methods systematic review, examined the relationship between nature-based early childhood education and children's social, emotional, and cognitive development. Jannah and Trianggono (2025) investigated nature-based learning through mini-garden activities in relation to the development of children's naturalistic intelligence. Priadi and Fatria (2024) specifically examined the development of naturalistic intelligence in early childhood through environmental education. Meanwhile, Susanti et al. (2025), through a systematic literature review, identified various strategies for recognizing and developing children's naturalistic abilities, including activities that use the natural environment and direct learning experiences. Collectively, these studies indicate that environment-based experiences represent a relevant approach to supporting naturalistic abilities (Sauli et al., 2026).

Although previous studies have examined nature-based education, gardening activities, and the development of naturalistic intelligence, further investigation is needed to understand the learning processes that occur when children participate directly in planting activities. Existing studies have addressed various developmental outcomes and instructional strategies, but they have not fully explained how the exploration of planting media, routine plant care, and the observation and

classification of plants are interconnected within a sequence of everyday learning activities in a specific school context. This gap is important because naturalistic intelligence involves the ability to recognize and distinguish characteristics of the natural environment, whereas caring for plants provides experiences that may foster environmental concern.

This study draws on Howard Gardner's theory of multiple intelligences, particularly the concept of naturalistic intelligence, which concerns the ability to recognize and distinguish characteristics of elements in the natural world (Gardner, 2011). Planting-based learning provides opportunities for children to develop this ability through direct interaction with plants and planting materials. By engaging in planting, caring for plants, and observing their growth, children can develop their ability to recognize, compare, and classify natural objects based on their observable characteristics.

Based on this background, the present study aims to analyze the implementation of planting-based learning in supporting the development of naturalistic intelligence among children aged 5–6 years in Group B at Aminah Hamdi Kindergarten. The study focuses on three aspects: children's exploration of planting media and plants, their involvement in plant care, and their ability to observe, compare, and classify plants according to observable characteristics. The novelty of this study lies in its qualitative examination of the relationships among these three aspects within a single sequence of learning activities in a specific early childhood education setting.

2. Methodology

This study employed a descriptive qualitative approach to examine the implementation of planting-based learning in supporting naturalistic intelligence development among children aged 5–6 years. The planting activities were designed by the researcher specifically for this study rather than adopted from an existing school program. The researcher prepared the planting materials and organized a series of learning activities, including the introduction of planting materials, demonstrations of planting and plant-care procedures, direct participation by children, and observation of plant development. The Group B teacher assisted in guiding and supervising the children throughout the activities. A descriptive qualitative approach was selected because the study aimed to document the learning process, children's participation and responses, and their interactions with the natural environment within the school context (Creswell, 2014; Moleong, 2017).

The study was conducted at Aminah Hamdi Kindergarten and involved 14 children aged 5–6 years in Group B. The planting-based learning activities involved flower seeds, soil, and rice husks as planting materials, with polybags serving as planting containers. Data were collected through observations, interviews with the Group B teacher and school principal, and documentation of the learning activities. Observations focused on children's engagement with natural materials, participation in plant-care activities, and ability to recognize and distinguish observable plant characteristics.

The study used primary and secondary data sources. Primary data were obtained through observations of children's activities during planting-based learning and interviews with two key informants: the Group B teacher and the school principal. Field notes were used to record children's participation in preparing planting materials, handling seeds, planting, watering, caring for plants, and observing plant growth. Although no formal written interview protocol was used, the interviews focused on several main topics, including the implementation of planting-based learning activities, children's participation and responses, observed changes in children's interest in and awareness of the natural environment, their involvement in plant-care activities, and challenges encountered during the learning process. Secondary data were obtained through relevant documentation, including learning documents, children's activity sheets, photographs of learning activities, and the school profile. Data collection involved observation, interviews, and documentation, following established qualitative research procedures (Sugiyono, 2019).

Data were analyzed using the interactive model proposed by Miles et al. (2014), which comprises data condensation, data display, and conclusion drawing and verification. During data condensation, the researcher selected and organized information relevant to planting-based learning and naturalistic intelligence. The data were then displayed through descriptive accounts and thematic groupings related to children's exploration of the natural environment, plant-care activities, and the observation and classification of plants. The final stage involved drawing and verifying conclusions by examining patterns in the data and comparing information obtained through observations, interviews, and documentation.

Data trustworthiness was addressed through systematic triangulation of sources and data collection techniques. Information obtained from observations, interviews, and documentation was compared to examine the consistency of the information and support the verification of conclusions. Regarding research ethics, permission to conduct the study was obtained from Aminah Hamdi Kindergarten. Written informed consent was also obtained from the parents or legal guardians of all 14 children before their participation in the research. This consent covered the children's involvement in the planting-based learning activities and the collection of research data through observation and documentation.

3. Results

The findings describe the implementation of planting-based learning among children aged 5–6 years in Group B at Aminah Hamdi Kindergarten. Data obtained from observations, interviews with the Group B teacher and school principal, and supporting documentation were organized into three themes: children's exploration of the natural environment, plant care and environmental responsibility, and plant observation and classification.

3.1. Children's Exploration of the Natural Environment

The learning activities began with an introduction to planting materials, including soil, rice husks, polybags, and flower seeds. Children were given opportunities to interact directly with these materials by touching the soil and rice husks, handling seeds, and preparing the planting media. During the activities, children participated in transferring soil using small shovels and placing planting materials into polybags under teacher supervision.

The observations documented children's direct engagement with the planting materials and their curiosity during the activities. The teacher also introduced the basic requirements for plant growth, particularly water, soil, and sunlight, helping children relate their direct experiences to the conditions needed by plants. Overall, the findings show that direct interaction with planting materials created opportunities for children to explore natural objects through hands-on learning experiences.

Table 1
Children's Exploration During Planting-Based Learning

Learning Activities	Observed Children's Responses
Exploring planting materials	Children touched and handled soil, rice husks, seeds, and polybags.
Preparing planting media	Children participated in transferring soil using small shovels and preparing the planting media.
Handling and planting seeds	Children participated in planting flower seeds with teacher assistance.
Learning plant requirements	Children were introduced to water, soil, and sunlight as basic requirements for plant growth.
Observing plant growth	Children were encouraged to observe changes in leaf appearance and plant growth.

Note. Source: Research observations and documentation, processed by the researchers (2026).

3.2. Plant Care and Environmental Responsibility

Following the planting activities, children participated in plant-care activities, including watering plants and observing their conditions under teacher supervision. Children were also encouraged to pay attention to the condition of leaves and soil as part of their interaction with the plants. The preliminary observations had documented behaviors such as picking ornamental plants and littering around the school environment. During the planting activities, children were provided with opportunities to engage in more environmentally responsible practices, including caring for plants, avoiding damage to vegetation, and maintaining the cleanliness of the planting area.

The findings describe opportunities for children to practice environmental responsibility through participation in plant-care activities. However, the available records do not establish the exact number of children who demonstrated particular behaviors or confirm the extent of individual behavioral changes. Therefore, these findings are interpreted as documented learning experiences and observed forms of participation rather than evidence of uniform behavioral improvement among all 14 children.

Table 2

Plant Care Activities and Children's Observed Behaviors

Learning Activities	Children's Participation
Watering plants	Children participated in watering plants under teacher supervision.
Observing plant conditions	Children were encouraged to notice the condition of leaves and soil.
Caring for plants	Children participated in activities aimed at caring for plants and avoiding damage to vegetation.
Maintaining the planting area	Children were involved in maintaining the cleanliness of the planting area.

Note. Source: Research observations and documentation, processed by the researchers (2026).

3.3. Plant Observation and Classification

Children were given opportunities to observe plant development, from the planting stage to the emergence of shoots and leaves. The teacher encouraged them to notice changes in plant conditions and describe their observations using simple language. The observations indicated that children began to recognize plant parts and pay attention to visible differences in plant characteristics, including leaf color, plant size, and shape.

During these activities, differences in children's participation and independence in recognizing plant characteristics were observed. Some children were able to identify and distinguish plants based on visible features, whereas others required teacher guidance to recognize these differences. Through direct observation and teacher-guided questions, children were encouraged to compare plant characteristics, identify similarities and differences, and describe their observations using simple language.

Table 3

Children's Participation in Plant Observation and Comparison

Learning Activities	Children's Participation
Observing plant growth	Children observed visible changes in plant growth, including the emergence of shoots and leaves.
Identifying plant parts	Children were introduced to visible plant parts through direct observation.
Comparing plant characteristics	Some children distinguished visible plant characteristics independently, while others required teacher guidance.
Describing observations	Children were encouraged to describe observed plant characteristics using simple language.

Note. Source: Research observations and documentation, processed by the researchers (2026).

Overall, the findings indicate that planting-based learning provided children with opportunities to explore natural materials, participate in plant-care activities, and observe and distinguish plant characteristics. Children's responses varied across these activities, particularly in their ability to recognize and differentiate plant characteristics, with some children demonstrating greater independence while others required teacher guidance.

4. Discussion

4.1. Direct Exploration as a Context for Naturalistic Intelligence

The findings indicate that planting-based learning provided opportunities for children to interact directly with natural objects by touching soil, handling seeds, preparing planting media, and observing plants. These activities created concrete learning experiences in which children could examine natural materials and respond to questions about plant growth. This pattern is consistent with Gardner's (2011) concept of naturalistic intelligence, which emphasizes the ability to recognize and distinguish characteristics of the natural environment.

These findings are supported by previous Indonesian studies that have directly examined the relationship between planting activities and naturalistic intelligence in early childhood. Amanda and Sit (2025), in their study involving 12 children aged 5–6 years at Madinah School Kindergarten, found that planting activities supported children's interest in nature, exploration of natural materials, environmental awareness, and knowledge of the natural environment. Similarly, Hotiah and Aprianti (2022) reported that planting activities provided opportunities for children to recognize plants according to their types, care for plants, and identify environmental conditions required for plant growth. Hasanah et al. (2019) also demonstrated the contribution of gardening activities to the development of naturalistic intelligence among kindergarten children in Merauke.

The contribution of this study lies in describing how direct exploration of planting materials forms an initial stage of children's engagement with the natural environment. Nevertheless, the findings represent documented learning experiences and children's observable engagement rather than evidence of a measurable increase in naturalistic intelligence.

4.2. Plant Care, Responsibility, and Environmental Awareness

The second finding concerns children's participation in watering plants, observing plant conditions, protecting vegetation, and maintaining the cleanliness of the planting area. These activities extended learning beyond the initial planting stage by providing repeated opportunities for children to engage with living organisms. The observed participation in watering plants, caring for vegetation, and maintaining the cleanliness of the planting area indicates that plant-care activities can provide opportunities for children to practice environmentally responsible actions (Anggraeni, 2026; Deniz & Kalburan, 2024).

These findings can be understood in relation to previous research on gardening activities and environmental responsibility in early childhood. Pratiwindya et al. (2018) found that hydroponic gardening activities and parental involvement contributed to the development of children's naturalistic intelligence, highlighting the value of direct involvement in plant cultivation. Similarly, Mawaddah and Helmi (2025) reported that environmentally responsible practices, including caring for plants, maintaining cleanliness, and observing the surrounding environment, supported children's sensitivity to environmental changes and their developing naturalistic intelligence. Nevertheless, environmental responsibility should be distinguished from naturalistic intelligence itself. While caring for plants reflects children's emerging concern for the natural environment, recognizing, observing, and distinguishing natural characteristics represent more direct indicators of naturalistic intelligence.

4.3. Plant Observation and Comparison as Naturalistic Learning Processes

The third finding concerns children's opportunities to observe plant growth, identify plant parts, and compare plants according to recognizable features. These activities align with the observational and classificatory dimensions of naturalistic intelligence described by Gardner (2011). By examining differences in leaf color, plant size, shape, and plant type, children engage with observable characteristics of the natural world (Caryati et al., 2026). Teacher questions also provide opportunities for children to describe what they notice and communicate their observations in simple language (Batshila et al., 2026).

The observation and comparison activities are particularly relevant to the naturalistic intelligence framework because they involve children's attention to similarities and differences among elements of the natural environment (Gardner, 2011). However, their participation varied: some children could distinguish visible characteristics independently, whereas others needed teacher guidance. This finding highlights the importance of providing repeated observation opportunities and developmentally appropriate questions to support children's engagement with natural objects. Kahriman-Pamuk et al. (2026) provide a broader perspective on integrating nature connection into early childhood education for sustainability, while Deswati et al. (2026) discuss learning strategies associated with naturalistic intelligence development. The present study extends this discussion by describing children's different levels of participation and the teacher support provided during plant observation and comparison activities in a specific kindergarten context.

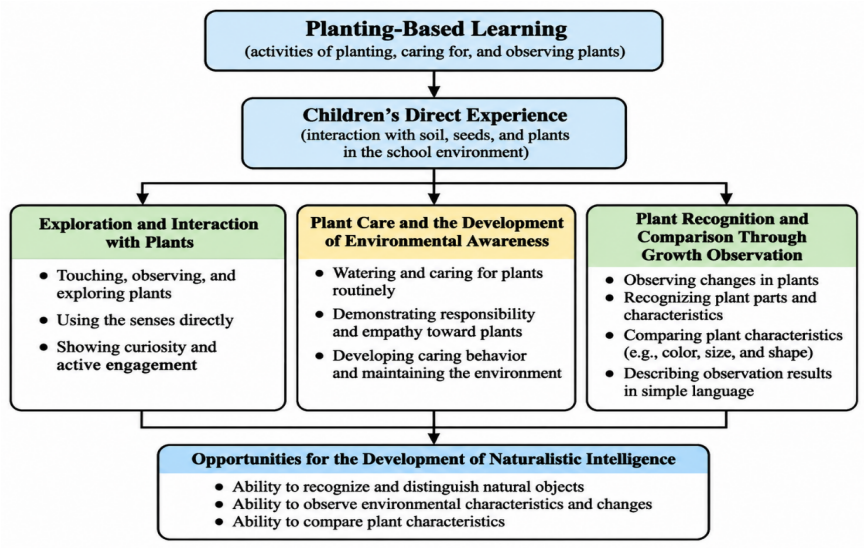


Figure 1
Conceptual Integration of Planting-Based Learning Activities and Naturalistic Intelligence Development

As summarized in Figure 1, planting-based learning brought together three related areas of activity: exploration of natural materials, plant care, and observation and classification. The educational value lies in the opportunities for direct observation and comparison, rather than in planting activity alone.

4.4. Practical Implications and Study Limitations

The findings suggest that early childhood educators can organize planting-based learning as a continuous learning process rather than a one-time classroom activity, consistent with the broader educational discussion of school gardening presented by Xu et al. (2025). Teachers can involve children in preparing planting media, planting seeds, watering plants, observing growth, and describing visible changes. These activities provide opportunities for children to interact directly with natural objects and

develop their ability to recognize and distinguish environmental characteristics (Gardner, 2011). Teachers can further support children's learning by asking open-ended questions that encourage observation, comparison, and classification. Such activities should be adapted to children's developmental characteristics, the resources available at school, and appropriate supervision. Integrating repeated plant-care activities into classroom routines may also provide opportunities for children to practice environmental responsibility, although this outcome should be examined separately from naturalistic intelligence.

Several limitations should be acknowledged. First, the study involved 14 children from a single kindergarten. Therefore, the findings provide context-specific insights and should not be generalized to other early childhood education settings without considering differences in institutional context and learning practices. Second, the descriptive qualitative design was intended to document learning processes and observed behaviors rather than establish causal relationships or quantify changes in naturalistic intelligence. Third, the study did not employ a standardized measure of naturalistic intelligence or a comparison group. Future research could examine similar activities across multiple early childhood education settings, document children's learning trajectories over a longer period, and combine qualitative observations with appropriate developmental assessments.

5. Conclusion

This study examined the implementation of planting-based learning in supporting naturalistic intelligence development among children aged 5–6 years in Group B at Aminah Hamdi Kindergarten. The findings identified three interconnected aspects of learning: direct exploration of natural materials, participation in plant-care activities, and observation and classification of plant characteristics. The findings also revealed variations in children's abilities, particularly in recognizing and differentiating plant characteristics, with some children requiring teacher guidance during the learning process.

Planting-based learning provides a contextual approach to early childhood education by integrating exploration, plant care, and observation into meaningful learning experiences. Practically, the findings may inform early childhood educators in designing sustained planting activities that encourage direct interaction with nature, support children's naturalistic learning experiences, and foster environmental responsibility.

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