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Scientific Approach in Increasing Naturalist Intelligence in Early Childhood

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Abstract

Naturalist intelligence in early childhood needs to be developed from an early age, because each child has a different level of intelligence. This study aims to determine the learning process using a scientific approach and the effect of applying a scientific approach to naturalist intelligence. The type of research is a systematic literature review (SLR), the data used comes from Google Scholar, DOAJ and SINTA with many articles totaling 40 articles, then 10 articles were selected as the main reference in writing this article. The data analysis technique used in this article is qualitative thematic analysis. The results of the study indicate that the scientific approach is effective in increasing the naturalist intelligence of early childhood. Through the 5M stages, children actively build attitudes, knowledge, and skills. This approach can be applied in various activities such as nature exploration, simple experiments, and thematic themes. Children who have honed naturalist intelligence tend to have high curiosity, think critically, and care about nature and the surrounding environment. This study contributes to strengthening the understanding that the scientific approach can increase the naturalist intelligence of early childhood. The results emphasize the importance of integrating the 5M stages in environmental-based learning and direct experience. This research also serves as a theoretical basis for the development of PAUD learning models that optimally stimulate children's curiosity, concern for nature, and critical thinking skills.

INTRODUCTION

Every child has unique characteristics and potential for intelligence, so an appropriate learning approach is essential for their optimal development (Alannasir, 2020; Bjorklund, 2022). According to the NAEYC (Priyanto, 2014), early childhood is the age range of 0 to 8 years, which is a crucial period for growth and development. Gardner (2013) stated that each individual has various types of intelligence at different levels, one of which is naturalist intelligence—the ability to recognize, understand, and interact with nature. Etxebarria et al., (2022) further highlighted that there are nine types of human intelligence, including naturalist intelligence, which is highly relevant for early childhood development. In this context, a scientific approach can be an effective method to enhance children's naturalist intelligence (Suhirman, 2020; Priadi & Fatria, 2024). This approach encourages children to observe, explore, and interact directly with their surroundings (Sari et al., 2022; Rakhmawati et al., 2023). By engaging in these scientific processes, children become more sensitive to nature and develop a sense of responsibility and care for the environment. This method fosters environmental awareness and nurtures an appreciation for the natural world from a young age.

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Naturalist intelligence is one type of intelligence in the theory of multiple intelligences, which is related to children's ability to recognize and protect the environment (Astuti et al., 2022). However, Saripudin's (2017) research shows that attention to child development is still lacking, so that children's awareness of the environment is also low. A similar thing was found by Kamtini et al. (2020) who revealed that the learning process in one PAUD was still dominated by teachers and did not utilize the appropriate approach. The urgency of developing naturalist intelligence is also driven by various environmental problems such as illegal logging, flooding due to plastic waste, and hunting of protected animals (Saripudin, 2017). Therefore, it is important to provide naturalist intelligence stimulus from an early age. One strategy that can be used is the scientific approach, which emphasizes active participation of children during learning (Aprilianti & Septiani, 2021). Aprilia & Lokollo (2023) also emphasized that this approach is able to increase naturalist intelligence and support all aspects of child development through direct experiences that are centered on children and increase the ability to adapt to the environment.

This study aims to determine how the learning process using a scientific approach is carried out and to analyze the effect of implementing this approach on increasing the naturalist intelligence of early childhood. This objective arises from the finding that so far, learning activities based on a scientific approach used to develop children's naturalist intelligence are still limited to activities related to plants. In fact, there are basically various activities that can be adjusted to the needs and characteristics of children. Therefore, the benefits of this study are to provide contributions in the form of information and new ideas regarding various learning activities based on a scientific approach that can stimulate naturalist intelligence more broadly. In addition, the results of this study are expected to be a reference for educators in designing more varied, meaningful, and child-centered learning to increase their concern and understanding of the environment.

Based on the research objectives to determine the process and influence of the scientific approach on increasing the naturalist intelligence of early childhood, the hypothesis in this study is: There is a significant influence between the application of the scientific approach in learning on increasing the naturalist intelligence of early childhood. This hypothesis is based on the assumption that the scientific approach, which actively involves children through the stages of observing, asking, trying, reasoning, and communicating, is able to provide concrete and meaningful learning experiences. Through this process, children not only gain knowledge, but are also trained to be more sensitive to the environment and are able to recognize patterns and changes in nature independently. Thus, the scientific approach is believed to be an effective strategy in stimulating aspects of child development, especially in terms of naturalist intelligence which is closely related to children's concern and involvement in the surrounding environment.

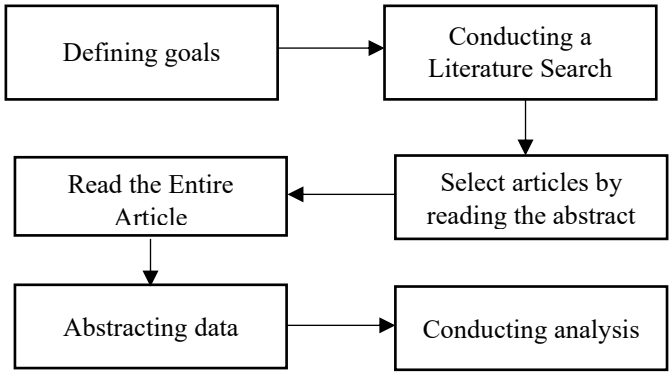
METHOD

This study uses the Systematic Literature Review (SLR) method to explore the topic "Scientific Approach in Improving Early Childhood Naturalist Intelligence." The SLR method is a technique for systematically identifying, evaluating, and interpreting all relevant studies on a particular topic in a structured way (Calderón & Ruiz, 2015). It allows researchers to synthesize past research, offering a comprehensive understanding of the subject. By focusing on existing literature, SLR provides a detailed analysis of previous findings, helping researchers organize and present the research landscape clearly. This method not only helps in identifying trends and gaps in existing research but also offers a structured approach to understanding how the scientific approach can be applied in early childhood education to enhance naturalist intelligence. Through the SLR, researchers can gather secondary data from trusted sources, ensuring a strong theoretical foundation for the study.

The purpose of selecting the SLR method for this study is to thoroughly explore and assess various scientific sources that explain how a scientific approach can be implemented in early childhood learning to improve naturalist intelligence. Through this method, the researcher can access a wide range of credible academic articles, journals, and other publications, providing a solid theoretical foundation for understanding the subject matter. The SLR method is particularly useful in

consolidating findings from different studies to present a cohesive understanding of the topic. Additionally, the SLR method aids researchers in identifying emerging trends, key findings, and gaps in previous research on naturalist intelligence development. By analyzing the current state of knowledge, the SLR approach helps to highlight areas that require further investigation or improvement. This enables researchers to propose new directions for future studies while contributing valuable insights into how the scientific approach can be effectively applied in early childhood education to nurture naturalist intelligence.

Figure 1. Systematic Literature Review Process



Sumber: Aznam et al., (2022)

In the study entitled Scientific Approach in Improving Naturalist Intelligence in Early Childhood, the articles reviewed came from national and international journals that discussed the topic of naturalist intelligence and scientific approach. The sources of the articles were obtained through academic search engines such as Google Scholar, DOAJ, and SINTA, with publication year limits between 2013 and 2023. The keywords used in the search included "naturalist intelligence", "naturalistic intelligence", "scientific approach", "smart nature", and "science ability". The articles collected included publications in Indonesian and English, and each relevant article was recorded in a database based on the journal name, year of publication, author's name, and abstract. From a total of 40 articles that were systematically reviewed, the researcher then selected 10 main articles that were the most relevant and in-depth to be used as the main references in writing this article, in order to gain a more comprehensive understanding of the topic being studied.

In the study entitled Scientific Approach in Improving Naturalist Intelligence of Early Childhood, the data analysis technique used is thematic analysis. This analysis aims to identify patterns or themes that emerge from the data that has been collected (Braun & Clarke, 2006). This approach is considered appropriate because it is able to explore deep meaning from the various literatures analyzed. The analysis process is carried out through several stages, namely: (1) recognizing the data as a whole to find common themes; (2) looking for themes in the coding results by observing the patterns that emerge; (3) reviewing the themes to ensure that the classified data is in accordance with the predetermined themes; (4) refining and confirming the themes to match the focus and research questions; and (5) compiling a final report based on the themes found. Through these stages, a systematic understanding is obtained regarding the contribution of the scientific approach to the development of naturalist intelligence of early childhood.

RESULTS AND DISCUSSION

Results

Results of Research on the Development of Naturalist Intelligence in Early Childhood

Based on a literature review on the scientific approach in improving the naturalist intelligence of early childhood, the researcher managed to find 10 articles that fit the research criteria. Furthermore, the research results will be described by dividing the focus of the analysis into two main

categories, namely those related to naturalist intelligence and the application of the scientific approach, to provide a clearer and more structured picture of the findings from the literature reviewed.

Table 1. Naturalist Intelligence

No.	Writer	Year	Research result
1	Maulidya Ulfah & Yurida Khoerunnisa	2018	The naturalist intelligence of group B children at TKIT Al-Farisi Majalengka increased after being given an inquiry strategy compared to before the treatment.
2	Nita Priyanti & Jhoni Warmansyah	2021	The use of nature-based Loose Parts media has a significant effect on increasing the naturalist intelligence of early childhood children, and is effectively used by teachers in kindergarten.
3	Winda Sherly Utami, Arif Rohman, & Roudlotul Islamiyah	2020	Introduction to the surrounding environment can stimulate and increase the naturalist intelligence of children aged 5-6 years gradually.

From the three studies presented in the table, it can be concluded that early childhood naturalist intelligence can be enhanced through learning approaches that involve direct interaction with nature. Although all studies utilized quantitative methods, the approaches and interventions varied, including inquiry strategies, the use of nature-based Loose Parts media, and environmental exploration. Despite these differences, all three studies demonstrated similar outcomes, showing an improvement in children's naturalist intelligence following the interventions. These findings highlight the effectiveness of nature-based learning experiences in fostering naturalist intelligence in early childhood education.

It is important to note that all the studies employed experimental or pre-experimental designs, which primarily focused on short-term outcomes. None of the studies conducted longitudinal research to assess the long-term impact of these interventions on children's behavior. While the studies reported positive results, the effectiveness of the scientific approach in improving naturalist intelligence has not been thoroughly explored in depth. This gap in research indicates the need for more extensive follow-up studies. A mixed methods approach, combining both qualitative and quantitative data, would provide a more comprehensive understanding of how these interventions impact children over time. Such studies would help strengthen the empirical evidence and offer valuable insights into the most effective strategies for enhancing naturalist intelligence in early childhood education.

Study on Scientific Approach in Early Childhood Learning

Research related to the application of the scientific approach in early childhood learning shows that the success of the implementation of this method is influenced by several important factors. The studies reviewed revealed that the right allocation of time, the number and type of learning tools or objects provided, and the role of teachers in asking questions that encourage children to think critically are the main keys to the quality of the implementation of the scientific approach. The learning stages that include observing, asking, gathering information, reasoning, and communicating are very appropriate for the cognitive and social development of early childhood, so that this approach is able to increase children's active involvement in the learning process. However, research also shows the need for increased teacher competence and support from related institutions so that the implementation of the scientific approach can run consistently and effectively, so that it has a positive impact on the development of children's naturalist intelligence.

Table 2. Scientific Approach

No.	Writer	Year	Research result
1	Maria Melita Rahardjo	2019	Important factors in the implementation of the scientific approach are time allocation, the number of objects provided, and the types of questions asked by teachers during learning.
2	Nur Afif, Desy Ayuningrum, Ali Imran, Agus Nur Qowim	2022	The implementation of the scientific approach in RA/PAUD is carried out through the stages of observing, asking, collecting information, reasoning, and communicating, according to the characteristics of early childhood.

3	Felisitas Ndeot	2019	The results of the study can be used as study material for teachers in implementing the scientific approach as well as a reference for the education office to improve the competence of PAUD teachers.

Findings from various studies show that the application of a scientific approach in early childhood learning requires special attention to several key factors, such as adequate time allocation, availability of sufficient learning tools or objects, and the quality of teacher interaction through questions that stimulate children's thinking. The learning process with a scientific approach that involves the stages of observing, asking, collecting information, reasoning, and communicating has proven to be appropriate and effective for application to early childhood, in accordance with their developmental characteristics. However, there are still challenges in consistent and optimal implementation, especially related to teacher readiness and institutional support. Therefore, improving teacher competence through training and policy support from educational institutions is an important aspect to ensure that the scientific approach can run effectively and have a significant impact on the development of naturalist intelligence and other aspects of child development.

Study of Scientific Approach to Improve Naturalistic Intelligence of Early Childhood

Various studies have shown that the scientific approach has an important role in improving the naturalist intelligence of early childhood. Through learning methods that involve activities such as observing, asking, gathering information, reasoning, and communicating, children can be actively involved in the process of exploring their surroundings. The studies reviewed revealed that the application of this approach not only improves children's ability to recognize, understand, and care for nature, but also arouses their interest and awareness of environmental conservation. However, the results of the study also showed variations in the quality of implementation, where several educational institutions still face challenges in implementing the scientific approach optimally. Therefore, it is important to increase teacher capacity and institutional support so that the scientific approach can be applied consistently, so that it has a significant impact on the development of naturalist intelligence and children's readiness to face environmental challenges in the future.

Table 3. Scientific Approach Can Improve Naturalist Intelligence

No.	Author and Year	Research methods	Key Results
1	Angra Gumitri & Dadan Suryana (2022)	Qualitative Descriptive	Life science activities have a significant impact on children's naturalist intelligence. Children are enthusiastic about participating in learning and show interest in preserving the environment by caring for and cleaning.
2	Kamtini, Isa Hidayati, dkk. (2019)	Quantitative	The scientific approach has a significant impact on the naturalist intelligence of early childhood.
3	Shinta Annisa, Sugito, Arumi Savitri (2019)	Qualitative	The facilitator implemented scientific learning with 5 out of 8 activities according to the scientific approach. Of the 18 indicators of naturalist intelligence, 10 emerged during learning.
4	Rohenah, Isti Rusdiyani, Laily Rosidah (2021)	Classroom Action Research	Naturalist intelligence increased significantly from pre-action (28%) to cycle I (46%) and cycle II (82%) after the implementation of learning actions.
5	Ita Aprilia & Lambertus J. Lokollo (2023)	Classroom Action Research	Children can observe, ask, differentiate, and tell about plants through scientific learning.
6	Riska Aprilianti & Sesi Septiani (2021)	Classroom Action Research	The scientific approach increases the naturalist intelligence of group B children at PGRI Mekar Wangi Kindergarten.
7	Husni Mubarok (2018)	Quantitative	There is a significant influence of the scientific learning model on children's naturalist intelligence, as evidenced by the increase in average scores before and after treatment.
8	Khusnul Laely & Subiyanto (2021)	Survei	The implementation of scientific learning at PAUD Karisidenan Kedu has only reached 44.44%. However, this approach is able to stimulate multiple intelligences in early childhood.

9	Siti Fatonah & Zuhdan Kun Prasetyo (2017)	Qualitative	Children know animals and plants around them, have a high interest in nature conservation, like farming, care about pets, and enjoy learning about nature.
10	Rahimah & Muzdhalifah (2022)	Descriptive Analysis	Through simple science experiments, children are able to recognize, understand, and classify phenomena in the surrounding environment, such as changes in the color of water using plastic.

Based on the findings of various studies, it can be concluded that the scientific approach has consistently proven effective in improving the naturalist intelligence of early childhood. This approach encourages active involvement of children through the process of exploration and direct observation of the surrounding environment, thereby fostering curiosity and concern for nature. However, the implementation of the scientific approach still shows variations in quality, which are influenced by factors such as teacher competence and institutional support. Therefore, the success of this approach is highly dependent on adequate teacher training and the provision of appropriate learning facilities. By optimizing these factors, the scientific approach not only improves naturalist intelligence, but also prepares children to become environmentally conscious individuals and able to adapt to the challenges of changing nature. This emphasizes the need for more serious attention to improving the quality of early childhood education, especially in the development of naturalist intelligence through the scientific approach.

Discussion

The Role of Scientific Approach in Developing Naturalist Intelligence

Naturalist intelligence in early childhood can be optimally developed through the implementation of appropriate learning strategies, the use of engaging media, and activities that are closely tied to children's everyday experiences (Darling-Hammond et al., 2023). According to Ulfah and Khoerunnisa (2018), one effective strategy for enhancing naturalist intelligence is the inquiry method. In this approach, the teacher poses thought-provoking questions, such as "What are the benefits of air?", which encourages children to make hypotheses related to the question. Following this, children conduct experiments by planting cayenne pepper in two different environments—one in a cupboard without water and air, and the other in the open air (Radojčin et al., 2021). Children observe the growth of the plants, collect data, and work with the teacher to analyze the differences in growth. This process allows children not only to learn about nature and the environment firsthand but also to develop critical thinking, analytical, and problem-solving skills. This approach is highly effective in fostering children's curiosity and understanding of their surrounding environment in a comprehensive way.

Priyanti & Warmansyah (2021) found that the use of natural learning media, such as loose parts, is very effective in increasing the naturalist intelligence of early childhood. Loose parts media consists of various natural materials that are easily found in the surrounding environment, such as seeds, pieces of wood, ropes, and bottles. Through this media, children are invited to learn directly about the surrounding environment and the importance of preserving it. Playing activities with natural materials are not only fun but also educational, so that children can understand the concept of recycling and protecting the earth more realistically (Hajj-Hassan et al., 2024). Children learn to recognize that plastic is difficult to decompose by nature, while natural materials such as wood and seeds can be used and appreciated. Loose parts media also allows children to develop creativity and imagination in processing natural materials into various forms of educational games (Chawla, 2020). This approach is an effective and cost-effective way to stimulate naturalist intelligence in a fun and applicable way.

Utami et al. (2020) emphasized the importance of introducing the surrounding environment using a scientific approach as an effective way to stimulate naturalist intelligence in early childhood. By providing opportunities for children to interact directly with nature, they not only get to know various elements of the environment, but are also able to develop various important aspects, such as

cognitive, social, and emotional. This learning process can start from a simple introduction to the environment and gradually move towards more complex activities, such as field trips or educational visits. Through this approach, children can gain in-depth and enjoyable direct experience, thereby strengthening their understanding and sense of caring for the surrounding environment. The combination of inquiry strategies, the use of natural media, and environmental exploration carried out in an integrated manner in a scientific approach has proven to be very effective in helping children develop their naturalist intelligence comprehensively and sustainably from an early age.

Implementation of Scientific Approach in Early Childhood Education

The scientific approach in early childhood learning is realized through five main stages, namely observing, asking, collecting information, reasoning, and communicating. However, based on a literature review, many PAUD institutions have not fully implemented this approach optimally. Rahardjo (2019) emphasized that each stage must be implemented properly so that the learning process runs effectively. For this reason, teachers need to focus on the initial stage, namely data collection, because its success is highly dependent on several key factors. First, the availability of adequate teaching materials allows children to interact and feel directly with the learning materials, activating their various senses. Second, sufficient time must be given so that children have the opportunity to explore the teaching materials thoroughly. Third, the teacher's ability to provide appropriate questions or instructions is very important to trigger children's curiosity and observation activities. With a mature understanding of this process, teachers can ensure that the implementation of the scientific approach is effective and has a positive impact on the development of early childhood.

Afif et al. (2022) studied the implementation of the scientific approach in early childhood education in RA/PAUD by directly involving children in the learning process. This learning process consists of five main stages. First, the observing stage, where children use their five senses such as hearing, sight, taste, smell, and touch to recognize objects independently or in groups, thus enriching the information received. Second, the questioning stage, where children actively seek out and connect old knowledge with new ones, with the teacher playing a role in triggering and stimulating questions that arise from children, including utilizing relevant learning media. Third, the trying or gathering information stage, where children experiment and play while honing their creativity, with the teacher supporting and building these abilities. Fourth, the reasoning stage, which connects old and new knowledge logically with the help of the teacher who invites children to think critically. Fifth, the communicating stage, where children convey learning outcomes through speech or work, and the teacher plays a role in strengthening children's understanding so that critical and creative thinking processes develop optimally. If teachers ignore children, this can hinder children's learning motivation and creativity.

Ndeot (2019) conducted a study on the application of the scientific approach in early childhood learning. At the observation stage, children use various senses such as eyes to see, ears to hear, skin to feel texture, nose to smell, and tongue to taste. At the questioning stage, teachers provide interesting learning media to stimulate children's curiosity. Furthermore, in the collecting stage, children obtain information through active explanations from the teacher. At the reasoning stage, children are given the opportunity to link the information they have obtained with their daily experiences so that understanding becomes deeper. Finally, at the communicating stage, children convey learning outcomes through activities such as coloring, telling stories, or exhibiting work. In addition to understanding the scientific approach process, teachers also need to utilize interesting media to increase children's interest in exploring new and existing knowledge during the learning process.

Scientific Approach Can Improve Naturalistic Intelligence in Early Childhood

Based on a study of 10 literatures, researchers found that the application of a scientific approach in learning has a positive influence on increasing naturalistic intelligence in early childhood. Gumitri & Suryana (2022) emphasize the stimulation of naturalistic intelligence through life science activities that invite children to actively seek facts and understand simple concepts independently. First,

children are given the opportunity to classify plants based on the condition of their leaves, namely dry and green leaves, with the guidance of teachers who facilitate discussions and encourage children's curiosity. Second, children observe and group leaves according to shape, color, and type, while getting directions to explore a deeper understanding of the classification. Third, children are divided into groups to collect flowering and fruiting plants, which fosters enthusiasm and concern for the surrounding environment. Fourth, children classify plant branches based on size while still paying attention to plant sustainability, while being taught the importance of maintaining a clean environment. This life science activity is carried out in a school environment using natural materials, so that the scientific approach has proven to be effective in developing the naturalistic intelligence of early childhood.

Kamtini et al. (2020) stated that the scientific approach in learning provides meaningful direct experiences for children by actively involving them in fun learning activities using real media or concrete activities. Through interaction with real objects, children can more easily understand and feel the concepts being taught. For example, by bringing pets to class, children can learn how to care for and get to know the animals directly. Exploration activities outside the environment such as observing piles of garbage and planting plants also help children understand the cause and effect and the importance of caring for the surrounding environment. This direct experience not only deepens children's understanding, but also fosters awareness and an attitude of loving the environment, including plants and animals around them.

Meanwhile, the results of Annisa's (2019) study showed that of the eight scientific activities carried out, five activities such as introduction to the school environment, nature exploration, sensory games, color experiments, and playdough successfully met the criteria for a scientific approach as a whole. However, the other three activities such as gymnastics, storytelling, and song movements have not fully implemented the scientific approach because not all learning activities are suitable for using this method. Thus, the scientific approach has proven effective in increasing the naturalist intelligence of early childhood through direct and contextual learning experiences.

Rohenah et al. (2021) explained that in implementing science learning, teachers need to follow several important stages so that the learning process takes place effectively. The first stage is preparation, where the teacher prepares all learning needs such as the Daily Learning Implementation Plan (RPPH), observation guidelines, and tools and materials that will be used in the activity. Furthermore, at the implementation stage, the teacher explains the tools and materials that will be used, as well as providing examples of how to carry out the activities correctly. The children then carry out the activities according to the instructions that have been given, with direct teacher supervision to ensure the safety and smoothness of the learning process. The final stage is evaluation, which aims to help children recall the activities that have been done. Through this evaluation, children can reflect on their learning experiences, thus helping to improve their understanding and naturalist intelligence gradually and comprehensively.

Learning at the kindergarten level should ideally be carried out in a fun and interesting way so that children are actively involved in the learning process. Aprilia & Lokollo (2023) stated that increasing children's naturalist intelligence can be done through a scientific approach by utilizing learning media such as plants. Children are also introduced to various types of fruits and ornamental plants as part of a fun and educational learning experience. Aprilianti & Septiani (2021) added that learning that is carried out directly in the open natural environment provides children with the opportunity to observe and gain new experiences in real terms. In implementing the scientific approach, teachers need to design activities systematically according to the stages, and convey the steps clearly so that children understand the learning process. Mubarok (2018) stated that the scientific approach allows students to explore information from various sources through activities such as observing, asking, trying, concluding and creating, making learning more scientific and meaningful. Meanwhile, Laely & Subiyanto (2021) develop naturalist intelligence through various nature-based activities such as printing with banana stems, sequencing plant growth, planting,

drawing, making collages from fruit, to creating simple foods. These activities strengthen children's love of nature and train their ability to actively explore the environment.

Fatonah & Prasetyo (2018) stated that science learning at the Syuhada Mosque Kindergarten in Yogyakarta is carried out using various methods to develop children's naturalist intelligence, such as play methods (color games, construction, movement and songs), storytelling (about floods, the benefits of queuing), role models (positive values), habits (rules when playing), excursions (visits to school parks), demonstrations (floating and sinking concepts), projects (making fruit satay), and questions and answers (evaluating children's understanding). Meanwhile, Rahimah & Muzdhalifah (2022) in their research at PAUD Athaira Modern School Banjarbaru explained that teachers prepare RKH, study rooms, and simple media such as water, transparent glasses, plastic bags, and colored pencils for experimental activities to change the color of water. The teacher demonstrates the experiment and the children try in turns. Supporting factors for this activity are simple but interesting media, as well as opportunities for children to directly observe their surroundings, thereby increasing understanding and concern for the surrounding environment.

CONCLUSION

Based on the results of the study above, it can be concluded that children's naturalist intelligence can be improved through learning using a scientific approach. The scientific approach learning process does not only use activities with plants, it can also use color change experiment activities, observe the natural environment, use life science, or activities that are integrated with the theme being studied. The application of learning using a scientific approach results in children actively building their attitude, knowledge and skills competencies through the 5M stages. The limitations of this study are that researchers cannot see the learning process using a scientific approach directly in PAUD institutions and how children's attitudes emerge after using a scientific approach. The recommendations that can be given for further research are to conduct research directly in PAUD institutions in order to get more accurate results.

This study confirms that the scientific approach is effective in building naturalist intelligence in early childhood. Through the 5M stages (observing, asking, collecting information, reasoning, and communicating), this approach encourages the development of children's scientific attitudes, knowledge, and skills. The scientific approach is flexible and can be applied to nature exploration, simple experiments, and thematic activities. For PAUD practitioners, it is important to integrate this approach into daily learning through activities that stimulate curiosity and direct interaction with the environment. Teachers should design activities based on the 5M stages and institutions need to provide training so that implementation is optimal. In addition, further research directly in the field is needed to assess its effectiveness and impact on the development of children's behavior as a whole.

This study has several limitations. First, the researcher did not conduct direct observation at the PAUD institution, so the data only came from literature reviews and did not reflect real field conditions. Second, the absence of direct observation of children's responses meant that the emotional and behavioral impacts were not fully described. Third, the approach used was qualitative descriptive based on literature studies, so it was not possible to measure the influence of the scientific approach quantitatively. Further research is recommended to be conducted directly in the field through observation, interviews, and documentation so that the results are more empirical. The use of mixed methods is also recommended to measure the process and results comprehensively. In addition, further studies can compare the effectiveness of the scientific approach with other approaches, as well as analyze the role of teachers, the most effective learning media, and children's emotional and cognitive responses during the scientific-based learning process.

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AUTHOR CONTRIBUTION STATEMENT

NA is responsible for data analysis and writing. LH and MA are responsible for reviewing the manuscript and providing suggestions.

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