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The influence of experiential Jelajah Alam Sekitar learning model on naturalist intelligence in science learning

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Abstract This research aims to determine the influence of the Experiential Jelajah Alam Sekitar learning model on naturalist intelligence in elementary school students' social and science learning. This research uses quantitative methods that are experimental. The population of this research is all fifth-grade students at SDN Segugus Dewi Sartika, Purworejo, for the academic year 2023/2024. The sampling technique used was cluster random sampling. The data collection techniques used were tests, questionnaires, and observation sheets. Data analysis techniques included prerequisite tests such as normality tests using the Kolmogorov–Smirnov method, homogeneity tests using Levene's test, balance tests using the t test, and hypothesis testing using the Independent Sample t Test. Based on the results of research conducted from the implementation of the naturalist intelligence test, it was found that the calculated value was 2.082, with degrees of freedom (dk) = 39, and a significance level of 5%, where the critical t value (t-table) is 2.023. Therefore, it can be concluded that t > t-table, thus H_0 is rejected and H_1 is accepted. Based on the results of the n-gain test, the average value in the experimental group was 0.44, and in the control group, it was 0.29. Hence, the increase in scores with the Experiential Jelajah Alam Sekitar learning model is better than with conventional learning models.

Keywords: EJAS model, naturalist intelligence, science learning

1. Introduction

To date, teachers have labeled students intelligent or not solely on the basis of their abilities in mathematical logic and language (Halimung, 2021). This approach is less appropriate if viewed through the lens of multiple intelligences, as every individual possesses both dominant intelligence and secondary intelligence. Therefore, teachers are expected to detect the intelligence of their students by paying attention to their tendencies, behaviors, interests, qualities, and ways in which they react to given stimuli. Students' intelligence needs to be well considered because it is crucial for their long-term life as a foundation of their knowledge. Thus, teachers need to understand how to develop the intelligence of their students by identifying indicators of intelligence in children (Fahlevi & Rosyid, 2018).

Howard Gardner proposed that every child is born with various types of intelligence known as multiple intelligence (Syarifah, 2019). Naturalist intelligence is one of the nine types of intelligence identified by Howard Gardner and is considered very important in preparing individuals to face future challenges (Supeno & Siswanto, 2022). Naturalist intelligence is the ability to recognize patterns in nature, classify objects, master taxonomy, show sensitivity to natural features, and understand flora and fauna species (Kalean & Batlolona, 2023). Supeno & Siswanto (2022) suggest that elementary school is the right time to develop the multiple intelligences of students, considering that at this age, children are experiencing the peak of their potential development (Supeno & Siswanto, 2022). School-aged children are individuals undergoing development according to their age range. At the elementary school stage, they often experience developments in initiative, responsibility, and identity. Children at this age are generally considered to experience their first speculative actions beyond the usual authority range that typically occurs at the kindergarten level (Anwar et al., 2024). This means that the development of naturalist intelligence, which is one type of intelligence, can already be instilled in elementary school students. Moreover, elementary school-aged children are when their cognitive abilities, attitudes, and psychomotor skills begin to develop rapidly. The development of naturalist intelligence in students is significantly influenced by their developmental stages in elementary school (Rahmawati

et al., 2022). Given the substantial environmental damage caused by human activities today, fostering naturalist intelligence is critical for elementary school children (Rahmawati et al., 2022).

On the basis of initial observations conducted at SD Negeri Keseneng, Purworejo District, there are still issues related to science learning in the ecosystem subject. These issues include the minimal involvement of students in learning because they are still teacher-centered, the lack of application of innovative learning models by teachers, and the students' insufficient awareness of cleanliness and the importance of environmental preservation. Creativity is required by teachers to enhance reflection, understanding, design, and professional implementation of learning (Tran et al., 2024). In science learning on the ecosystem subject, teachers can teach by providing exploration activities for students, but in reality, learning is conducted with in-class explanations as usual. The low degree of participation of students in science learning is due to the lack of engaging media and learning resources. Elementary school students generally like concrete and enjoyable things related to everyday life (Mertasari & Ganing, 2021). Learning activities that do not utilize innovative learning models and the minimal use of media make students bored (Sobirin & Purbonuswanto, 2022). Innovation examination as a system development management method can stimulate progress in various fields of societal life, including education (Akimova et al., 2023). This shows that students' understanding of science content has not yet reached the expected level in general.

The independent curriculum allows teachers to freely choose learning methods and strategies that suit the needs and interests of their students and enable them to develop their abilities and potentials (Supianto et al., 2024). The specificity of educational design concept application determines the formation of subjects with different activity qualities (Prokopenko et al., 2023). Learning about the physical aspects of the earth and its environment can be explained through the naturalist sciences, which are related to the study of nature, the environment, and living beings (Usman et al., 2022). The integration of science and social studies in the independent curriculum is based on the fact that elementary school children still see everything as whole, simple, holistic, and comprehensive, although not in detail (Sari et al., 2023). The goal of science and social studies learning is to help students develop the ability to build intellectual, social, spiritual, and practical knowledge through the integration of science with the social sciences (Suhelayanti et al., 2023). Science can be considered a part of modern world culture, where society needs to understand that science is a crucial tool for improving quality of life. Therefore, the management of education and science teaching must be improved so that students can understand science deeply and adopt it as a worldview (Nuangchalerm et al., 2024). Science and social studies learning is closely related to nature and human social interactions (Wulandari et al., 2023). As social beings, humans fundamentally depend on each other to maintain a relative balance. Science and social studies education simplifies social sciences and humanities disciplines, facilitating the realization of potential for developing societal understanding, enhancing communication skills, and supporting critical and creative thinking development (Lytvynenko et al., 2023). Thus, aspects of naturalist intelligence are closely related to knowledge about flora, fauna, and the natural environment studied in science learning.

In today's modern era, all needs can be easily met with the technology and competencies available. Thus, teachers need to integrate various intelligence skills into every learning activity to enable students to compete in the 21st-century modernization era (Septiana et al., 2023). Skills that need to be developed in the 21st century include critical thinking and problem solving, communication, collaboration, and creativity and innovation (Avdiu et al., 2024). Naturalist intelligence cannot develop on its own. In schools, teachers can provide learning that supports the enhancement of naturalist intelligence in children. If naturalist intelligence is not well honed and is continuously neglected by teachers, it will affect students' naturalist intelligence and the surrounding natural environment (Supeno & Siswanto, 2022). Teachers have knowledge of the disciplines that can communicate with students in the educational process and have the skills to present material attractively (Shvets et al., 2024). Research on the variable of naturalist intelligence in elementary school students has been conducted by Rini and Amaliyah, who stated that several factors contribute to the low level of students' naturalist intelligence, including the lack of student involvement due to the insufficient application of innovative learning models, limited teaching aids or media to deliver learning materials, and high dependence on the teacher's role in implementing learning activities (Rini & Amaliyah, 2021). The school environment culture must be creative to create special rooms that are attractive and comfortable for activities (Akishina et al., 2023). A well-designed learning space can stimulate students' learning motivation and increase their engagement in learning (Sun & Aziz, 2024). A proper solution is needed to maximize the development of students' naturalist intelligence on the basis of these factors.

The EJAS (Experiential Jelajah Alam Sekitar) learning model is a form of learning that uses the environment as a source of knowledge (Wanabuliandari et al., 2019). EJAS is a learning model that allows students to engage directly with nature to acquire information, skills, and attitudes as a result of their education. The EJAS learning model has five main stages: exploration, interaction, communication, reflection, and evaluation (Basaroh et al., 2021). Efficiency and success in learning can be increased through the optimal design of learning activities. The use of the nature-based physical activity model by Kusriyanti and Sukoco also demonstrated an increase in the naturalist intelligence of lower-grade elementary school students (Kusriyanti & Sukoco, 2020). An increase in students' learning outcomes occurs when they engage in direct learning with nature, as nature provides facilities for them to gain knowledge about various aspects around them. Thoha also mentioned that by habituating students to be friendly and love the environment, such as sorting waste and using waste for crafts, naturalist intelligence in children develops well (Muhammad Thoha et al., 2023). Therefore, it is necessary to habituate the learning process, such as direct interaction with nature, to optimally develop naturalist intelligence.

Science learning needs to be enhanced by involving students through direct experiences to improve their skills. The experiential learning model enables students to actively and directly use experiences as the basis for acquiring knowledge, examining, concluding, and transforming experiences through direct experimentation (Masyitha et al., 2023). Students experience contextual learning with the EJAS model, which is experience-based and involves nature exploration. Active student participation in this learning process allows them to internalize concepts more deeply through experiential learning. This process strengthens not only the cognitive aspects but also the affective and psychomotor aspects of learning (Susiloningsih et al., 2023). Students can observe and study scientific concepts in their surroundings, enabling them to gain a deeper understanding of the subject through practical application. Therefore, it is necessary to habituate the learning process, such as direct interaction with nature, to optimally develop naturalist intelligence. According to the outlined principles, education contributes not only to the transfer of knowledge but also to the formation of community awareness and responsibility toward environmental and social issues. In today's world, education is a crucial tool for addressing challenges such as environmental pollution, loss of biodiversity, and climate change. Education is recognized as a primary tool that not only imparts knowledge but also shapes the values, perceptions, and awareness needed to address current environmental challenges (Hnatyuk et al., 2024). On the basis of this explanation, this study aims to determine the influence of the experiential Jelajah Alam Sekitar (EJAS) learning model on naturalist intelligence in elementary school students' science learning.

2. Materials and Methods

This research is a quasiexperimental study aimed at determining the effect of the EJAS learning model on the development of naturalist intelligence in science learning for elementary school students. The research design used was the nonequivalent control group design. The study population consisted of 126 fifth-grade students at SD Negeri Segugus Dewi Sartika. The sample for this research included fifth-grade students from SDN Keseneng as the experimental class, SDN 2 Baledono as the control class, and SDN Brengkelan as the trial class. The study used probability sampling and cluster random sampling to select the samples. Data were collected through essay tests to measure naturalist intelligence, questionnaires to assess students' responses to the EJAS model, and observation sheets to evaluate the implementation of the EJAS learning model. Naturalist intelligence was measured with an essay test consisting of 6 questions that had been validated and deemed reliable. The data analysis techniques used in this study included descriptive statistics to calculate the mean, mode, and median of the group data. Additionally, the data analysis involved a normality test via the Kolmogorov–Smirnov test, a homogeneity test via Levene's test, a balance test via the t test, and hypothesis testing via the independent sample t test formula.

3. Results

This study involved administering a pretest and posttest to students in the experimental and control groups to measure their naturalist intelligence abilities. The pretest results in the experimental class had an average score of 44.50, whereas those in the control class had an average score of 40.43. The posttest results in the experimental class had an average score of 69.40, and those in the control class had an average score of 59.48. The average pretest and posttest scores for both groups can be seen in the histogram in Figure 1.

Figure 1 shows that the average scores before and after the treatment in both the experimental and control groups increased. The hypothesis test in this study used the independent t test because it met the analysis prerequisites with data that were normally distributed and homogeneous, and both groups had balanced abilities. The hypothesis test results are as follows:

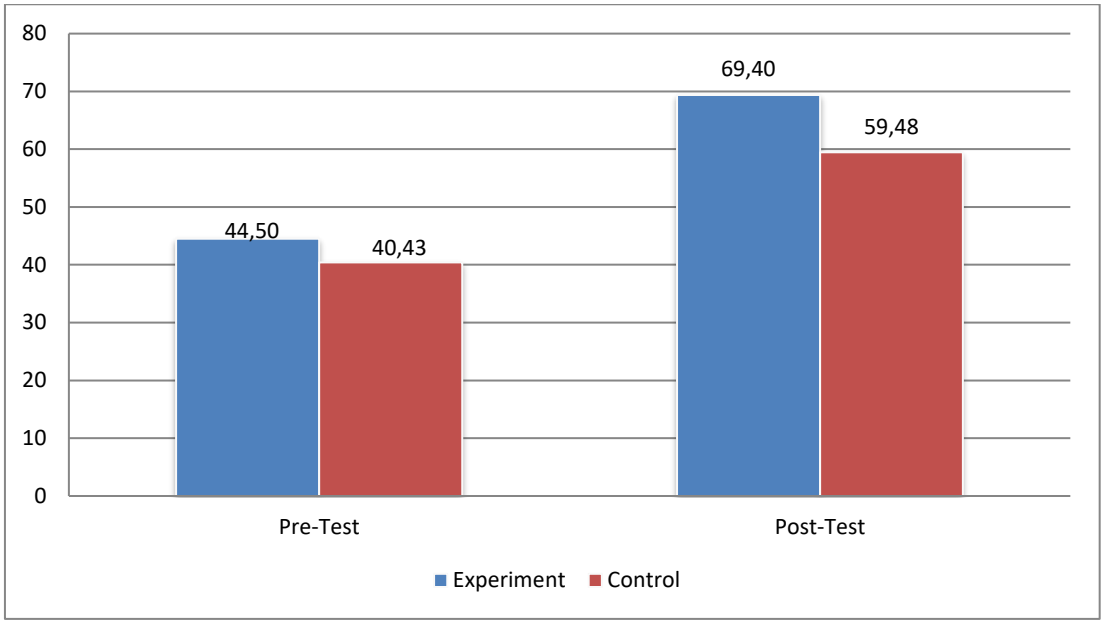

Figure 1 Average scores of the experimental and control classes.

Table 1 Results of the independent sample t test.

Independent Samples Test										
		Levene Test for Equality of Variances		t Test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Naturalist Intelligence	Equal variances assumed	1995	.166	2082	39	.044	9924	4766	.283	19565
	Equal variances not assumed			2099	36061	.043	9924	4727	.338	19510

Table 1 shows that the Sig. (2-tailed) value was < 0.05 at the 5% significance level, indicating a significant difference between the research groups. These findings suggest that the different treatments in each group had different effects. Therefore, the researcher found that the EJAS learning model significantly influences naturalist intelligence in science learning among elementary school students. Consequently, the results of the analysis and hypothesis testing in this study are acceptable.

Table 2 Results of n-Gains.

Data	Mean	Category
Pretest and Posttest of Experimental Class	0.44	Medium
Pretest and Posttest of Control Class	0.29	Low

According to the analysis of the pretest and posttest results in Table 2, students' naturalist intelligence improved more when the EJAS learning model was used than when the conventional lecture method with diverse lectures was used. This is in line with Bruner's constructivist theory, which views knowledge as dynamic and constantly changing with natural changes. Therefore, direct experience in the learning process is considered important for understanding and acquiring such knowledge (Alimah & Marianti, 2016). Furthermore, this statement is supported by the humanistic naturalistic theory of J.J. Rousseau and Pestalozzi, which states that learning means giving freedom to learners to grow and develop naturally. This means providing opportunities for learners to become independent because humans are capable of self-actualization without external intervention (Alimah & Marianti, 2016).

4. Discussion

The analysis of the pretest and posttest results revealed that the increase in naturalist intelligence was greater in the experimental class than in the control class. Learning activities using the EJAS model in the experimental class allow students to learn by directly interacting with nature and using their environment as a learning source. Consistent with the research of

Suryawan and Tohir, students engaged in active learning models tend to better remember discussed information. This is because they actively participate in problem solving with their group members in a relaxed and enjoyable discussion environment (Suryawan et al., 2022). Moreover, group learning activities have advantages over conventional learning methods (Fahruddin et al., 2016). According to Rini and Amaliyah, several factors contribute to the low level of naturalistic intelligence among students, including the lack of application of creative learning models in teaching practices, insufficient learning aids or media, and teacher-centered learning resulting in low student engagement (Rini & Amaliyah, 2021). Therefore, compared with conventional learning models, innovative models such as the EJAS allow students to develop their naturalist intelligence.

Table 3 Explanation:

Indicator 1: Awareness of Problems in Nature
Indicator 2: Understanding the Life of a species
Indicator 3: Awareness of the Importance of Caring for Nature and Its Living Beings.

Table 3 shows that each syntax of the EJAS learning model has a connection to indicators of naturalist intelligence. Students can utilize the educational environment as a learning resource during the exploration phase. Through this process, students can identify and solve problems in their surroundings. Additionally, exploration activities enable students to observe ecosystems in their environment and foster care for the living creatures around them. Outdoor learning is not merely a supplementary means of classroom learning but can create concrete experiences centered on student activities to identify various concepts comprehensively, authentically, and meaningfully (Hastuti et al., 2019). Outdoor learning motivates students to study science topics by increasing their enjoyment of environment-related material, which will eventually develop a caring attitude toward the environment (Hastika et al., 2024). As a learning resource, the environment teaches children how to detect and address environmental problems while providing opportunities to participate in environment-related activities (Khajanchi et al., 2024). Teachers can implement outdoor learning to enhance students' naturalist intelligence (Andima et al., 2021).

Table 3 Relationships between the EJAS Learning Model and Naturalist Intelligence Indicators.

Syntax of the EJAS Model	Indicators of Naturalist Intelligence		
		2	3
Exploration	✓	✓	✓
Interaction	✓	✓	✓
Communication	✓	✓	✓
Reflection	✓	✓	✓
Evaluation	✓	✓	✓

Learning activities during the interaction phase involve discussions among students within their groups as they explore their surroundings. On the basis of the worksheets provided to students, they can observe problems occurring in the environment around the school and discuss them with their group members. Working with their group members can also deepen students' knowledge of various species' lives and ecosystems. Furthermore, the interaction and discussions that take place while the school environment is explored can strengthen their love and concern for the environment. Thus, it is evident that the interaction phase relates to all three indicators of naturalist intelligence.

Students' understanding of problem solving through discussion can be enhanced by cooperative learning (Ismayawati et al., 2016). Cooperative learning helps students by improving the quality of learning, such as developing a mutually helpful attitude in various social activities (Doyan et al., 2017). Group collaboration significantly aids in developing individual potential during the learning process by building a consensus to align perceptions, perspectives, and ways of thinking about the information obtained from learning resources. (Alimah & Marianti, 2016). Collaborative approaches involving peers can emphasize the influence of interpersonal relationships on students' educational experiences. This significantly contributes to students' understanding, ultimately creating a positive learning environment (Nguyen et al., 2024). Additionally, group learning can improve students' academic achievement, foster relationships with peers, and enhance self-confidence (Suhartin, 2019).

In the communication phase, students can present their findings and analyses regarding environmental issues to other groups, which helps raise widespread awareness. Presentations and reports on various species help students consolidate and convey their knowledge about how to maintain good species and ecosystems. Moreover, by communicating the importance of preserving the environment and the consequences of failing to do so, students' awareness of caring for living beings is increased. Vygotsky's theory suggests that all thoughts, information, and concepts can be expressed verbally and in writing

through the use of language. This communication phase helps children develop their knowledge and understanding, strengthens their cognitive structures, and builds social connections with their surroundings (Alimah & Marianti, 2016).

The reflection phase allows students to consider their experiences and the knowledge gained during the learning process. This phase helps students internalize the problems they have identified and seek deeper solutions. Additionally, students can align their knowledge about species and ecosystems with that of their teacher to better understand the complex relationships between species and their environment. Deep reflection on natural experiences and knowledge in this phase can strengthen students' emotional and moral bonds with the environment and living beings. Problem-solving and updates to incomplete material concepts are addressed during the reflection phase, making learning more meaningful through reflection (Rosnawati, 2021).

The knowledge and skills acquired during the learning process are assessed in the evaluation phase. Evaluation helps measure the extent to which students understand and become aware of existing environmental issues. Through evaluation, students can demonstrate their understanding of various species and their ecological relationships. Assessment of students' attitudes and commitment to the environment can reveal how well they have internalized the importance of loving nature and living beings. The evaluation process is crucial, as it allows the measurement of success in the learning process (Sepriano & Efitra, 2024). Through each phase of the EJAS learning model, students not only gain academic knowledge but also develop their naturalistic intelligence, enabling them to become environmentally conscious and responsible individuals in adulthood.

The results of the pretest and posttest for the experimental class are shown in Figure 2 below.

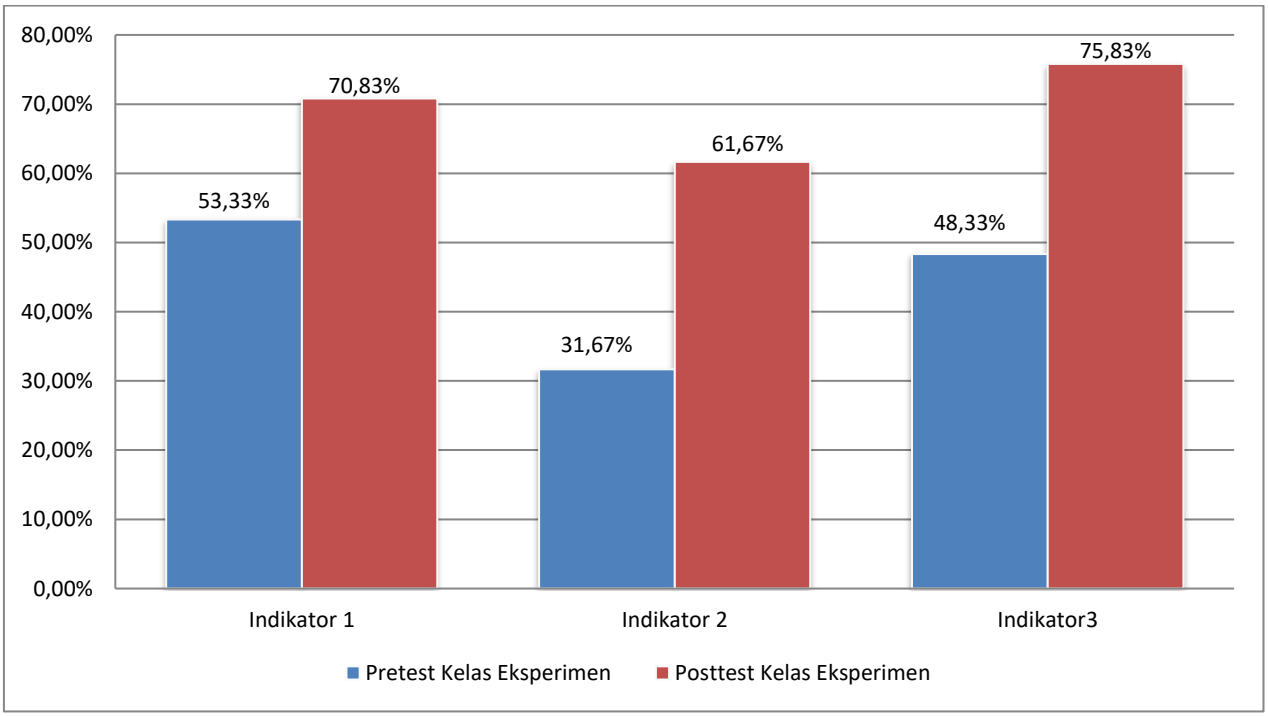

Figure 2 Percentage of naturalist intelligence indicators in the experimental class.

As shown in Figure 2, each indicator of naturalist intelligence has improved. The first indicator (problems in nature) increased from 53.33% to 70.83%. The second indicator (understanding of species' life) increased from 31.67% to 61.67%. The third indicator (awareness of the importance of loving nature and its creatures) increased from 48.33% to 75.83%.

The results of the pretest and posttest for the control class are shown in Figure 3 below.

Figure 3 shows that each indicator of naturalist intelligence has improved. The first indicator (problems in nature) increased from 44.44% to 65.87%. The second indicator (understanding of species' life) increased from 30.16% to 41.27%. The third indicator (awareness of the importance of loving nature and its creatures) increased from 47.62% to 71.43%.

On the basis of the pretest and posttest data, the highest result was obtained for the indicator "awareness of the importance of caring for nature and its living beings." In fact, by immersing students in real-world scenarios and conditions, learning in a natural environment can provide added value for them (Suryani et al., 2017). This finding indicates that direct and emotional experiences within the EJAS learning model are highly effective in fostering awareness and appreciation of nature. Moreover, the lowest result for the indicator "understanding of species life" may be attributed to the complexity of the material and limitations in terms of time and activity. The indicator "awareness of problems in nature,"

which is positioned in the middle, reflects that while there is awareness, a deeper understanding requires additional experience and education. Education significantly influences a person's values, beliefs, and ethical standards (Mahmudulhassan et al., 2024). The research results show that the model applied during the learning process has a significant effect on improving students' knowledge. Initially, there was no significant difference between the experimental and control groups in terms of the students' initial abilities. However, after the students received various treatments, the average score of the experimental class was higher than the average score of the control class. Therefore, the application of the EJAS model has a positive effect on the development of students' naturalistic intelligence.

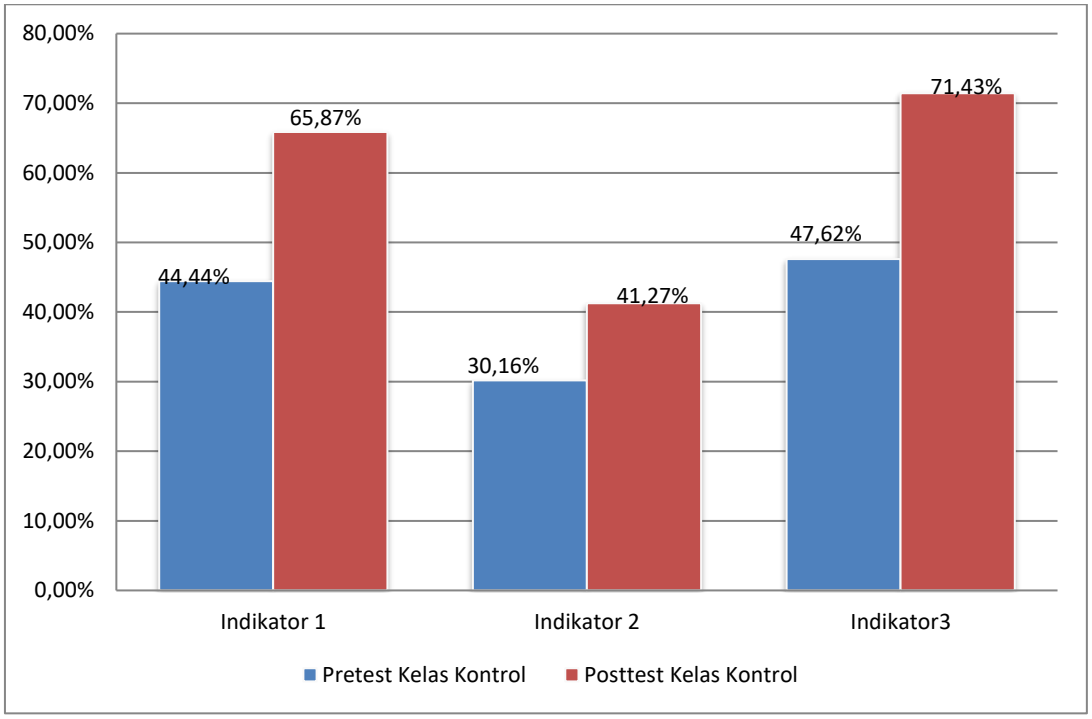

Figure 3 Percentage of naturalist intelligence indicators in the control class.

5. Final Considerations

On the basis of the findings and analysis of this research, the experiential learning model of Jelajah Alam Sekitar (EJAS) has a positive effect on naturalist intelligence in elementary school science education. Hypothesis testing via the independent sample t test reveals a significant relationship between students' naturalistic intelligence and the implementation of the EJAS model, as evidenced by the t value being greater than the t-table, thus rejecting the null hypothesis (H_0). The EJAS model stimulates students' naturalistic intelligence by utilizing nature as a learning resource. This research enhances our understanding of how the EJAS model impacts students' naturalistic intelligence within science education. It also plays a role in developing students' naturalistic intelligence and implementing more innovative and relevant learning processes, leading to better learning outcomes.

This study has several limitations that need to be considered, especially in terms of generalizability of the results because it was only conducted on fifth grade students in one school, so it may not be representative of a wider population. The duration of the implementation of the Experiential Nature Exploration (EJAS) model was also limited, so its long-term effectiveness cannot be ascertained. In addition, the influence of external factors such as students' initial abilities and support from the learning environment outside of school were not fully controlled. The naturalist intelligence measurement instrument used may also have limitations in terms of reliability and validity, which can affect the accuracy of the results. Finally, this study did not explain in depth the conventional learning method used as a comparison, so it is difficult to know whether the difference in results is entirely due to the advantages of the EJAS model or the weaknesses of the control model.

Ethical Considerations

This study was conducted in accordance with ethical guidelines to ensure the protection of the participants' rights and well-being. Prior to data collection, informed consent was obtained from both students and their guardians. The anonymity and confidentiality of all participants were strictly maintained, and the data collected was used solely for research purposes. Additionally, the research followed the ethical standards set by the institution and adhered to the principles of honesty, transparency, and integrity throughout the research process.

Conflict of interest

The authors declare that there is no conflict of interest in this research. No personal or financial interests influenced the design, implementation, or reporting of the study's findings.

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