Proceedings Series on Social Sciences & Humanities, Volume 12
Proceedings of International Conference on Social Science (ICONESS)
ISSN: 2808-103X

Development of Ecological Citizenship-Based Character Education Model to Improve Environmental Naturalistic Intelligence of Elementary School Students

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ARTICLE INFO

Article history:

DOI:
10.30595/pssh.v12i.835

Submited:
May 31, 2023

Accepted:
August 24, 2023

Published:
October 05, 2023

Keywords:

Ecological Citizenship,
Character Education,
Naturalistic Intelligence

ABSTRACT

The lack of naturalistic intelligence in students can have an impact on students' understanding of the environment and nature. Naturalistic intelligence can help students understand the importance of protecting the environment and being responsible for preserving the environment. Therefore, the purpose of this study is to develop an Ecological Citizenship-Based Character Education Model to Improve Environmental Naturalistic Intelligence of Elementary School Students. A research and development (RnD) research design was used in this study. The development model used in this study refers to the development model according to ADDIE. This research was conducted in Jetis Sub-district, Yogyakarta City, Yogyakarta Special Region from February to March 2023. The population of this study were fourth grade students at the elementary school level with a research sample of 20 students. The study used a quasy experiment design with a pre and post test one group design approach. The results showed that there was a significant difference between the scores of improving the post-test showing a significance value of 0.001. This shows that the use of ecological citizenship-based character education model is effective to improve the ability of environmental naturalistic intelligence of fourth grade students of SDN Vidya Qasana.

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1. INTRODUCTION

In general, the lack of naturalistic intelligence in students can have an impact on their understanding of the environment and nature, and may reduce their awareness of frequent environmental problems, such as pollution, deforestation, and climate change (Purwono & Jannah, 2020). In addition, the problems faced if students do not have naturalistic intelligence include students' lack of understanding of their surrounding environment (Fattah & Suhirman, 2019). Students tend to be indifferent to problems that occur in the environment, for example, students do not care about environmental cleanliness and throw garbage where it should not be, such as in rivers, parks, or on the road (Wahyuningsih et al., 2020). In addition, students also tend to use materials that are not environmentally friendly, such as plastic bags or chemicals that damage the environment (Hammami et al., 2018). They may not pay attention to the impact of these habits due to weak naturalistic intelligence in students (Zellawati, 2017).

Therefore, it is very important to develop empathy for the environment in students from an early age, so that they understand the importance of protecting the environment and taking responsible actions towards the

environment. This can be done through early introduction and understanding of the environment and character building in students so that they can understand the importance of protecting the environment and be responsible in preserving the environment (Ministry of Education and Culture Republic of Indonesia, 2015).

Several studies have shown that students' understanding and concern for the environment can be improved through education about naturalistic intelligence (Suhirman, 2020). For example, a study in Brazil showed that students who learned about naturalistic intelligence had a significantly increased understanding of environmental issues such as waste, energy, and water. Golightly, (2020) found that multiple intelligence theory, particularly naturalistic intelligence, can help improve students' understanding of environmental issues. This research emphasizes the importance of introducing the concept of naturalistic intelligence into the environmental education curriculum in primary schools. In addition, Liu et al., (2019) conducted a literature review on multiple intelligences and environmental education in China.

The findings of this study suggest that multiple intelligence education can improve students' understanding of environmental issues, and further research in this area is needed to expand the understanding of how multiple intelligence theory can help environmental education in China. The Ministry of Education and Culture (2013) emphasizes the importance of introducing students to the concepts of sustainability and responsible use of natural resources through environmental education. Some of these opinions can be concluded that naturalistic intelligence in primary schools can be one of the solutions to improve students' understanding of the environment and increase their concern for environmental issues (Ministry of Environment and Forestry, 2015).

Character education can be an effective way to instill naturalistic intelligence in students (Thambu et al., 2021). Some of the characters that can be developed through character education are environmental awareness, responsibility, cooperation, caring, and openness to various perspectives. Character education that focuses on naturalistic intelligence can be carried out through various activities, such as nature observation, environmental sample collection, and school farming (Winarti et al., 2019). In addition, these activities can also be linked to other subject matter, such as biology, science, and mathematics, to increase students' understanding of environmental issues more holistically.

Character education that focuses on naturalistic intelligence can help students develop awareness and skills to address environmental issues around them (Suhirman et al., 2021). In addition, character education can also help students to develop caring and responsible attitudes towards the environment, as well as expand their understanding of the diversity of nature and life around them (Dewi & Alam, 2020).

The Ecological Citizenship-based character education model is an alternative to increasing students' naturalistic intelligence. The Ecological Citizenship-based Character Education Model is an approach that integrates aspects of naturalistic intelligence and character education in an effort to form students who have environmental awareness and become responsible citizens for the environment (Khan et al., 2019). This model is based on the concept of ecological citizenship, which is a new paradigm in understanding citizenship that prioritizes concern for the environment as a civic responsibility (Ghosn-Chelala & Akar, 2021). The ecological citizenship-based character education model aims to develop the character of students who care about the environment and are responsible for environmental sustainability.

The ecological citizenship-based character education model also involves collaboration between students, teachers, and the community in solving complex environmental problems (Monte & Reis, 2021). In developing naturalistic intelligence, this model can also help students develop skills such as observation, analysis, and investigation of natural phenomena. In addition, students can also learn to appreciate biodiversity and understand the impact of human activities on the environment.

Thus, the ecological citizenship-based character education model is very important to improve students' naturalistic intelligence and help them become a generation that cares about the environment and is committed to maintaining environmental sustainability. Research related to Ecological Citizenship has been conducted by Simsar, (2021) investigating the effect of outdoor environmental education programs in improving children's environmental attitudes and behavior as a form of Ecological Citizenship.

The results show that outdoor environmental education programs can improve children's environmental attitudes and behaviors. In addition, Wu et al., (2022) investigated the relationship between Ecological Citizenship and sustainable water use behavior among university students in China. While Hadjichambis & Paraskeva-Hadjichambi, (2020) investigated the effect of outdoor learning in improving students' ecological understanding and practice as a form of Ecological Citizenship. The results show that outdoor learning can increase students' pro-environmental awareness, knowledge, and actions. In Indonesia, Ecological Citizenship-based education has not been widely practiced. Therefore, this research aims to develop an Ecological Citizenship-Based Character Education Model to Improve Environmental Naturalistic Intelligence of Elementary School Students.

2. LITERATURE REVIEW

2.1 Naturalistic Intelligence

The concept of naturalistic intelligence is one of the eight types of intelligence in Howard Gardner's theory of multiple intelligences (Cavas & Cavas, 2020). Naturalistic intelligence refers to the ability to understand and appreciate nature and the physical world around us, as well as the ability to interact with living and non-living things. Individuals who have high naturalistic intelligence often have the ability to recognize, classify and use various elements of nature such as plants, animals and minerals for specific purposes (Shearer, 2020). In the context of education, naturalistic intelligence can assist students in developing observation, problem-solving, and exploration skills.

Naturalistic intelligence can help students develop an open attitude towards the differences and diversity of nature and living things (Maharani et al., 2020). It can also help students increase their empathy for other living things and become more responsible individuals for our environment. The characteristics of students who have naturalistic intelligence include: 1) Have a high interest in nature and the surrounding environment, 2) Easily recognize various types of plants, animals, and physical objects, 3) Prefer to learn through direct observation and practicum, 4) More sensitive to weather or environmental changes, 5) Able to observe, analyze, and solve problems related to nature and the environment, 6) Easily identify natural patterns, such as weather patterns, seasonal patterns, or animal migration patterns, and 7) Easily adapt to new environments (Kistyanto et al., 2022).

Naturalistic intelligence refers to a person's ability to understand and appreciate nature and the physical world around us. The concept of naturalistic intelligence can be applied in elementary school children's learning through several ways (Mahmudi et al., 2019), including:

1) Hands-on learning in nature: Hands-on learning in nature such as going to a park or zoo can help students in developing their naturalistic intelligence. Students can observe, learn and understand various aspects of nature and living things around them. It can also help students to develop observation, exploration and hands-on experience skills.
2) Using nature-based teaching materials: The use of nature-based teaching materials such as pictures, posters, or videos that display various aspects of nature and living things around us can help students to understand and appreciate the physical world around them. This can expand students' knowledge of nature and living things and help them to better understand the concepts taught in the lesson.
3) Simple experimental activities: Simple experimental activities such as growing plants or creating a mini zoo in the classroom can help students develop their naturalistic intelligence. These activities can also help students to understand the life cycle of living things and other natural processes.
4) Nature-based project assignments: Nature-based project assignments such as creating miniature ecosystems or studying environmental balance can help students to deepen their understanding of nature and living things. In addition, project activities can help students develop creative, collaborative and critical skills

In elementary school children's learning, it is important for educators to pay attention to the development of students' naturalistic intelligence. By providing hands-on experiences and utilizing nature-based teaching materials, educators can help students to understand and appreciate nature and the physical world around us. In addition, simple experimental activities and nature-based project tasks can also help students develop creative, collaborative and critical skills and expand their knowledge of nature and living things.

Table 1. Naturalistic intelegence indicators

No.	Indicators
1	Explores the natural and human environment with great interest and enthusiasm
2	Likes to observe, recognize, interact or care about plant or animal objects
3	Able to classify objects according to certain object characteristics
4	Able to recognize patterns among species or classes of objects
5	Enjoys studying the life cycle of flora and fauna
6	Want to know how things work
7	Studying the taxonomy of plants and animals
8	Enjoys nurturing plants or animals

2.2 Character Education

Character education aims to develop moral and ethical values in individuals to have good character (Birhan et al., 2021). Character education aims to help individuals understand values such as integrity, honesty, responsibility, loyalty, and cooperation. The concept of character learning is an effort to develop character values in individuals through the learning process (Pradana et al., 2021). This concept involves teachers,

parents, and communities in helping individuals develop the attitudes, values, and skills needed to become individuals who are virtuous, socially responsible, and have good character. Law No. 20/2003 on the National Education System has stipulated the character values that must be instilled in education.

The character values that must be instilled consist of eight values, namely religious, nationalist, independent, mutual cooperation, integrity, democratic, creative, and communicative. In character learning, teachers must have a good understanding of the character values to be developed in students, and implement appropriate strategies and methods to help students develop these character values.

2.3 Ecological Citizenship-based Character Education Model

The ecological citizenship-based character education model is a character education approach that emphasizes the development of individual awareness and responsibility for the environment (Georgiou et al., 2021). This model teaches individuals to appreciate, maintain, and care for the environment through concrete actions in everyday life. The ecological citizenship-based character education model focuses on developing the character of individuals who are responsible for the environment and able to take action to maintain environmental sustainability (Bhoki et al., 2022). There are several steps in applying the Ecological Citizenship-Based Character Education Model to elementary school students.

First, students can be introduced to environmental concepts through interesting and fun learning such as stories, songs, or games. Second, students can be accustomed to maintaining the cleanliness of the surrounding environment such as the school yard or home environment. Third, teachers can provide concrete examples of wise use of natural resources such as saving water, electricity, and sorting waste. Fourth, students can be invited to participate in greening and environmental conservation activities in the surrounding environment. Fifth, teachers can encourage students to think critically and question the impact of their actions on the environment. Finally, mutual respect and cooperation in protecting the environment can be built through daily interactions with friends and the surrounding environment (Ardian Feriandi et al., 2022). The application of Ecological Citizenship-Based Character Education Model in elementary school students can shape the character of students who care and are responsible for the environment.

3. RESEARCH METHODS

This research model uses the type of research and development (Research and Development). Research and Development is a research method used to produce certain products, and test the effectiveness of these products. In order to produce certain products, research is used to analyze the needs and to test the effectiveness of these products so that they can function in the wider community, research is needed to test the effectiveness of these products. The development model used in this study refers to the ADDIE development model (Ghirardini, 2011). The ADDIE development model has a systematic structure and steps because this form is more complete, logical and can be used for various forms of product development such as forms, upgrading strategies, tools and learning materials. This form of ADDIE development consists of 5 important stages, namely: Analysis, Design, Development, Implementation, and Evaluation.

This research was conducted in Jetis Sub-district, Yogyakarta City, Yogyakarta Special Region from February to March 2023. The population of this study were fourth grade students at the elementary school level as many as 20 students. Thus, the sample used total sampling the number in this study was 20 students.

The research is a quasy experiment with a pre and post test one group design approach. Test analysis of character education models based on ecological citizenship testing effectiveness tried 2 times is to try the description to increase the naturalistic intelligence of the environment of elementary school students. The instrument used to collect data on innovative behavior variables, developed and tested first to test the validity with a product moment correlation coefficient exceeding 0.296 (n = 30) and from the calculation results (reliable) if it has a reliability coefficient value or alpha of 0.60 or more IBM SPSS 25.00 program. Then the classical assumption test using the normality test is tried to try whether the research illustration is a reasonable distribution type or not. The method to find out whether the residuals are fairly distributed or not, is to use graph analysis. The information normality test in this research utilizes the Kolmogorov Smirnov test and is proven utilizing SPSS.

A normal distribution should make a straight diagonal line and plot the residuals naturally, so that the line explaining the actual information should follow the normal line. Then t test (effectiveness test) hypothesis testing in this study using paired sample t-test experiment. Paired sample t-test is used to try the comparison of 2 illustrations that are independent or different treatments. Paired sample t-test is used when the information is fairly distributed. Independent sample t-test is one of the testing procedures used to assess the effectiveness of the treatment, characterized by a comparison in general gain alongside the control group and the experiment. The basis for collecting decisions to accept or deny Ho in the paired illustration t-test experiment. If the probability (Asymp.Sig) <0.05 then Ho is rejected and Ha is accepted.

4. RESULT AND DISCUSSION

4.1 RESULT

4.1.1 Expert Validity Result

Educational model products along with evaluation instrument forms that have been validated by instrument experts are submitted to educational design expert validation (material expert test instruments, design expert test instruments). The type of instrument used is a questionnaire using a Likert scale with 5 scales, but still provides space for the evaluator to provide comments / input from the assessment results

4.1.2 Material Expert Validity Result

The evaluation of educational material experts begins with reviewing educational model products in terms of educational materials by material experts. A summary of the evaluation results through questionnaires is presented in the following table.

Table 2. Summary of material expert evaluation result

Assessment Indicator	Assessment Item	Expert Respondent Rating 1	2
Content Appropriateness Aspect			
A. Suitability of the material with the objectives of the education model	1. Completeness of material	4	5
	2. Breadth of material	4	5
	3. Depth of material	5	5
B. Accuracy & novelty of learning materials	4. Accurate & up-to-date definitions and concepts	5	5
	5. Accuracy & currency of facts	5	5
	6. Accuracy & currency of data	4	3
	7. Accuracy & updatability of examples	4	4
	8. Case accuracy & updatability	4	4
	9. Accuracy & updatability of images, and illustrations	3	4
	10. Accuracy & updatability of notations and symbols	3	4
	11. Accuracy & currency of references	4	4
C. Supporting learning materials	12. Reasoning	4	4
	13. Applicability	4	4
	14. Linkage between cases	4	4
	15. Material attractiveness	5	5
Presentation Appropriateness Aspect			
A. Presentation Technique	16. Order of presentation	5	5
	17. Systematic presentation of mobile learning-based learning materials	4	4
	18. The attractiveness of the learning presentation	4	4
	19. Discussion of important concepts	4	4
	20. Examples of problems in each learning activity	4	4
	21. Feed back	4	4
	22. Glossary	3	4
	23. Bibliography	5	5
	24. Summary	4	4
B. Presentation of learning materials	25. Student engagement	5	5

Assessment Indicator		Assessment Item	Expert Respondent Rating 1	2
C. Completeness of presentation	26.	Introduction section	4	4
	27.	Contents section	4	4
	28.	Closing Section	4	4
Penilaian Bahasa				
A. Straightforward	29.	Sentence structure accuracy	4	4
	30.	Sentence effectiveness	4	4
	31.	Standardization of terms	4	4
B. Communicative	32.	Readability	4	4
	33.	Appropriate use of language rules	4	4
C. Dialogical and interactive	34.	Motivating ability	5	5
	35.	Ability to stimulate critical thinking	5	5
D. Use of terms, and symbols	36.	Consistency in the use of terms	5	5
	37.	Consistency in the use of symbols	5	5
			156	160

Average Feasibility Score = Overall Item Score / Number of Items
= Respondent 1, 162/37= 4, 22
= Respondent 2, 161/37= 4, 32
Average Feasibility 2 respondents = **4,27**

Table 3. Value Scale Description on a scale of 5 (Sugiono, 2015):

Scale	Rate Value
Strongly Agree (SS)	5
Agree (S)	4
Undecided (RG)	3
Disagree (TS)	2
Strongly Disagree (STS)	1

Value Range	Scale
4.29 – 5.00	Very feasible to use
3.63 – 4.28	Feasible to use
2.98 – 3. 62	Less feasible to use
2.32 – 2.97	Not worth using
1.67 – 2.31	Not worth using
1.00 – 1. 66	Cannot be produced

The results of the evaluation by the preliminary validation expert of the learning media development show that the average feasibility value is at 4.27, which indicates that in terms of the feasibility of learning materials, from the calculation of the material expert is feasible to use in learning. Material development expert validation suggests the need for improvement in several parts of the script, including: the need for material improvement tailored to the value of creating environmental values, attitudes and behaviors in elementary schools. Input from educational model development experts becomes a reference to improve the learning model product until it is declared feasible to use.

4.1.3 Learning design outcomes

The results of the evaluation of learning design validators by experts begin with a review of educational model products in terms of educational model design by educational model design experts. A summary of the

evaluation results through questionnaires is presented in table 2, while the details of the evaluation process questionnaire are presented in the appendix.

Table 4. Summary of one to one expert evaluation results of learning media experts

No	Aspects to be assessed	Expert Respondent Rating	
		1	2
	Formulation of Education Model Objectives		
1	Formulation of educational model objectives refers to learning objectives at the elementary school level	4	4
2	The accuracy of the tasks that students must master after carrying out learning by applying the collaboration ecological citizenship education model with learning objectives.	5	4
3	Formulation of learning objectives in	4	4
4	collaboration ecological citizenship education model using operational verbs	4	2
5	Writing the formulation of learning objectives is carried out in accordance with the ABCD formulation	5	4
	Material Organization Strategy		
6	The suitability of learning objectives in accordance with creating environmental values, attitudes and behaviors with the content of the collaboration ecological citizenship education model.	4	4
7	The suitability of learning materials in the collaboration ecological citizenship education model supports the achievement of learning objectives.	5	4
8	Each learning activity begins with appropriate objectives	4	4
9	The title of the learning content is in accordance with the learning objectives	5	5
10	Learning strategies contain appropriate methods	5	4
11	Learning activities contain learning media and tools	4	4
12	Learning materials are in accordance with the time allocation	4	4
Material Presentation Strategy			
13	The collaboration ecological citizenship education model material refers to elementary school education strategies.	4	4
14	Tasks and cases contained in the collaboration ecological citizenship education model material are appropriate so that the achievement of specific objectives	4	4
15	The tasks and cases contained in the collaboration ecological citizenship education model material support the achievement of specific objectives.	5	4
16	The font presentation of the letters used in the educational model material is in accordance with the learning objectives	5	4
17	Image quality is sharp and contrasting according to the learning material	4	4
18	Task orders and cases that students work on are clear	4	4
19	The collaboration ecological citizenship education model material is equipped with feedback for students	4	4
20	The suitability of the learning material objectives The tendency in the collaboration ecological citizenship education model.	3	4
Instructional Management Strategies			
21	The educational model strategy used is collaborative-based according to the instructional material	4	4
22	Presentation is interesting to learn	4	4
23	The educational model strategy applied encourages the achievement of learning objectives	4	4
24	The education model strategy increases student creativity	4	4

No	Aspects to be assessed	Expert Respondent Rating	
		1	2
25	The education model strategy produces a design that can be used	4	4
Learning Implementation Strategy			
26	The education model system is able to accommodate various learning methods so as to increase student interest in learning.	4	4
27	The education model system allows lecturers to provide awards or rewards to increase achievement motivation	4	4
28	The education model system has flexibility in learning time (can be learned anytime and anywhere)	5	5
29	Education model learning system is easy to understand so as to increase students' confidence	4	4
30	The education model learning system allows students to control their own learning speed.	4	4
Evaluation Strategy			
31	Equipped with practice questions that are in accordance with the general objectives and special objectives	4	4
32	Test questions are developed with criteria (easy, medium, difficult)	4	4
33	The test questions developed are logical and contextual so that they are easily understood by students.	4	5
34	The scoring of test questions is objective referring to the determination / consistency of the level of difficulty	5	4
35	The test has practicability properties, namely ease of administration (easy to implement, check and equipped with clear instructions).	4	4
Total number of items		148	141
Average Feasibility Score = Overall Item Score / Number of Items = Respondent 1, 148/35= 4, 23 = Respondent 2, 141/35= 4, 03 Average Feasibility 2 respondents = **4,13**			

Table 5. Description: Value Scale Description on a scale of 5 (Sugiono, 2015):

Scale	Value Rate
Strongly Agree (SS)	5
Agree (S)	4
Undecided (RG)	3
Disagree (TS)	2
Strongly Disagree (STS)	1

To convert the average feasibility score into a scale (SS/S/RG/TS/STS), first determine the length of the interval class to determine the value range of each scale, with the formula (Sulfemi, 2019). Based on the results of the above calculations, the scale value range for the evaluation of learning design/instructional learning media expert validation becomes:

Value Range	**Scale**
4.29 – 5.00	Very feasible to use
3.63 – 4.28	**Feasible to use**
2.98 – 3. 62	Less feasible to use
2.32 – 2.97	Not worth using
1.67 – 2.31	Not worth using
1.00 – 1. 66	Cannot be produced

The results of the evaluation by the educational model development validation expert showed an average feasibility score of 4.13 which indicates that in terms of the feasibility of the educational model, from the results of the calculation of the formative design expert is feasible to use in learning. There are only a few minor notes/findings on the product that need to be refined, for example: there are no examples of test questions, there are only quizzes that are not accompanied by grids and there is no way to score and interpret scores. Input from formative design experts becomes a reference to improve the learning model product until it is declared suitable for use.

4.1.4 Descriptive Analysis Results

The results of the evaluation of learning design validators by experts begin with a review of educational model products. In testing the descriptive analysis of experimental results conducted at the elementary school level, the application of the collaboration ecological citizenship education model was carried out using the computer software program SPSS 24.0 for windows. The description results are as follows.

Table 6. Descriptive Test Results

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Pre Test	Control	20	3.5580	.58019	.12973
	Experiment	22	3.6682	.57003	.12153
Post Test	Control	20	3.6890	.21208	.04742
	Experiment	22	3.9855	.33003	.07036

Based on descriptive experimental treatment with the application of the collaboration ecological citizenship education model to create environmental naturalistic intelligence of elementary school students. On the results of the control class pre-test score with an average value of 3.5580, on the experimental class pre-test value with an average value of 3.6682. Then on the results of the post test value of the control class with an average value of 3.6890, then the post test value of the experimental class with an average value of 3.9855. So it can be concluded that there is an increase in value between the application of pre-test and post-test activities by applying the collaboration ecological citizenship education model to create environmental values, attitudes and behaviors.

4.1.5 Classical Assumption Test Results.

Normality Test Results

The data normality test in this study uses PPlot normal graph testing and the One-Sample Kolmogorov Smirnov test contained in the SPSS 24.0 for Windows program. The results of the normality test can be seen in the following table:

Table 7. Normality test results

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	GROUP	Statistic	df	Sig.	Statistic	df	Sig.
PRE TEST	CONTROL	.157	20	.200*	.918	20	.092
	EXPERIMENT	.083	22	.200*	.975	22	.827
POST TEST	CONTROL	.128	20	.200*	.946	20	.305
	EXPERIMENT	.107	22	.200*	.963	22	.558

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

From table 2 above, it can be seen that the pre-test value of the control group with a statistical value of 0.157 with a sig value of 0.200 c.d, then in the experimental group with a statistical value of 0.083 with a sig value of 0.200 c.d.. In the implementation of post test activities, the control group with a statistical value of 0.128 with a sig value of 0.200 c.d, in the experimental group the statistics were 0.107 with a sig value of 0.200 c.d.. Thus it can be concluded that overall H0 is accepted and H1 is rejected, so it can be concluded that it can be said that all residuals on variables are normally distributed.

Homogeneity Test Results

This univariate homogeneity test uses Levene's test. In Levene's test, researchers used the help of IBM SPSS 24.0 Statistics for Windows. The results of the normality test can be seen in the following table:

Table 8. Homogeneity test results

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
PRE TEST	Based on Mean	.156	1	40	.695
	Based on Median	.168	1	40	.684
	Based on Median and with adjusted df	.168	1	38.301	.684
	Based on trimmed mean	.158	1	40	.693
POST TEST	Based on Mean	3.660	1	40	.063
	Based on Median	3.528	1	40	.068
	Based on Median and with adjusted df	3.528	1	34.505	.069
	Based on trimmed mean	3.571	1	40	.066

From table 3 above, it can be seen that the homogeneity test results show the probability value of the Levene statistic of the entire pretest and posttest in the homogeneity test shows that all research variables have a probability value greater than the 5% alpha degree (sig> 0.05) so it can be concluded that all research variables have homogeneous data variants.

4.1.6 Hypothesis Test

Normality Test Results

Paired Sample T-test

After going through prerequisite tests with normality and homogeneity tests, hypothesis testing can be used. The hypothesis test used in this study is a parametric statistical test, namely the Paired Sample T-test because it comes from two interrelated variables. This test is used to determine whether or not there is an average difference between two groups of samples that are paired (related). The point is two samples but get two different treatments. The data in this study used an interval or ratio scale.

Tabel 9. Hasil uji paired sample t-test

Paired Samples Test

		Paired Differences			t	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean		
Pair 1	POST TEST CONTROL - PRE TEST CONTROL	0.131	0.58545	0.13091	1.001	0.330
Pair 2	POST TEST EXPERIMENT - PRE TEST EXPERIMENT	0.317	0.55343	0.11799	2.689	0.014

Based on the results of table 5 of the t-test results (paired sample t-test) in the table above, the paired samples test value of environmental naturalistic intelligence of elementary school students shows post test control - pre test control, then the calculation of the t-test is the t-count value> than the t-table, besides the significance value is 0.0330 <0.05 so it can be concluded that there is no significant difference in students' environmental naturalistic intelligence between before and after the use of the collaboration ecological citizenship education model. Furthermore, showing the experimental post test - pre test ekserimen next to the calculation of the t test is the t-count value> than the t-table, besides the significance value is 0.014 <0.05 so it can be concluded that there is a significant difference in students' environmental naturalistic intelligence between before and after the use of the collaboration ecological citizenship education model.

Independent Sample T Test

Hypothesis testing is carried out after conducting a normality test and homogeneity test. If the assumption test of normality of distribution and homogeneity of variance has been met. This means that the parametric requirements for hypothesis testing using SPSS have been met. Next is the test of differences in the results of improving the environmental naturalistic intelligence of elementary school students using ecological

citizenship-based and conventional character education models. The test was conducted by researchers with the help of IBM SPSS 24.0 Statistics for Windows, the decision was made by researchers by comparing the calculated t value with the t table.

Table 10. Independent sample t test results

Independent Samples Test					
		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Sig. (2-tailed)
PRE TEST	Equal variances assumed	0.156	0.695	-0.620	0.539
	Equal variances not assumed			-0.620	0.539
POST TEST	Equal variances assumed	3.660	0.063	-3.424	0.001
	Equal variances not assumed			-3.494	0.001

Based on the results of table 5, the statistical test results show that the significance value obtained in the independent sample t test of the pre-test value shows a significance value of 0.539 or in other words the significance value is greater than the 5% alpha degree (0.539> 0.05) so it can be said that there is no difference in the average value of students' environmental naturalistic intelligence abilities. Furthermore, the statistical test results show that the significance value obtained in the independent sample t test of the post-test value shows a significance value of 0.001 or in other words, the significance value is greater than the 5% alpha degree (0.001 <0.05) so it can be said that there is a difference in the average value of students' environmental naturalistic intelligence ability. In other words, the application of ecological citizenship-based character education model is effective to improve the ability of environmental naturalistic intelligence of fourth grade students of SDN Vidya Qasana.

4.2 DISCUSSION

The school has an obligation to shape the character of its students to love their environment from an early age, therefore the school implements an environmental wiyata program to train Naturalist intelligence and environmental care attitudes of students and other school residents. However, this institution does not implement an adiwiyata-based school recommended by the government, it is just that this institution implements an environmental wiyata program which is carried out every morning before entering class (Prasetyo et al., 2021). Intelligence or in Latin is "intelligence" which means connecting or uniting with each other (to organize, to relate, to bind together) (Gardner, 2007).

There are many interpretations of the word intelligence from experts or researchers. Edward Lee Thorndike, an American psychologist argued that intelligence is divided into three, namely real intelligence, abstract intelligence and social intelligence (Ridlo, 2019). But at this time, the theory of intelligence that became the parent for the developing theory of intelligence is Howard Gagnery's theory known as Multiple Intelligence. The intelligence is divided into nine categories, namely: Linguistic Intelligence, Mathematic logic, Spatial Intelligence, Kinesthetic Intelligence, Musical Intelligence, Interpersonal Intelligence, Intrapersonal Intelligence, Natural Intelligence, and Existential Intelligence (Cavas & Cavas, 2020). The nine intelligences mentioned above are currently being applied and developed in school institutions.

Naturalist intelligence is the human ability to understand the surrounding nature or have a high sensitivity to nature (Winner, Ellen & Gardner, 1988). This means that naturalist intelligence has a very close relationship with everything in the surrounding environment (Thambu et al., 2021). Thus, it can be concluded that naturalist intelligence is the ability to recognize distinguish and make categories related to flora or fauna and natural objects in the surrounding environment (Suharsono et al., 2022). According to Hines, there are 4 cores that must be present in naturalist intelligence (Utami et al., 2020), namely: Sensitivity and understanding of environmental issues, Skill in addressing issues that arise in the environment, Skills in terms of acting skills in terms of good personality.

It is known that the use of an ecological citizenship-based character education model is effective for improving the ability of environmental naturalistic intelligence of fourth grade students of SDN Vidya Qasana. This can be seen from the sig score. ($p<0.05$) which means that there is a significant difference between the scores of improving the post-test shows a significance value of 0.001 or in other words the significance value is

greater than the 5% alpha degree (0.001 <0.05) so it can be said that there is a difference in the average value of students' environmental naturalistic intelligence ability. In other words, the application of the ecological citizenship-based character education model is effective for improving the ability of environmental naturalistic intelligence of fourth grade students of SDN Vidya Qasana.

The findings are in accordance with research conducted by (Yu et al., 2019). the results showed that the process of internalizing character values to students through ways, namely internalization in teaching and learning activities, integrated into all subjects; the process of internalizing character values through utilizing the basic values of school culture that have become habits by all elements of school residents. Furthermore, Uge et al., (2019) From the results of qualitative data analysis obtained data that the level of natural intelligence of students has increased after participating in nature tadabbur learning while for spiritual intelligence shows an increase after participating in nature tadabbur learning, although not too significant because it is still influenced by the curriculum at school which requires starting school activities with tadarrus and Duhur and Asr prayers in congregation in the school mosque.

Furthermore, Hidayati et al., (2020), the results of research conducted through the application of multisensory learning models in Indonesian language learning showed an increase in each cycle. Based on the data from the research results, it can be concluded that the application of multisensory learning models can improve the naturalist intelligence of students in grade VA SD.

5. CONCLUSION

It is known that, the use of ecological citizenship-based character education model is effective to improve the ability of environmental naturalistic intelligence of fourth grade students of SDN Vidya Qasana. This can be seen from the sig score. (p<0.05) which means that there is a significant difference between the scores of improving the post-test shows a significance value of 0.001 or in other words, the significance value is greater than the 5% alpha degree (0.001 <0.05) so it can be said that there is a difference in the average value of students' environmental naturalistic intelligence abilities. In other words, the application of ecological citizenship-based character education model is effective to improve the ability of environmental naturalistic intelligence of fourth grade students of SDN Vidya Qasana.

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