

The Influence of Culturally Responsive Teaching (CRT) Approach Based On Local Wisdom To Increase Environmental Awareness of Fourth Grade Students at Ceger 1 Bogor Public Elementary School in the Science Subject

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ABSTRACT

This research is a quasi-experimental quantitative study. Descriptively, this study aims to describe the increase in environmental awareness of fourth-grade students at Ceger 1 State Elementary School in Bogor who have been learning using a Culturally Responsive Teaching (CRT) approach based on local wisdom and a Scientific Approach. Comparatively, it tests the difference in the increase of environmental awareness among fourth-grade students at Ceger 1 State Elementary School in Bogor between learning using the CRT approach based on local wisdom and the scientific approach. The population of this study consists of all fourth-grade students at Ceger 1 State Elementary School in Bogor, which consists of two classes: class IV A with 17 students and class IV B with 17 students. The data collection technique used a testing instrument in the form of multiple-choice questions for the pretest and posttest, which had been trialled in class V with 19 students. The validity test results of 10 questions yielded a significance value < 0.05 , meaning the instrument can be used. The data analysis technique employed descriptive analysis, equivalence tests, normality and homogeneity tests, and hypothesis testing. The results of this study indicate that descriptively, the increase in environmental awareness with the CRT approach obtained an average of 91.76, which falls into the very high category, while environmental awareness using the scientific approach obtained an average of 75.88, which falls into the high category. Comparatively, there is a significant difference in the increased environmental awareness in the class taught using the local wisdom-based CRT and scientific approaches. The t-test results obtained a Sig. (2-tailed) of $0.000 < 0.05$. This indicates that the local wisdom-based CRT approach significantly increases environmental awareness more than the scientific approach.

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1. INTRODUCTION

The environment is an inseparable part of human life. All human activities, from basic needs to social and economic endeavours, greatly depend on environmental sustainability. Unfortunately, various ecological damages continue to occur today, including air, water, and soil pollution, illegal logging, and uncontrolled accumulation of waste. This issue suggests that public awareness of environmental preservation still needs improvement, particularly from an early age.

Environmental awareness refers to an individual's understanding and recognition of preserving and conserving the natural environment [1]. The understanding of individuals or groups about the importance of preserving and protecting the natural environment, as well as the recognition of the impact of human actions on this ecosystem, involves a deep understanding of the interconnectedness between humans and nature, including how daily activities can affect the quality of air, water, soil, biodiversity, and climate.

Environmental awareness encompasses a caring and responsible attitude that promotes proactive action in preserving natural resources, reducing pollution, managing waste wisely, and supporting sustainable practices for the well-being of the environment and future generations. Environmental awareness motivates individuals to make positive behavioral changes, fostering a harmonious and balanced relationship between humans and their environment.

Elementary school is one of the strategic places to shape attitudes and behaviors towards environmental awareness. Through education, students are taught about the environment and instilled with values and responsibilities to protect it. One subject that contains environmental material is IPAS (Natural and Social Sciences). In this subject, students are introduced to the relationship between humans, nature, and technology and their impact on life. However, IPAS learning is often theoretical and does not touch on the students' real lives. The material presented has not been fully connected with the cultural, social, and local environmental conditions close to their daily lives. As a result, students may understand environmental concepts cognitively but may not necessarily develop genuine awareness or concern for their surrounding environment.

Efforts to raise environmental awareness among students can be conducted through various learning approaches, including the Culturally Responsive Teaching (CRT) approach. CRT refers to the teaching behaviour of teachers that brings students' cultural identity and life experiences into the classroom [2]. CRT emphasises the importance of recognising and understanding students' cultural backgrounds, languages, and experiences in the teaching and learning process [3]. The CRT approach can improve students' learning outcomes from diverse ethnic backgrounds [4].

Culture can be used to achieve the subject matter's objectives, also serving as a preserved and sustainable cultural identity [5]. Previous research has shown that the use of CRT proves effective in achieving learning objectives for students with initially low scores; after being treated with the CRT approach, students' learning outcomes increased to the high category [6]. The implementation of the CRT approach to improve learning outcomes in the

subject of IPAS has proven effective in enhancing student engagement and academic achievement [7].

The CRT approach in learning will become more contextual through the local wisdom of each student. Local wisdom refers to the paradigms and concepts of a nation's knowledge [8]. Local policies are based on cultural identity [9], which is built and rooted in normative stability, so the Soach region has a different cultural character [10].

Previous research also supports the importance of integrating local cultural values into learning. Previous studies indicate that the CRT approach positively impacts students' engagement and learning outcomes in the IPAS subject [11]. Meanwhile, other studies show that local wisdom influences various aspects of sustainable development, including multicultural competence. Local wisdom affects how communities enhance the management of ecotourism [12], manage teenage life [13], disaster mitigation [14], financial literacy [14], student character [15], and tolerance in religious life [13]. One of the local wisdoms is the Sundanese local wisdom, which teaches 'Tri Tangtu di Buana'. However, little research has examined the influence of the CRT learning approach based on Sundanese local wisdom, particularly 'Tri Tangtu di Buana', on the environmental awareness of fourth-grade elementary school students in the IPAS subject. Therefore, research is needed to fill this gap and provide empirical evidence regarding the effectiveness of this approach.

"The local wisdom of 'Tri Tangtu di Buana' is a philosophy of life for the Sundanese people that divides human roles in maintaining the harmony of the world into three main components: 1) Prebu; responsible for organizing and maintaining the order of life, 2) Rama; plays a role in preserving nature and resources, and 3) Resi; tasked with utilizing nature wisely [16]. These three elements are very suitable to serve as fundamental values in building environmental awareness among students. By introducing the 'Tri Tangtu di Buana' concept in the IPAS learning, students not only study facts and concepts about the environment, but also absorb local cultural values that emphasize the importance of maintaining the balance between humans and nature.

The results of the initial observation conducted in the fourth grade of SDN Ceger 1 in Bogor City revealed that most students lacked a strong awareness of the importance of environmental preservation. This is evident from their habits of littering, not being economical in using water and electricity, and a lack of participation in classroom and school cleanliness activities. Additionally, during the learning process, teachers often employ lecture methods and less contextual teaching materials, making students feel that the material is irrelevant to their daily lives. This situation encourages the need for a learning approach connecting the IPAS material with the students' local culture and environment.

To address this, a more contextual and meaningful learning approach is needed for learners. One relevant approach is Culturally Responsive Teaching (CRT), a learning approach that connects teaching materials with learners' culture, local values, and life experiences. This approach positions local culture as an essential learning resource, enabling learners to feel that their learning is directly relevant to their daily lives. Thus, learning becomes more engaging, grounded, and shapes a character that aligns with local cultural values.

Based on this background, the researchers are interested in conducting a study entitled "The Influence of CRT-Based Learning Approaches on Local Wisdom to Increase Environmental Awareness of 4th Grade Students in Science Subjects." Through this research, it is hoped that the culturally based learning approach will enhance students' understanding of IPAS concepts and cultivate awareness, concern, and a sense of responsibility towards the environment from an early age.

2. LITERATURE REVIEW

IPAS (Ilmu Pengetahuan Alam dan Sosial) learning in the Merdeka Curriculum combines science and social studies subjects previously taught separately. This approach aims to create a non-monotonous and more contextual learning experience for students. IPAS is designed to develop inquiry skills and students' self-understanding and environmental awareness by observing surrounding phenomena. In its implementation, IPAS learning allows teachers to design teaching modules and creative teaching methods. It encourages students to be active, independent, and collaborative in their learning activities [17].

The study of Integrated Natural Science and Social Science (IPAS) in elementary schools is an integrative approach that combines the subjects of science and social studies into a single field of study. The primary goal of IPAS learning is to cultivate students who possess a comprehensive understanding of the natural and social phenomena around them and develop the ability to think critically, reflectively, and contextually.

Environmental awareness is an individual's awareness or alertness to their environmental conditions, both in the non-living environment (abiotic) and the living environment (biotic), enabling the individual to control themselves and their environment [18]. Building environmental awareness and concern among elementary school students requires a diverse and relevant learning approach related to their daily lives. Methods that encourage active student participation, such as group discussions that stimulate critical thinking about environmental issues, collaborative projects focused on solutions to environmental problems in their communities, or direct field practice such as tree planting or cleaning school areas, have proven to be more effective in instilling values of environmental concern compared to lecture methods [19]. In addition, the use of learning media and resources that utilize the students' surrounding environment. Culturally responsive teaching is an educational approach that considers students' diverse cultural backgrounds in planning, instruction, and assessment [20]. This approach recognises the importance of appreciating and understanding the cultural diversity of students in the learning context. The Culturally Responsive Teaching approach is a learning method that ensures every student has equal access to instruction, regardless of their cultural background [21]. The Culturally Responsive Teaching (CRT) approach is a learning approach that values and accommodates the cultural diversity of students to create an inclusive, equitable, and culturally relevant learning environment [21]. This approach encourages students to be active, feel valued, and engaged in learning by utilizing their cultural backgrounds as a learning resource.

The material "My Area and Its Natural Wealth" for 4th Grade elementary school aims to introduce students to their living environment, specifically the natural wealth they possess. This learning includes understanding various natural resources such as plants, animals, water, soil, and minerals found in their area. Moreover, students are encouraged to understand how humans utilize these natural resources to meet their needs and the environmental impacts of such utilization. Emphasis is placed on preserving nature so future generations can enjoy this wealth. Through this material, it is hoped that students can cultivate a sense of love and responsibility towards their surrounding environment.

The material 'My Region and Its Natural Wealth' for fourth-grade students can be enriched by integrating the local wisdom of 'Tritangtu', which emphasizes the importance of balance. In this context, we can observe how forests, jobs, and residences are interconnected with natural wealth and noble values. As part of 'Rama' (the power of nature), forests are vital natural resources. In Bogor, forests in the mountainous area not only provide oxygen and clean water but also hold spiritual value ('Buyut') for some communities that respect their existence. The way the surrounding communities seek jobs (part of 'Nagara', the social order), such as farming or sustainably utilizing forest products, must be in harmony with efforts to preserve the forests. Finally, human settlements are also highly dependent on natural wealth. The choice of location for habitation and the way it is constructed should consider the balance of nature to avoid damaging the environment. By understanding this connection through the lens of Tritangtu, students are encouraged to appreciate nature as a source of life, respect traditional values in its use, and support responsible management of natural resources.

3. METHOD

This type of research is a quasi-experimental design, which is a development of proper experimental design. This study has two independent variables (X) and the dependent variable (Y). According to Sugiyono [22], research variables are defined as attributes or values of a person, object, or activity whose changes are determined by the researcher for the study, and then conclusions are drawn. This study's independent variable (X) is the Culturally Responsive Teaching (CRT) approach and the Scientific approach. In contrast, the dependent variable in this study is the increase in environmental awareness. During the implementation of the research, a pretest and posttest were conducted using questions from the IPAS subject relevant to my region and its natural wealth. The test questions are used as data collection instruments to measure the increase in students' environmental awareness before the pretest and after the posttest.

Before the question instrument was used for research, the questions were trialed on fifth-grade students who had previously received the same material to determine whether the instrument was suitable for use. The test questions consist of 10 multiple-choice items at the level 4 or HOTS (Higher Order Thinking Skills). The data obtained is then analyzed as part of the assumption and hypothesis testing, aided by IBM SPSS 25 for Windows software. After obtaining research results, hypothesis testing and analysis are conducted using a paired sample t-test to get the difference in scores or gain between the pretest and posttest results. The research results will undergo normality testing or prerequisite testing before hypothesis

testing, and a paired sample t-test will be performed. Normality testing is conducted to determine whether the data from the research results follow a normal distribution. Normality testing is performed using the Shapiro-Wilk test.

The research was conducted to determine the effect of using the Culturally Responsive Teaching (CRT) approach on increasing environmental awareness among the 4th Grade students of Ceger 1 State Elementary School in Bogor. The subjects of this study consisted of 34 students, divided into a control class of 15 students and an experimental class of 19 students. The research was conducted on April 29, 2025, in Classes IV A and IV B of Ceger 1 State Elementary School in Bogor. The material used was 'My Region and Its Natural Wealth' from the IPAS subject in the second semester.

4. INSTRUMENT TESTING

A trial of the instrument was conducted to evaluate the feasibility of the research instrument before it was used in actual data collection. The trial was conducted in the fifth-grade class of Ceger 1 State Elementary School, which had already received the same material, namely "My Region and Its Natural Resources," consisting of 19 children. The instrument used is HOTS (Higher Order Thinking Skills) multiple-choice questions, which will later be used.

4.1. Validity Instrument Test

A test is considered valid if it can accurately measure what it is intended to measure [23]. The item validity test in this study was conducted using SPSS. Then, the validity testing criteria were compared with the r product moment value at a significance level of $\alpha=5\%$ (0.05). The test item is said to be valid if $r_{hitung} > r_{tabel}$. The respondents in this study were 19 students, resulting in a table value (r_{table}) at a significance level of 0.05 with a value of 0.456. An instrument item is also considered valid if the significance value is < 0.05 , while the instrument is said to be invalid if the significance value is > 0.05 . Below are the results of the validity test for the items using the IBM SPSS application:

Table 1. Validation Test Results

Question item	r_{table} 5% n=19	r_{count}	Significant	Criteria
No 1	0,456	0,791	0,000	Valid
No 2	0,456	0,791	0,000	Valid
No 3	0,456	0,874	0,000	Valid
No 4	0,456	0,909	0,000	Valid
No 5	0,456	0,790	0,000	Valid
No 6	0,456	0,699	0,001	Valid
No 7	0,456	0,790	0,000	Valid
No 8	0,456	0,874	0,000	Valid
No 9	0,456	0,644	0,003	Valid
No 10	0,456	0,791	0,000	Valid

Based on the table, the validity test results on 10 items using SPSS are valid because $r_{\text{calculated}} > r_{\text{table}}$ and a significance value of < 0.05 was obtained. Thus, the 10 items numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 can be selected for analysis.

4.2. Reliability Test

Reliability relates to the consistency of assessment results. According to Arikunto [23], reliability is an instrument that can be trusted to be used as a data collection tool because the instrument is already good. To interpret the level of reliability of the questions, categories are used with the following criteria:

Table 2. Criteria for the Reliability Coefficient Correlation of the Instrument

Correlation coefficient	Correlation	Interpretation of Reliability
$0,90 \leq r \leq 1,00$	Very High	Very stable/very good
$0,70 \leq r < 0,90$	High	Good Stable/good Fairly
$0,40 \leq r < 0,70$	Medium	stable/fairly
$0,20 \leq r < 0,40$	Low	Good Unstable/bad Very
$r < 0,20$	Very Low	Unstable/very bad

In this study, the items tested for reliability consist of 10 questions. The following are the results of the reliability test of the instrument:

Table 3. Reliability Test Results

Coefisien Alpha Cronbach	Description
0,776	Reliability

Based on the table, after conducting reliability tests on the question item instrument using IBM SPSS, a Cronbach's Alpha result of 0.776 was obtained. Based on this result, the correlation coefficient falls within the criteria of $0.70 \leq r < 0.90$, which means the interpretation of the reliability of the 10-question items is satisfactory/good; thus, it can be concluded that the question instrument is deemed reliable.

4.3. Difficulty Test

The test difficulty level ensures that the questions used have a proportionate difficulty level and align with the measurement objectives. In this study, the interpretation of the difficulty level is as follows:

Table 4. Interpretation of difficulty level

P-P	Classification
0,00-0,30	Difficult
0,31-0,70	Medium
0,71-1,00	Easy

Table 5. Results of the Difficulty Test

		Statistics									
Questions		1	2	3	4	5	6	7	8	9	10
N	Valid	19	19	19	19	19	19	19	19	19	19
	Missing	0	0	0	0	0	0	0	0	0	0
Mean		.68	.68	.63	.63	.79	.68	.74	.68	.63	.58

Based on Table 4, the difficulty level test on questions 1, 2, 3, 4, 6, 8, 9, and 10 yields a difficulty level interpretation of 0.31-0.70, indicating that these questions can be considered medium in difficulty. Questions 5 and 7 have difficult interpretations of 0.71-1.00, so these questions can be considered easy.

4.4. Test of Differential Power

The discrimination power test determines whether a question item can differentiate between test participants with high ability (or mastery of the material) and those with low ability (or not yet mastering the material). In other words, a good question should be answered correctly by the upper group and answered incorrectly by the lower group. The classification of the question's discrimination power is as follows:

Table 6. Classification of different powers of questions

Interpretation	Category
$DB < 0$	Very bad (question not used)
$0,00 < DB \leq 0,20$	Bad (question not used)
$0,21 < DB \leq 0,40$	Sufficient
$0,41 < DB \leq 0,70$	Good
$0,71 < DB \leq 1,00$	Very good

Table 7. Results of Discriminative Power Test

Questions	Item-Total Statistics			
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	6.05	7.497	.693	.816
2	6.05	7.497	.693	.816
3	6.11	7.544	.642	.821
4	6.11	7.877	.509	.834
5	5.95	8.164	.501	.834
6	6.05	7.608	.646	.821
7	6.00	8.000	.521	.832
8	6.05	7.830	.554	.829
9	6.11	8.322	.340	.849
10	6.16	8.251	.353	.848

Based on the results of the differential test on the Corrected Item-Total Correlation, it was found that questions 1, 2, 3, 4, 5, 6, 7, and 8 are considered good questions. Questions 9 and 10 can be regarded as sufficient. Therefore, all these questions can be used.

5. RESULTS AND DISCUSSION RESULTS

Based on research conducted on the students of grade IV of Ceger 1 Elementary School in Bogor on April 29, 2025, the results of the study are as follows:

5.1 Equality Test

From Table 8, a significance value of 0.571 is obtained, greater than 0.05. Therefore, both classes are equivalent.

Table 8. Results of Equivalence Test (Anova One Way)

Levene Statistic	df1	df2	Sig.
.328	1	32	.571

5.2 Descriptive analysis

The following are the results of the descriptive analysis using IBM SPSS 25. In the control class, the average initial environmental awareness score (pretest) for 17 students was 65,29 with a standard deviation of 14,194, a minimum score of 40, and a maximum score of 90. Meanwhile, the environmental awareness score for the control class after being treated with a scientific approach resulted in an average posttest score of 75,88 with a standard deviation of 12,277, a minimum score of 60, and a maximum score of 100.

Table 9. Descriptive Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest Experiment	17	40	90	63.53	12.719
Post Test Experiment	17	60	100	91.76	11.311
Pretest Control	17	40	90	65.29	14.194
Post Test Control	17	60	100	75.88	12.277
Valid N (listwise)	17				

Based on the data, there is an increase in the average environmental awareness score in the experimental class after being treated with a Culturally Responsive Teaching approach based on local wisdom, which is 28,23. In the control class, there is an increase in the average environmental awareness score after being treated with a scientific approach, which is 10,59. There is a difference in the rise in the average score after treatment in each group, showing that the results in the experimental class are better than those in the control class.

5.3 Normality Test

The following are the results of the normality test using IBM SPSS 25. Based on the results of the calculations, it is evident that all calculations yield significance values greater than 0.05; thus, it can be concluded that the data used in this study are normally distributed.

Table 10. Results of Normality Test

Class	Shapiro-Wilk				
	Statistic	Statistic	df	Sig.	
Results	Pretest Experiment	.198	.951	17	.468
	Post Test Experiment	.291	.851	17	.011
	Pretest Control	.159	.938	17	.301
	Post Test Control	.272	.884	17	.036

5.4 Homogeneity test

The following are the homogeneity test results conducted using IBM SPSS 25. Based on the homogeneity test results, a significance value of 0.404 was obtained, indicating a mean of 0.404. Based on this result, it can be concluded that the homogeneity test results > 0.05 , indicating that the two data sets of student environmental awareness are homogeneous.

Table 11. Results of Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Results	Based on the Mean	.989	3	64	.404
	Based on the Median	.774	3	64	.513
	Based on Median and with adjusted df	.774	3	63.415	.513
	Based on the trimmed mean	1.115	3	64	.349

5.5 Hypothesis testing

Table 12. Results of Hypothesis Testing

		Levene's Test for Equality of Variances		t	df	Sig. (2-tailed)
		F	Sig			
Score	Equal variances assumed	1.253	.271	3.923	32	.000

The hypothesis test on Equal variances assumed obtained a significance value (2-tailed) of $0.000 < 0.005$. It can be concluded that there is a difference in the average increase in environmental awareness among the fourth-grade students of SDN Ceger 1.

5.6 DISCUSSION

Increasing Environmental Awareness of Grade IV Students at Ceger 1 Bogor State Elementary School using a Scientific Approach.

The results of the environmental awareness study conducted with fourth-grade students at Ceger 1 State Elementary School in Bogor, before the treatment, showed a pretest average score of 68.00, with a minimum score of 50 and a maximum score of 90. After the treatment was implemented in the learning process using a scientific approach with a total of 15 students, an average score of 82.67 was obtained, with a maximum score of 100 and a minimum score of 60. Thus, there was a 14.67% increase in environmental awareness, and the ecological awareness achieved through the scientific approach is categorized as high.

The scientific approach to learning IPAS for 4th grade, focusing on the topic "My Area and Its Natural Wealth," is implemented through a series of stages that encourage

students to construct their knowledge actively. Starting with the observation stage, students are invited to directly observe various aspects of natural wealth around them through visual media, such as the diversity of plants in the city park, the flow of the Ciliwung River, or the types of soil present. Then, in the questioning stage, the teacher facilitates students to formulate critical questions related to their observations, for example, "Why does this river water look different in several places?" or "What are the benefits of these plants for the environment?"

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As for the shortcomings in implementing this approach, several students do not participate in discussions and cooperation activities. This is due to a lack of understanding of each other's roles, resulting in only a few students doing the work, which causes some students to struggle with grasping the material, and some students refuse to group up.

Increasing Environmental Awareness of Grade IV Students at Ceger 1 Public Elementary School in Bogor using a Culturally Responsive Teaching (CRT) approach.

The results of the environmental awareness research among fourth-grade students of State Elementary School Ceger 1, Bogor, before treatment showed an average pretest score of 63,53, with a minimum score of 10 and a maximum score of 100. After being treated with the learning process using the CRT approach involving 19 students, the average score increased to 83.68 with a maximum score of 100 and a minimum score of 50. Thus, there was a 16.3% increase in environmental awareness, and the ecological awareness using the CRT approach, based on the local wisdom 'Tri Tangtu di Buana', is classified as high. This improvement indicates that students better understand the importance of preserving the living environment when learning is directly connected to the cultural values they are familiar with and experience.

The first step begins with the pre-learning stage, where the teacher initially explores the students' cultural backgrounds and their understanding of the environment. During this stage, students are given a pretest to determine their initial level of environmental awareness. This pretest also serves as a basis for the teacher to understand the needs and learning strategies appropriate to the students' characteristics.

Next is the stage of material presentation, where the teacher relates the IPAS material, specifically about environmental preservation, with local Sundanese cultural values, such as the importance of living in harmony with nature. The teacher explains Tri Tangtu in Buana, which consists of the values of Prebu, Rama, and Resi, each responsible

for maintaining harmony between humans and nature. The material is presented through folk tales, daily experiences, images, videos, and discussions that stimulate students' curiosity.

After that, the teacher invites the students to interact and engage actively through group work, class discussions, and simulations on environmental conservation. Students are asked to share their experiences maintaining the home or school environment. They are also encouraged to create posters or simple works about caring for the environment based on Sundanese cultural values. In this activity, the teacher pays attention to the learning styles and interests of the students, so that all learners can participate comfortably and confidently.

Then, the learning was closed with a stage of reflection and evaluation, in which students were asked to recount what they had learned and what they could do to be more concerned about the environment. After participating in CRT-based learning, the teacher administered a posttest to assess the development of students' understanding and attitudes toward the environment. The posttest results showed an average score increase of 26,23 points, from 63.53 to 91.76. This indicates that the local wisdom-based CRT approach effectively increases students' environmental awareness. This is consistent with previous research that the CRT approach can improve students' learning outcomes, with a significance value 0.000 between pretest and posttest data. The significance value indicates that it is less than 0.05.[6]. Previous research found that using CRT has been proven effective in achieving learning objectives, where the initial scores of students in the low category increased to high after treatment with the CRT approach. Implementing the CRT approach has also enhanced student engagement and academic performance in IPAS. Furthermore, the CRT approach has been proven to significantly improve student learning outcomes with a significance value 0.000 between the data.

The use of culture, such as the philosophy of 'Tri Tangtu di Buana' in the Sundanese context taught in this study, can achieve the goals of the subject matter while preserving cultural identity. Previous research also supports that the CRT approach positively impacts student engagement and learning outcomes in the IPS subject. This is reinforced by findings that local wisdom influences various aspects of sustainable development, including student character. By connecting the IPS material on environmental preservation with local cultural values, students learn concepts and absorb values that emphasize the balance between humans and nature. This creates a more contextual, engaging, and grounded learning experience, thus shaping character that aligns with regional cultural values and fostering real awareness and responsibility towards the surrounding environment.

From the overall learning process, it can be concluded that linking lessons with local culture can help students better understand, appreciate, and apply the values of environmental care. They learn concepts, experience, and feel the meaning of the learning in their daily lives. This CRT approach with local content can be an alternative learning method that is relevant, contextual, and positively impacts students' character.

The difference in environmental awareness enhancement among fourth-grade students at Ceger 1 Bogor Elementary School between using the Culturally Responsive Teaching approach and the scientific approach.

This comparative study examines the implementation of learning using the Culturally Responsive Teaching (CRT) approach versus the scientific approach. This research employs two classes: Class IV A, which serves as the experimental class using the CRT approach, and Class IV B, which serves as the control class using the scientific approach. The results of the t-test calculation showed a significant value (2-tailed) of $0.000 < 0.05$, indicating a substantial difference in environmental awareness between students taught using the culturally responsive teaching (CRT) approach ($X = 91.76$), which is higher than the average of those using the scientific approach ($X = 75.88$). Therefore, it can be concluded that the environmental awareness of students using the culturally responsive teaching approach is higher than that of students using the scientific approach.

This difference can be linked to relevant previous research that supports each approach's effectiveness and how CRT adds a deeper dimension. The scientific approach, with stages of observing, questioning, gathering information, reasoning, and communicating, encourages students to actively construct knowledge about their environment. This aligns with studies showing that participatory and contextual learning methods instill environmental care values effectively. However, the findings of this research also highlight the weaknesses of the scientific approach, namely the potential lack of active participation from all students in the group due to an insufficient understanding of role division, which can hinder material comprehension for some learners.

On the other hand, the CRT approach has proven superior due to its ability to connect teaching materials with culture, local values, and students' life experiences. Previous research has shown that by bringing students' cultural identities and experiences into the classroom, CRT can improve learning outcomes for students from diverse ethnic backgrounds [24], [25]. The use of culture, such as the Sundanese local wisdom 'Tri Tangtu di Buana' in this study, achieves the subject matter goals and preserves cultural identity. The increased environmental awareness observed in the CRT group indicates that when learning is directly linked to cultural values that are known and experienced by students, they better understand and internalize the importance of preserving the environment. This aligns with research that states that the CRT approach can improve student learning outcomes and that integrating local cultural values in learning has a positive impact.

6. CONCLUSION

Culturally Responsive Teaching (CRT) based on local wisdom significantly increases environmental awareness of fourth-grade students at SDN Ceger 1 Bogor compared to the scientific approach. The average environmental awareness in the group using the CRT approach is 91,76, while in the scientific group it is 75,88. The significant difference (significance value $0.000 < 0.05$) indicates that learning that connects the material with local culture enables students to understand better, appreciate, and apply values of concern for the environment. Based on these findings, educators may consider integrating culturally responsive teaching methods, particularly those based on local wisdom, into the science curriculum (IPAS) to enhance students' environmental awareness. This approach has

made learning more contextual, engaging, and meaningful for students. Future research could explore the effectiveness of the local wisdom-based CRT approach at different educational levels or subjects to see the generalisation of these findings.

REFERENCES

- [1] M. Miterianifa and M. F. Mawarni, "Penerapan Model Pembelajaran Literasi Lingkungan dalam Meningkatkan Pengetahuan dan Kesadaran Lingkungan," *Jurnal Sains dan Edukasi Sains*, vol. 7, no. 1, pp. 68–73, 2024, doi: 10.24246/juses.v7i1p68-73.
- [2] J. Meléndez-Luces and P. Couto-Cantero, "Engaging ethnic-diverse students: A research based on culturally responsive teaching for roma-gypsy students," *Educ Sci (Basel)*, vol. 11, no. 11, 2021, doi: 10.3390/educsci11110739.
- [3] A. Androsov and B. H. Zhang, "Students as Co-Creators: Bringing Culturally Responsive Teaching into a Doctoral Course for International Students in China," *Sage Open*, vol. 13, no. 1, pp. 1–16, 2023, doi: 10.1177/21582440221145914.
- [4] M. M. Cheng, A. V. Lacaste, C. Saranza, and H. H. Chuang, "Culturally responsive teaching in technology-supported learning environments in marine education for sustainable development," *Sustainability (Switzerland)*, vol. 13, no. 24, 2021, doi: 10.3390/su132413922.
- [5] Y. Rahmawati, A. Mardiah, E. Taylor, P. C. Taylor, and A. Ridwan, "Chemistry Learning through Culturally Responsive Transformative Teaching (CRTT): Educating Indonesian High School Students for Cultural Sustainability," *Sustainability (Switzerland)*, vol. 15, no. 8, 2023, doi: 10.3390/su15086925.
- [6] A. Nawati, I. Dyah Kumalasari, and H. M. Zulfiati, "Pengaruh Problem Based Learning (Pbl) Dengan Pendekatan Culturally Responsive Teaching (Crt) Terhadap Hasil Belajar Ips Pada Siswa Kelas V Sekolah Dasar," *Pendas : Jurnal Ilmiah Pendidikan Dasar*, vol. 09, no. 01, pp. 2503–2514, 2024.
- [7] K. Noviarini, R. S. Bahtiar, and E. Santoso, "Penerapan Culturally Responsive Teaching Untuk Meningkatkan Hasil Belajar Materi Produk Unggulan Daerah bagi Siswa Kelas V Sekolah Dasar," *Edutama : Jurnal Ilmiah Penelitian Tindakan Kelas*, vol. 1, no. 1, pp. 105–113, 2024.
- [8] T. Susanto, H. Rasni, and L. A. Susumaningrum, "Using values of local wisdom for family healthcare of adolescents in the Indonesian context," *Sri Lanka Journal of Child Health*, vol. 48, no. 3, pp. 256–258, 2019, doi: 10.4038/sljch.v48i3.8762.
- [9] I. Nurashiah, A. Marini, M. Nafiah, and N. Rachmawati, "Nilai Kearifan Lokal: Proyek Paradigma Baru Program Sekolah Penggerak untuk Mewujudkan Profil Pelajar Pancasila," *Jurnal Basicedu*, vol. 6, no. 3, pp. 3639–3648, 2022, doi: 10.31004/basicedu.v6i3.2727.
- [10] S. Sujinah, M. A. Mu'ammam, A. N. Affandy, and E. Supriyanto, "The effectiveness of local wisdom based on textbook to improve students' writing literacy," *Universal Journal of Educational Research*, vol. 7, no. 12, pp. 2573–2583, 2019, doi: 10.13189/ujer.2019.071204.
- [11] M. SYA'BANA, E. HARIYONO, and T. D. MAHARANI, "Pengaruh Pendekatan Culturally Responsive Teaching Terhadap Keaktifan Dan Hasil Belajar Ipa," *SCIENCE : Jurnal Inovasi Pendidikan Matematika dan IPA*, vol. 4, no. 2, pp. 74–88, 2024, doi: 10.51878/science.v4i2.2965.
- [12] Marlina, Sumarmi, I. K. Astina, D. H. Utomo, and E. Kurniawati, "Ecotourism Management Based on Local Wisdom for Optimizing the Function of Cave Water Resources As a Prevention of Floods and Droughts in Wakatobi Regency, Indonesia," *Geojournal of Tourism and Geosites*, vol. 44, no. 4, pp. 1222–1232, 2022, doi: 10.30892/gtg.44406-938.
- [13] S. W. Hanafie Das, A. Halik, Ahdar, and B. Iman, "Prenatal Education Process Based on Local Wisdom in Indonesia," *Educ Res Int*, vol. 2022, 2022, doi: 10.1155/2022/6500362.
- [14] Priyambodo *et al.*, "Mitigation of Social Impacts of Alternative Road Development Plans Based on Local Wisdom in West Sumatra, Indonesia," *Scientific World Journal*, vol. 2022, 2022, doi: 10.1155/2022/6895084.
- [15] I. N. Kardana, I. G. N. A. Rajistha, and M. Sri Satyawati, "Revitalizing Local Wisdom in Balinese Simile: An Effort to Enhance Balinese Youth Character," *Journal of Language Teaching and Research*, vol. 13, no. 1, pp. 138–144, 2022, doi: 10.17507/JLTR.1301.16.
- [16] H. Pajarianto, I. Pribadi, and N. S. Galugu, "Youth religious moderation model and tolerance strengthening through intellectual humility," *HTS Teologiese Studies / Theological Studies*, vol. 79, no. 1, pp. 1–10, 2023, doi: 10.4102/hts.v79i1.8196.
- [17] I. K. N. Sri Nuryani, Lutfi Hamdani Maula, "Implementasi Kurikulum Merdeka Belajar Dalam Pembelajaran Ips Di Sekolah Dasar," *DISCOURSE: Indonesian Journal of Social Studies and Education*, vol. 1, no. 1, pp. 75–80, 2023, doi: 10.69875/djosse.v1i1.103.

- [18] M. A. Nugroho, “Konsep Pendidikan Lingkungan Hidup Sebagai Upaya Penanaman Kesadaran Lingkungan Pada Kelas Iv Min 1 Jombang,” *Ibtidaiyyah: Jurnal Pendidikan Guru Madrasah Ibtidaiyyah*, vol. 1, no. 2, pp. 16–31, 2022, doi: 10.18860/ijpgmi.v1i2.1691.
- [19] L. F. Ludiya, “Pentingnya Membangun Kesadaran Lingkungan Melalui Pembelajaran PKN di Sekolah Dasar Guna Membentuk Karakter Peduli Lingkungan pada Siswa,” *Jurnal Pendidikan Guru Sekolah Dasar*, vol. 1, no. 3, p. 11, 2024, doi: 10.47134/pgsd.v1i3.529.
- [20] D. Hardiana, “Peningkatan Minat Belajar Ips Melalui Culturally Responsive Teaching Pada Peserta Didik Kelas Iv Sdn 01 Sumpalsari,” *Didaktik : Jurnal Ilmiah PGSD STKIP Subang*, vol. 9, no. 2, pp. 2394–2405, 2023, doi: 10.36989/didaktik.v9i2.983.
- [21] I. M. Khasanah, H. Nuroso, A. S. Pramasdyahsari, and Affliasi, “Efektivitas Pendekatan Culturally Responsive Teaching (CRT) Untuk Meningkatkan Hasil Belajar Siswa Kelas II Sekolah Dasar,” *JOURNAL OF ALIFBATA: Journal of Basic Education (JBE)*, vol. 3, no. 2, pp. 7–14, 2023, doi: 10.51700/alifbata.v3i2.514.
- [22] Sugiyono, *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R & D*. Bandung: Alfabeta, 2015.
- [23] S. Arikunto, *Dasar-Dasar Evaluasi Pendidikan*. Jakarta: Bumi Aksara, 2013.
- [24] L. Hutchison and L. McAlister-Shields, “Culturally responsive teaching: Its application in higher education environments,” *Educ Sci (Basel)*, 2020, [Online]. Available: <https://www.mdpi.com/2227-7102/10/5/124>
- [25] B. R. Romijn, P. L. Slot, and P. P. M. Leseman, “Increasing teachers’ intercultural competences in teacher preparation programs and through professional development: A review,” *Teach Teach Educ*, 2021, [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S0742051X2031427X>
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