



## Science learning to understand the value of conservation character in students in the Coastal region



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### ABSTRACT

This research was conducted to understand the value of conservation character in students by utilizing local resources in the coastal areas of Gorontalo Province. The research design used is the application of one group pretest-posttest design. Data collection was performed using cluster sampling techniques with research subjects totaling 160 students spread across four elementary schools in the coastal areas of Gorontalo Province. Data analysis was performed using N-Gain and Anava 2 x 2 test to see differences in learning outcomes in the form of moral knowledge and moral goodness of conservation at each grade level and examine the difference in the total score of the pretest and the total score of the posttest. The results showed that the N-Gain value for knowledge about coastal natural resources was 0.74, moral conservation knowledge was 0.76, and moral goodness conservation was 0.84. Anava test results showed the level of class and type of test differed significantly on the character values of students with sig <0.05 (0.000 <0.05). That is, there are differences in the value of student conservation characters based on grade levels. Significantly the character value of grade 3 and grade 4 students shows the highest value compared to the grade value of grade 5 and grade 6 students. The application of science learning tools with conservation characteristics utilizing the local potential of natural resources in elementary school students in coastal areas can understand the character conservation of students in coastal areas.



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### Introduction

Coastal ecosystems consist of three primary forms of ecosystems, namely mangroves, coral reefs, and seagrasses. Damage to coastal ecosystems generally occurs in every region in Indonesia. [Rudianto \(2018\)](#) reported that in 1997-2000, mangrove damage in the potential area of

mangrove habitat in Indonesia was +8.6 million ha, consisting of 3.8 million ha in forest areas and 4.8 million ha outside the area. At present, 1.7 million ha (44.73%) of mangrove forests within the forest area and 4.2 million ha (87.50%) of mangrove forests outside the forest area are in damaged condition. It was further stated that from 1064 stations in 108 locations spread across

Indonesian waters, the condition of coral reefs in very good condition was 6.39%, good condition was 23.40%, sufficient condition was 35.06% and bad condition was 35.15%. The report concerns the percentage of seagrass cover in Indonesia calculated from 166 observation stations is 41.79%. If the value is classified according to Minister of Environment Decree 200 of 2004, then the status of seagrass in Indonesia is considered to be in an unhealthy condition. On a local scale based on the information document on the performance of environmental management in Gorontalo Province in 2017 that Gorontalo Province has two coastal areas, namely the southern coast facing the waters of Tomini Bay and the north coast facing the waters of the Sulawesi Sea. The north coast has a length of 217.7 km, and the south coast has a coastline of 438.1 km. The level of damage that occurred in this region is estimated at 40% of the total area.

These facts have an impact on the life of the ecosystem and coastal environment as well as human life today and future generations. Governments, schools, and communities play an important role in realizing coastal ecosystems and environments to remain intact and sustainable (Abdullah, Said, & Omar, 2014). One effort that can be done is to instill the character of conservation or protect the environment against the ecological system of the environment to the next generation (Dahdouh-Guebas & Koedam, 2008). The nation's generation must be brought closer to their surroundings to understand their environment and their needs from the beginning. These surroundings can be done through formal and non-formal education. Formal education is done through learning in class and Non-formal education through education in the community.

International scope and character education are included in the four pillars of education from UNESCO, namely learning to know, learning to do, learning to be, and learning to live together. Thomas Lickona (in Hindun, 2014) that good character involves good knowledge, wanting good, and doing good habits, habits of the heart, thoughts, and habits of action. It is not just about teaching character education or increasing the value of character based on such understanding. Formula character education includes understanding (cognitive), aspects of motivation or desire

(affective) to do good, and acts of doing good (psychomotor).

Learning to instill the character of conservation in schools requires learning tools that present ecosystems, such as in students' environment (Utina, 2017). However, learning tools (lesson plans, teaching materials, student worksheets, and evaluation tools) issued by the government do not yet have a load of local potential values regarding the preservation of the coastal environment where students learn and live. Such conditions can make it difficult for students to understand the teaching material that they should master because they do not meet in everyday life (Pane & Patriana, 2016). Therefore, it is necessary to develop learning tools that utilize local potential through systematic and planned efforts in the interests of planting conservation characters.

The character of conservation can be instilled through moral knowing, moral feeling, and moral action (Sulasmono, Ekosiswoyo, Widodo, & Sugiyo, 2017). Noble character includes knowledge about goodness (moral knowing), which can lead to a commitment to goodness (moral feeling) and finally actually doing good behavior (moral action). Moral knowledge, which includes moral awareness, knowledge of moral values, foresight, moral reasoning, decision making, and self-awareness, are important things that must be taught to students. Furthermore, it needs to continue to moral feelings, namely: conscience, self-confidence, empathy, kindness, self-control, and humility, further to the most significant stage, which is a moral action. This moral action is essential because, at this stage, the driving force for someone in doing good things can be seen from their abilities, desires, and practices. The synergy of the three interrelated moral components requires the implementation of character education in developing students' moral intelligence. Planting the character of conservation must be done from the beginning on the students of primary education age. This balance is of moral knowledge, and attitudes towards environmental problems as a process of moral formation of the nation's children. Planting characters can be done in various ways through learning in schools, communities, and at home. In connection with that, Kim (2015) states that building character in schools can develop students' character to be able to handle problems in

various situations and embed characters through games at school. Character education is considered to be an individual subject. So, character education subject is treated like other subjects. This character education means that the teacher of character education should develop a curriculum, syllabus, lesson plans, and teaching Medias to teach character education subject to students (Rolina, 2014). The excellent point of this model is that the concept of character education is delivered to students clearly (Eliasa, 2014; Rokhman, Hum, Syaifudin, & Yuliati, 2014). This research is to develop character education in schools through curriculum development that will be taught by a teacher.

Cultivation of the character of conservation can be realized by referring to the natural wealth on the local coast that reflects the way people behave and act in response to changes in their physical and cultural environment (Tamalene, Henie, Al, Suarsini, & Rochman, 2014; Utina, 2017). Furthermore, the learning tools developed in this study are textbooks and picture books about environmental care characters. These are unique by using contextual examples of the natural environment around students, so they are very recognizable by students. Science learning tools are expected to instill the character of coastal conservation in students through the learning process by empowering local potential so that commitment to moral knowledge to achieve good (moral feeling) towards the preservation of the coastal environment can be realized. Learning devices need to be applied in learning to instill the character of conservation in students in coastal areas.

The purpose of this study is to implement the learning tools developed in the process of learning science to instill conservation character based on the local potential of coastal areas. Estuary finally is that students can understand and recognize coastal ecosystems and subsequently will arise in students' awareness of loving the coastal environment where students learn, play, move with their families, and live.

## Method

This study uses a quasi-experimental method with one group pretest-posttest design. Samples were taken through a cluster sampling technique taken from four

primary schools in the coastal areas of Gorontalo province, namely Pahuwato Regency, Boalemo Regency, Gorontalo Regency, and North Gorontalo Regency. Samples were taken in clusters representing each district on the coast. Each region was randomly drawn as many as ten students at each grade III, IV, V, and VI. In order to obtain a sample of 40 people for each class level with a total of 160 research subjects. The research instrument was in the form of learning tools that included Learning Implementation Plans, Textbooks, Student Worksheets (LKPD), and Evaluation Tools developed in the previous stages. The instrument has been through the validation stage with expert judgment involving two experts.

Learning done on 3 times the meeting begins with the pretest at the first meeting and ends with the posttest at the 3rd meeting. Pretest instruments are presented in the form of multiple-choice and essay. The test consists of knowledge about coastal natural resources, moral knowledge of the conservation of the environment (moral knowing), and about the moral goodness of the environment (moral feeling). Data analysis was performed using the N-Gain statistical analysis technique and the Anava 2 x 2. Anava test was used to see differences in test scores at each grade level and test the total score of the pretest and the total score of the posttest. Statistical analysis of the N-Gain test shows differences in test scores in 3 groups, namely knowledge test scores on SDA, moral knowledge test scores, and moral goodness test scores on environmental damage.

## Research Instruments and Procedures

The instrument used was a test instrument to test students' knowledge about coastal natural resources, moral knowledge, and the moral goodness of the environment. This instrument is in the form of multiple-choice tests and essays. The instrument validity test uses the Pearson correlation test by calculating the value of  $r$  (if  $r$  count  $>$   $r$  minimum 0.3, then the instrument used can be said to be valid). The validity test results show that the test instrument concerning knowledge has a value of  $r = 0.348$ , moral knowledge has a value of  $r = 0.815$ , and moral goodness has a value of  $r = 1$ . All  $r$  values for the three test instruments have a value higher than the minimum value of  $r$  as the benchmark is 0.3.

This result means that the test instruments used in this study are in the valid category. The reliability test uses alpha Cronbach with a minimum value of 0.6 (if alpha Cronbach > minimum value 0.6, then the instrument used can be reliable). The reliability test results showed that the alpha Cronbach value obtained was 0.712. This value is higher than the minimum alpha Cronbach value, which is the benchmark of instrument reliability, which is equal to 0.6. This result means that the test instruments used in this study are in the reliable category. The procedure of applying science learning research is carried out using learning tools, namely Learning Implementation Plans, Textbooks, Student Worksheets (LKPD), and Evaluation Tools that have been developed in the previous stages. Before learning, students fill in the pretest. After completing three lessons, students fill out a test in the form of a posttest description test.

### Research data analysis

Research data in the form of learning outcome score data obtained from the implementation of pretest and posttest. The material tested is in the realm of knowledge and the realm of attitude. The realm of knowledge is coastal natural resource knowledge, and moral knowledge or conservation character / moral knowledge of the environment (moral knowing). The affective domain is a test of the moral goodness of the environment (moral feeling). Each score is calculated. The score of moral knowing and moral feeling is a score of learning outcomes, following Bloom's statement that learning outcomes consist of cognitive, affective, and psychomotor aspects. This study focused on cognitive and affective musty. Data in the form of student learning outcomes scores used N-Gain statistical analysis techniques. The consideration is that the calculation results have high accuracy, practical, and comfortable in concluding. The normalized N-Gain formula proposed by Hake (in Meltzer, 2002).

$$N - Gain = \frac{Skor\ posttest - Skor\ pretest}{Skor\ max - skor\ pretest}$$

The results of the *N - Gain* calculation are then categorized into 3 (three) categories, as in Table 1.

Also, the Anava 2x2 parametric statistical test was performed. Anava test was conducted to test the difference in learning outcomes scores at each grade level and to test the differences in the total pretest score and the total posttest score.

Table 1. Kriteria N-Gain

Score N-Gain	Criteria Normalized
0.70 < N-Gain	High
0.30 ≤ N-Gain ≤ 0.70	Middle
N-Gain < 0.30	Low

## Results and Discussion

Based on the results of the 2013 Curriculum analysis, there are some themes in science learning that can be developed to instill knowledge and attitudes/character of conservation in learners in coastal areas. Science learning tools developed by researchers in the previous year included: (a) learning implementation plans, (b) teaching materials, (c) student worksheets, and (d) evaluation tools. This learning tool used in science learning is characterized by conservation.

Previous research has developed a learning tool based on the 2017 edition of the 2013 Curriculum in Science. Learning tools consist of (a) learning implementation plans, (b) there are two teaching materials, namely supplementary materials, and storybooks, (c) learners' worksheets, and (d) assessment tools. The four learning tools that were successfully arranged had a content of the local potential of coastal communities. Teaching material chosen included: (a) class III material theme loving plants and animals around (b) material class IV theme three about the diversity of living things and theme four about various occupations, (c) class V material about ecosystems, and (d) class VI material on natural resources. Characteristics of teaching material are the presentation of teaching material about the wealth of local coastal natural resources that support efforts to conserve biological natural resources. Details of class levels and teaching material developed are presented in Table 2.

This learning tool is valid with an average textbook supplement validity of 89% (very valid category) with details (a) accuracy of content coverage (3 aspects), (b) implementation (5 aspects), (c) use of language (6 aspects), and (d) appearance (8 aspects).

Table 2. Teaching material that is developed at each grade level

Class	Product	Theme/Material	Student Competencies
III and IV	Learning Implementation Plan, Textbooks, and Student Worksheets	Diversity of living creatures in coastal areas Loving plants and animals around	Explain the concept of natural resources, Knowing the various natural resources of plants, animals, and non-living natural materials (abiotic) around the story.
	Storybook	The suffering of the Small Fish (Derita si Ikan Kecil) Nune sister. Wise Woodworkers (Kak Nune. Pengrajin Kayu yang Bijak) Nonu, Pulu, Uma and Tune the Savior of Padang Seagrass (Nonu, Pulu, Uma dan Tune Sang Penyelamat Padang Lamun)	Explain activities that can preserve natural resources through various stories
V	Learning Implementation Plan, Textbooks, and Student Worksheets	coastal ecosystem	Identifying components in an ecosystem. Describe several types of ecosystems
	Learning Implementation Plan, Textbooks, and Student Worksheets	Relationships between living things in coastal ecosystems	Describe the sequence of food chains and food webs of living things in the ecosystem. Making madding food webs in an ecosystem accompanied by information.
	Learning Implementation Plan, Textbooks, and Student Worksheets	Coastal ecosystem balance	Explain a variety of human activities that can affect the balance of the ecosystem
VI	Learning Implementation Plan, Textbooks, and Student Worksheets	Characteristics and adaptation of living things in coastal areas (Mangroves, Seagrasses, Coral reefs)	Explain the characteristics of plants that are typical in the surrounding environment Describe the adaptation of plants in the surrounding environment Explain the characteristics of animals that are typical in the surrounding environment Describe the adaptation of animals in the surrounding environment
IV, V, and VI	Evaluation tools	All themes/material	Aspects of knowledge/known about the environment in coastal areas, aspects of moral knowing, aspects of moral feeling

Based on learning activities by students, it appears that the seven activities observed showed a value of 87.54 with a very good category. The seven activities are the activities of students in (a) observing the picture shown by the teacher, (b) giving questions about the picture shown, (c) searching and processing information contained in the book, (d) discussing according to the instructions of students worksheets, (e) present the results of the discussion, (f) make conclusions, and (g) do the evaluation with your abilities.

Tests of student learning outcomes measure learning. The learning outcomes

measured are knowledge about environmental science and moral knowledge (moral knowing) about the importance of human moral values to the environment and moral goodness towards the environment (moral feeling) of students when given questions about environmental problems. The test results are presented in Table 3.

Aspects of knowledge about the environment (Knowing) obtained a score of 0.74 with a high category. That is, learning character science can instill students' knowledge about coastal natural resources. In the aspect of moral knowledge about

ethics on the environment (moral knowing) obtained a score of 0.76 with a high category. That is, learning science with character can be instilled with moral knowledge about the importance of

preserving coastal natural resources. Learning outcomes on the aspect of moral feeling (goodness) obtained a score of 0.85 with a high category.

Table 3. Student Learning Outcomes for Knowledge (Knowing) and Moral Knowledge about the environment (Moral Knowing) and moral Goodness about Environmental Problems (Moral Feeling)

Aspect	knowing about the environment	Moral knowing	Moral feeling
<b>Category</b>			
Average pretest	29.6	45.7	41.4
Average posttest	196.7	234.9	272.3
N Gain	0.74	0.76	0.85
Category	High	High	High

Through character learning, science can instill moral goodness in loving the environment when given the problem of damage and preservation of coastal natural resources. Based on the N-Gain test results, it can be concluded that learning science in conservation character can instill knowledge about coastal natural resources

and develop the moral goodness of students in environmental conservation.

Furthermore, the difference test was conducted with Anava to see if there were differences in the value of students' conservation characters based on grade levels, as presented in Table 4.

Table 4. Analysis of differences in the value of students' conservation characters based on grade levels with Anava

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	171327.475	7	24475.354	208.414	.000
Intercept	416772.225	1	416772.225	3548.925	.000
Grade level class	19488.025	3	6496.008	55.315	.000
Test	147248.225	1	147258.225	1253.943	.000
Grade level class* Test	4581.225	3	1527.075	13.003	.000
Error	17850.300	152	117.436		
Total	605950.000	160			
Corrected Total	189177.775	159			

Anava test results showed that the class level and type of test differed significantly on the character values of students, which were marked by the acquisition of Sig. 0,000 < 0.05. There are differences in student character scores based on grade levels, and there are differences in the pretest and posttest scores. Post Hoc test further to see the level of class that obtained the highest character value is presented in Table 5.

Based on the Multiple Comparisons table (Table 5), it is seen that the character values of class 5 and 6 students are not significantly different. While the character values of students in grades 3 and 4 are significantly different. The character values of students in grades 5 and 6 are significantly different from those of students in class 4 and class 3. classes 3 and 4 significant differences in the value of characters in, meaning that the character values of students in grades 3 and 4 are the higher than the character value of students compared to grades 5 and 6.

Table 5. The best character value based on class level

Class	Total students	Level		
		1	2	3
Class 6	40	41.07		
Class 5	40	42.85		
Class 4	40		51.28	
Class 3	40			68.95

Based on the results of the N-Gain shows there is an increase in the value of aspects of knowledge about the coastal environment, aspects of moral knowledge, and aspects of attitude (moral feeling) from the beginning of learning and after learning.

Aspects of knowledge of the environment, moral knowledge, and aspects of goodness (moral feeling) are at high criteria so that the character of environmental care from the aspects of knowledge and moral feelings of students already embedded in students can be seen based on their answers to the tests given.

Based on the analysis results of the pretest and posttest at the end of learning has been able to increase the knowledge of students, namely knowledge about natural resources in the coastal area, to enhance the moral goodness of the characters care about the environment. Based on the different levels of classes shows, there are differences in the value of characters in different classes.

Based on further test data, it appears that learning outcomes in grades 3 and 4 are higher than those in grades 5 and 6. This will can be explained because it is related to the complexity of the material in grades 5 and 6 compared to content that is easier in grades 3 and 4. Also, adjusted to the level of cognitive abilities of children to be able to understand the concept of the environment and expectations that the morals of the environment can be adequately understood.

The character of conservation is measured through a test of learning outcomes consisting of multiple-choice questions and essays about environmental knowledge, moral knowledge of the environment, and moral feeling questions about ethics on environmental issues. The test results show an increase in the value of student's environmental care character from the aspects of moral knowing and moral feel. It can be seen based on students' answers to the tests given in response to environmental problems.

Moral feeling included in the high criteria, so it can be said the character of caring for the environment in terms of the moral feeling of students is already embedded in students. Indicators set to measure aspects of moral feeling in research are one of the assessments of a description of problems relating to the environment. So, it can be said that learning Science can improve the character of caring for the environment in students.

This research has succeeded in instilling character values in students since elementary school. The way taken to instill the values of caring for the environment in students is to integrate these values in the design of learning, Student Worksheets,

student books, and tests of learning outcomes (Hindun, 2014). Katili, Utina, Tamu, and Nusantari (2018) stated the importance of developing conservation character education based on socio-cultural values, especially local potential, as an appropriate educational model to encourage patterns of management of coastal ecosystems about biodiversity. It means elementary school teachers can use the utilization of local potential, as socio-cultural values owned the community on the coast in instilling conservation character students. Such as planting mangroves, maintaining the integrity of small fish habitat on the edge beach, not taking sand and rocks on the beach, maintaining the integrity of mangrove trees on the beach, and so on. Educational institutions, in this case, elementary schools on the coast, play an important role in developing local values that promote the community as an effort to build the nation's generation character. The task of the teacher to explore local values possessed by the coastal community to be used as a source of learning for their students, so they can be used as a guide for students in protecting the coastal ecosystem. Thus, local values embodied in the form of local culture in the coastal area can be used as a model of conservation character education in elementary schools as a whole.

This research is a real planned and systematic effort that is carried out in supporting the realization of conservation character education. By utilizing product development learning tools, teachers can be creative in the learning process to instill a conservation character in their students. In the learning contained local values of coastal communities that teachers can efficiently utilize in teaching their students about the character of conservation. The efforts carried out are in line with Ardan (2016), which states that the creativity of teachers is needed in choosing approaches, strategies, learning plans, learning materials, student worksheets, and evaluation tools so that the implementation of the learning process is optimal. Science learning empowers local potential and is a tangible manifestation of teachers' creativity to optimize the application of the learning process in elementary schools to instill the character of conservation to students in coastal areas.

Its implementation in the learning process is carried out with patterns of

recognition, observation, appreciation, and discovery to internalize students' understanding of the coastal environment. With these learning patterns, students can find contextual and realistic concepts of local phenomena on the coast. Utina (2017) that learning activities by applying a scientific approach, one of which is a scientific approach to the inquiry or discovery model, namely the learning process designed to enable students to encourage students in constructing concepts and principles of learning material through scientific methods to a specific phenomenon or event. Nusantari and Lihawa (2017) also stated that the development of teaching materials based on local potential has advantages. Namely, the material presented contains local potential about the diversity of local living things in the coastal areas so that students can learn in contextual and realistic ways.

Learning Science has many advantages over traditional learning tools, namely the presentation of textbooks and student worksheets equipped with activities to understand coastal ecosystems and have knowledge, attitudes, and moral feelings. In the worksheet, the students presented the wealth of coastal natural resources in Gorontalo, so students can directly learn about the characteristics of natural resources in the form of coral reefs, seagrasses, and mangroves. In the textbooks presented the impacts that occur if the use of the coast is not wise and prudent. The values of local wisdom possessed by coastal communities can be a noble example that can be imitated by students as the next generation. Thus, students are expected to be able to recognize and look more closely at natural resources in their area and be able to realize the impacts that will occur if the coastal natural resources are damaged.

The learning process by utilizing this product development learning device has succeeded in instilling the character of conservation and instilling good and noble attitudes to students as the next generation in maintaining the sustainability of coastal ecosystems. As has been researched by Ratana-ubol and Henschke (2015) that learning models by utilizing local cultural values in Thailand have guaranteed the existence of cultural diversity that develops in Thailand. Indeed, learning in schools should rely on local cultural values that promote in the local area so that the

learning process can produce optimal behavioral changes. In this study, the local cultural values of coastal communities can be optimally utilized to instill conservation character in students as the next generation in maintaining the sustainability of coastal ecosystems. The preserved coastline can sustain the lives of millions of living creatures, and the balance of being on the coast can work well.

In this connection, it is essential to build cooperation between local governments, universities, and the community in building character education. We can adopt the idea of Thornton and Scheer (2012), which states that it is very important to conserve ecosystems by making strong collaboration between academics and non-governmental organizations, local governments, and local communities. It can be used as a reference and can be adopted relating to appropriate learning models and applying the values of local wisdom in the curriculum of learning in elementary schools.

Furthermore, Thornton and Scheer (2012) that (1) the government and the private sector have a role in promoting community learning and teaching, (2) educational institutions and organizations in the community, play a role as a center for developing local wisdom, learning resources, learning processes, (3) schools play a role in their local education, motivate, encourage families and communities to be aware, and collaborate in the learning process, and (4) the teacher plays an active role in learning the community, the potential, and local wisdom that can be implemented in education.

Therefore, in Gorontalo, it is necessary to build a network that involves all parties and all elements that are interested in the preservation of the coastal ecosystem called the spider network. The spider's network includes all components, such as local government, private elements, universities, community organizations, religious leaders, community leaders, customary stakeholders, stakeholders, teachers, students, parents of students, fishers, fish entrepreneurs, and the parties concerned with the preservation (Farley, Batker, de la Torre, & Hudspeth, 2010). Of the coastal ecosystem are united and support one another in maintaining and preserving the coastal ecosystem by their respective fields of expertise. Thus, the implementation of character education by exploring natural



resources in the school's learning process can create an education system that can prepare human resources.

Next-generation qualified and ready to work in maintaining coastal ecosystems while still adhering to the values of character, noble personality, noble morals, and ethics.

## Conclusion

The application of science learning sets characterized as conservation by utilizing the local potential of natural resources in elementary school students in coastal areas can instill knowledge about the environment, moral knowledge, and moral goodness in solving environmental problems. Furthermore, this research is essential to be disseminated to elementary schools in coastal areas. Collaboration between universities and the district government in Gorontalo is needed to be able to jointly commit to science learning programs to instill the character of environmental conservation in children early on.

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