

## Bio-Conservation Learning Model Development With Waste Management Topic to Empower Environmental Awareness Character of Primary School Students

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### Abstract

This research was conducted because of the needs to empower the students' environmental awareness character. This research aims to develop a bio-conservation learning model with waste management topics adapted from Project Based Learning model (PjBL) and inquiry and determine the influences of the bio-conservation learning model toward learning outcomes and students environmental awareness. This research is an ADDIE Research and Development. The model consists of Analysis, Design, Development, Implementation, and Evaluation. The subjects consisted of 93 third graders of 02 Santo Antonius Primary School.. The techniques of collecting data were interview, observation, questionnaire, and documentation. The product was a module for teachers with several contents, such as the bio-conservation model's characteristics, goals, and syntaxes. The validation result obtained a percentage of 88.6%. The N-gain of the first experimental group was 0.072 with high criteria. On the other hand, the second experimental group obtained a percentage of 0.514 with moderate criteria. The understanding of environmental awareness attitude was obtained by using a questionnaire and observational sheets. The obtained criteria were categorized high, with average scores of questionnaire 87.2% and observation 85.9%. This research showed the influence of learning outcomes and environmental awareness attitude after using the bio conservation model. The model implementation's emerging characters were waste management and 3R activities (Recycle, Reuse, and Reduce).

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## INTRODUCTION

Waste becomes a public matter in Indonesia. The increased community purchasing power towards various primary needs and technology products; and the increased business or economic supporting activities in a region contribute to the quantity and quality of produced wastes (Pratama, 2015). Those wastes impact the environment and make the ecosystem unbalance. Lack of community awareness toward environment increases the environmental damages.

One of the efforts to overcome environmental problems is instilling environmental awareness character at schools' early childhood age. Character is an important matter to foster individual and national personalities. Character education is a strategic step to create characterized personalities (Ariyani & Wangid, 2016; Amini, 2017). An appropriate learning model could teach environmental awareness character education. An appropriate learning model maximizes Learning (Susilo et al., 2016; Purnomo & Sukarjo, 2017).

An environmentally correlated learning model could improve students attitudes. Biodiversity have important roles in maintaining and putting natural ecosystem in balance (Biswas, 2018; Mellish et al., 2019). One of the efforts to keep them is applying bio-conservation learning model. It is an integrated science developed to protect species and ecosystems (Wilson, 2016). An environmental education prioritizes science, experience, and practice to interact productively with researches (Toomey et al., 2017).

Bio-conservation is a model based on the actual environmental condition. Baihaqi et al., (2015) found that bio-conservation learning improved biodiversity process skills and environmental awareness. Other findings also showed that this model could improve learning outcomes, attitudes, values, environmental science, and skills to prepare individuals and communities for collaboratively carrying out

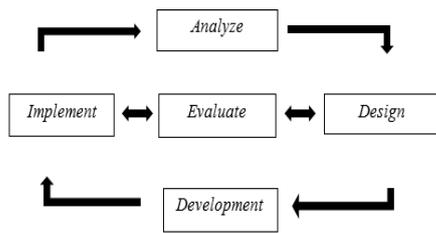
positive environmental action (Thomas et al., 2018; Ardoin et al., 2019).

Conservation-minded model development is expected to improve an individual's interest to learn. It also aims as policy decision-making to improve knowledge and students attitudes. This learning model benefits both students and teachers. For teachers, it is useful to apply a new-developed and accurate model for a certain material. Environmental education integration in science learning could be done with motoric learning, dealing with character education, contextual approach, and effective multimedia to improve students' environmental knowledge (Sukarjita et al., 2015).

This research aims to develop a bio-conservation learning model with waste management topics adapted from the Project-Based Learning model (PjBL) and inquiry. PjBL can improve the ability of students in solving project problems, while inquiry can develop student attitudes and skills (Majid & Rochman, 2015). The research aim too is determine the bio-conservation learning model's influences toward learning outcomes students' environmental awareness character.

## METHOD

The research method used in this study was Research and Development (RnD). It was carried out in 02 Santo Antonius Primary School, Banyumanik, Semarang. The subjects consisted of thirty one-third graders of the school for each group, one control group, and two experimental groups. This research applied the ADDIE model (Analyze, Design, Development, Implementation, and Evaluation). The applied ADDIE model was explained by Mulyatiningsih (2019) and adapted from Dick and Carry (1996).



**Figure 1** The Stages of ADDIE Model Development

The first stage was analyzing. This research found problems with the students environmental awareness. Thus, it should be developed.

It was continued to design by determining the learning objectives, designing the activities, learning instruments, learning materials, and learning evaluation tools with bio-conservation model development. The developed learning model with waste management was the development of PjBL and inquiry models. The syntaxes of adapted PjBL applied activity projects as the media. Meanwhile, the characteristic of inquiry is a learning activity that maximally involves all students' abilities to look for and investigate something critically,

The findings were used to determine the influence of the bio-conservation learning model with environmental awareness characteristics. The research activity was done online from August - September 2020. The model was developed based on ADDIE model stages.

Bio-conservation learning model with waste management topics adapted from Project Based Learning model (PjBL) and Inquiry. PjBL is a learning model based on the project to challenge students daily lives (Triana *et al.*, 2019). Rooparine and Johnson, quoted by Arisanti (2017), argue that PjBL provides various learning experiences to foster roles and respond to ideas from each person, organize the efforts, and maximize contributions from different members of all sub-groups.

The first stage was a conceptual understanding. It facilitated a conceptual

logically, systematically, and analytically so that they can formulate their own findings independently and confidently.

The next stage, the development, had the purpose of realizing the previously conceptualized products. The conceptual framework was realized in an applicable product. The model had a colorful cover design. It consisted of 15 pages. The model discussed definitions, theoretical principles, characteristics, learning objectives, syntaxes, assessments, applications, instructional procedures, and sources.

The activity was continued to the implementation stage. In this stage, the developed design was applied in the class. The materials were shared with the newly developed model or method.

The last stage was evaluation. During the implementation, the developed model or method designs were applied in an actual classroom. After implementing the method, an initial evaluation was done by providing feedback on the following method or model.

## RESULTS AND DISCUSSION

understanding of the material by providing daily life, relevant, and trusted problems.

The second stage was environment linkage. In this stage, the materials were connected to environmental sensitivity, knowledge, and skills to solve problems. Students formulated and collected data actively in a student-centered learning atmosphere.

The third stage was an assignment. It aimed to measure the cognitive aspects of students after the learning process. It was done by creating a product.

The last stage was empowerment. Teachers recalled the discussed materials. They provided behavioral responses for students that made them revise or improve those behaviors.

The teachers would eventually use the model to improve the students environmental awareness. The bio-conservation model module would be applied online for four meetings due to the COVID-19 pandemic situation. The taken

topic was waste management. The students were taught to manage the waste with 3R-principle. The examples of the activity, assisted by the parents, were creating tin phones, transportation miniatures, and montages. The students' works were made from unused things to reduce waste.

### Bio-conservation Learning Model Reliability

The module in this learning should have undergone experts' validations. Experts did the validations based on the learning instrument necessity, media, and materials. They were lecturers of UNNES and Atma Jaya Yogyakarta

**Table 1** The Results of Bio-conservation Model Reliability by Experts

Number	Assessors	Institution	Score (%)
1	Validator 1	Lecturer of UNNES	92
2	Validator 2	Lecturer of UNNES	86
3	Validator 3	Lecturer of Atma Jaya University	88
Average			88,6 (Reliable)

The result shows that bio-conservation model reliability obtained a percentage of 88.6%, with categorized as reliable. Thus, it could be used with a few revisions.

The other validated instruments were syllabus, lesson plan, observation sheet, and

questionnaire sheet. From the validation, it could be used when the score  $\geq 80-95$ . The evaluation results of the syllabus are shown in Table 2

**Table 2** Syllabus Validation by Experts (Third Grade Teacher)

Number	Assessors	Institution	Score (%)
1	Validator 1	SD Antonius 02 Banyumanik	92
2	Validator 2	SD Antonius 02 Banyumanik	86
3	Validator 3	SD Antonius 02 Banyumanik	82
Average			86.6 (Reliable)

The syllabus validation results showed an average score of 86.6. The results showed that the model could be applied to improve learning

outcome. The evaluation results of the Lesson Plan are shown in Table 3

**Table 3** Lesson Plan Validation by Experts (Third Grade Teacher)

Number	Assessors	Institution	Score (%)
1	Validator 1	SD Antonius 02 Banyumanik	94.7
2	Validator 2	SD Antonius 02 Banyumanik	91.5
3	Validator 3	SD Antonius 02 Banyumanik	86.3
Average			90.83 (Reliable)

Based on the table, the lesson plan evaluation by the experts obtained an average score of 90.83. The results showed that the

model was reliable and could be applied without revision. The environmental attitude questionnaire validation is presented in Table 4.

**Table 4** The Environmental Attitude Questionnaire Validation (The Third Grade Teachers)

Number	Assessors	Institution	Skor(%)
1	Validator 1	SD Antonius 02 Banyumanik	80
2	Validator 2	SD Antonius 02 Banyumanik	84
3	Validator 3	SD Antonius 02 Banyumanik	96
Average			86.6 (Reliable)

The table shows that the questionnaire's score, by the experts, obtains an average score of 86.6, categorized reliable and applicable in learning process. The observation sheet is presented in Table 5.

**Table 5** The Environmental Awareness Attitude Questionnaire Validation (The Third Grade Teachers)

Number	Assessors	Institution	Score (%)
1	Validator 1	SD Antonius 02 Banyumanik	92
2	Validator 2	SD Antonius 02 Banyumanik	80
3	Validator 3	SD Antonius 02 Banyumanik	92
Average			88 (Reliable)

The table shows that the environmental care observation sheet evaluated by the experts obtained an average score of 88. The results showed that the model was reliable and could be applied to learning process.

pretest was done to determine the initial skills of students before using the bio conservation model. The comparison of pre-and post- learning outcomes of the model implementation on both groups is presented in Figure 3.

**The R&D Design Results**

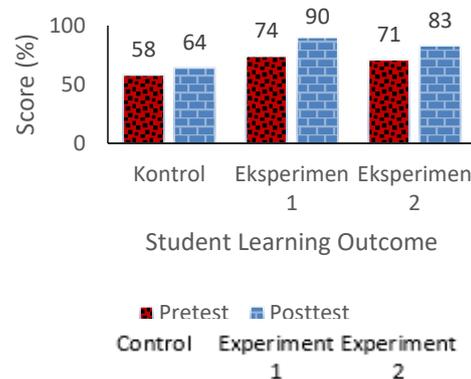


**Figure 2** The Cover of R&D Design Result

The module's look is colorful. The module consisted of definition, theoretical framework, characteristic, objective, learning model syntax, assessment, module implementation, instructional procedure, and source.

**The Learning Outcome Analysis Results of Bio-conservation Model Implementation**

The learning outcomes were obtained from cognitive pretest and post-test. Cognitive



**Figure 3** The Comparison Diagram of Learning Outcome Completeness

The learning outcome completeness of the control group's pretest is 58%, while in the posttest test increased to 64%. The learning outcome completeness of the first-experimental group's pretest is 74%. It improves to 90% seen from the post-test after using the bio conservation model. The learning outcome

completeness of the second-experimental group pretest is 71%. It improves to 83% seen from the post-test after using bio-conservation model. The experimental groups reached higher than 80% ( $\geq 80\%$ ) based on the classical completeness requirement. The cognitive assessment was classically completed, therefore learning with the bio-conservation model was effective.

The students cognitive learning outcomes were obtained from *pretest* and *post-test* of the applied model, bio-conservation model. The students cognitive learning outcomes after the intervention were improved. The N-gain test result recapitulation is in Table 6.

**Table 6** The results of Normalized Gain Test of Pre-test and Post-test

Class	Average		<i>N-Gain</i>	Categories
	<i>Pretest</i>	<i>Posttest</i>		
Control Group	68.54	73.80	0.101	Low improvement
Experimental Group	71	89.83	0.702	High improvement
Experimental Group	69.93	83.90	0.514	Moderate improvement

The *N-Gain* test result showed that a normalized-gain average score of the control group was 0.101, which is categorized as low improvement. On the other hand, the experimental groups obtained 0.702 and 0.514, categorized as high and moderate. Thus, the experimental group students were better than the control group. The experimental group gained significant improvement after applying the bio-conservation model. This finding is in line with previous research by Solikhin & Prasetyo (2015), Syahriyani et al. (2017), and Sato & Haan (2015). They found that environmental awareness attitude could improve the learning outcomes about the given materials.

#### **The Analysis of Environmental Awareness Attitude**

One of the characters that should be owned by every individual is environmental

awareness. This attitude could be instilled in the family or school environments (Syahriyani, 2017). Character is moral or a way to differentiate an individual from the others. The value of conservation character has to be recognized by students. Education has important roles in developing qualified human resources and national characters (Saputri et al., 2019). Environmental awareness is an individual's skill to realize the correlations between human activity and the surrounding environment to create safe and healthy environments (Laksmi, 2015).

The environmental awareness attitude analysis data was done with a questionnaire and observation sheet. The results of the questionnaire and observation are shown in Table 7 and Table 8

**Table 7** The Environmental Awareness Analysis (Questionnaire)

Respondents	Total	Score (%)
Control Group	247	79.6
Experimental Group 1	272	87.7
Experimental Group 2	269	86.7

**Table 8** The Environmental Awareness Analysis (Observation)

Respondents	Total Score	Score (%)
Control Group	240	75
Experimental Group 1	263	84.8
Experimental Group 2	270	87

The analysis of environmental awareness was obtained from the environmental awareness questionnaire filled out by the students and observation sheets filled out by the parents. Both of them were done online. The questionnaire and observation sheets were shared a week after implementation of the bio-conversation model.

The obtained percentage score of the control group's environmental awareness was 79.6%. On the other hand, the first experimental group obtained 87.7%, while the second experimental group obtained 86.7%. Both experimental groups' results were better than the control group, with an average score of 87.2%.

The obtained percentage score of the control group's environmental awareness was 75% based on the observation. On the other hand, the first experimental group obtained 84.8%, while the second experimental group obtained 87%. Both experimental groups' results were better than the control group, with an average of 85.9% category score. This finding is in line with Widiyaningrum et al. (2015), Ulfatin & Permana (2018), and Susilo et al. (2016). They found that instilling environmental awareness through conservation could improve the students environmental awareness.

Previous research (Solikhin&Prasetyo, 2015; Syahriani et al., 2017; Sato&Haan, 2015) and this current research investigated a learning model development to improve students environmental awareness. However, the difference was to improve students environmental awareness character. This research also developed a bio-conservation learning model with waste management topics, integrated with environment and environmental preservation attitude. The character that stands out from the application of this bioconservation model is separating organic and inorganic waste. The application of the model has a possitive on

improved learning outcome and students' environmental awareness

## CONCLUSION

Based on the findings, the learning model, bio-conservation, was reliable to apply in learning. It was also effective in improving learning outcomes and environmental awareness attitude. This research is expected to be a reference material for further studies. Schools should collaborate with parents of implementing environmental awareness character in house.

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