

Fostering a Knowledge and Environmental Care Attitude Through an Environmental Theme Education Module

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The results of the development of an environmental education module for biology learning on the environmental theme were judged based on the BNSP (National Institution of Educational Standard) instrument. The study analysed the effect of the module implementation on learning environmental education (EE). Research has been done on fourth-grade students of UNNES Lab School, i.e. class A as experimental class and B as control class, by quasi-experimental design. Information on the improvement of 'environmental care' learning outcomes were from tests and questionnaires of environmental concerns on the dimensions of knowledge, curiosity, investigation and evaluation as well as verbal commitment. The N-gain data of pre-test and post-test and environment care scores were analysed by a t-test. The results showed that there was a difference in the improvement of the students' knowledge of the experimental class with control. Likewise, environmental attitudes show a difference in attitude improvement. Improvement of knowledge and attitude in experimental class is higher than control class. Based on this research, it is found that the learning environment facilitated by the EE module could increase knowledge and attitudes of environment care. This result is reinforced by students and teachers' responses that express well in the learning setting.

Key words: *environmental care attitude, environmental education.*

Introduction

The environment is a current global issue. To overcome these challenges, it is important to understand how humans make behavioural decisions that is relevant to the environment because the transition to alternative action can make significant differences (Klößner, 2013). Understanding how determinants of environmental behavior vary by country and culture is an urgent need. Morren and Grinstein (2016) showed that in developing countries and their individualistic societies, the intention to behave environmentally friendly tends to be translated into actual behavior and that attitudes towards the environment are related to purpose in the environment. Furthermore, the contextual environment studied will affect the outcome. Thus, the real effort to minimise environmental problems becomes a necessary thing that must be possessed by all groups from elementary school to higher education institutions. A concern that can minimise these problems is the promotion of environmental education as well as the conservation of natural resources from an early age.

EPA (2017), the United States Environmental Protection Agency, explains environmental education (EE) is a process that allows individuals to explore environmental issues, engage in problem-solving, and take action to improve the environment. In essence, EE refers to organised efforts to teach how the natural environment functions, and in particular, how humans can manage behavior and ecosystems to live sustainably (UNESCO, 2014). Hopefully, individuals develop a deeper understanding of environmental issues and have the skills to make appropriate and responsible decisions or have knowledge and attitudes towards the environment. EE is not just information on the environment nor does it advocate specific points of view or actions. Instead, EE teaches individuals how to consider various aspects of an issue by critical thinking which enhances their problem solving and decision-making skills, as explained by EPA (2017).

EE is a medium to provide awareness and knowledge to the community through the learning process. KLH (2004) states that EE can be done by various elements of society in formal, non-formal and informal activities. In formal education, EE is integrated with the realm of learning especially science and biology subjects, because EE studies are included in the scope of these subjects. UNESCO (2014) explains EE is a multi-disciplinary field that integrates scientific disciplines such as biology, chemistry, physics, ecology, earth science, atmospheric science, mathematics, and geography. While in non-formal education, EE can be provided through structured and gradual activities according to the age of the student. Ahmad (2010) mentioned that EE has a significant role in instilling ones ecological beliefs and understanding. By education, a person could change his perspective and raise his ecological capacity to drive environmentally friendly behaviours and lifestyles.

The contemporary challenge for education is how to develop an eco-warrior generation, which is an active citizen who makes lifelong environmentally friendly decisions (Lloyd & Gray, 2014). EE for sustainable development emerged as an essential approach to encourage students to preserve and protect the natural environment in their schools and environment. EE needs to be taught because it aims to provide opportunities for students to increase knowledge and foster care to improve the quality of life that is friendly to nature and friendly to the environment. Improving the quality of students could be achieved by the implementation of sustainable EE, meaning that it is not only integrated through learning activities but also needs practical studies.

Observations made at five elementary schools in Limbangan, Semarang and Sanggar Griya Cahya Muntal, Ngijo, Semarang showed that the implementation of EE had not sufficiently increased students motivation to care about the surrounding environment. In addition, the curriculum for science subjects in schools did not fully involve indicators of student achievement related to environmental attitudes. For this reason, Nurani (2013) has developed an environment education (EE) module for fourth graders through lessons in the schools and studios mentioned above.

The module does not only accommodate explanations but also concerns the formation of environmental care characters. Character-based EE module embraces environmental topics that are integrated with science subjects. Environmental topics presented follow the nature of environmental education according to the Sage Encyclopedia of Green Education according to Stevenson (2011) and Stevenson & Neus (2011), namely: *education about, in, through, with and for the environment*. The material presented comprises five chapters namely: the classification of animals, the life cycle of animals, living things and their environment, changes in the environment and its effects as well as the relationship between natural resources, the environment, technology and society. Preparation of the material is adjusted to the SBC and Curriculum 2013. Character-based EE modules have content eligibility under BNSP assessment criteria standards and module criteria according to the Directorate of Education Personnel. The EE module has a complete presentation component so that expert judgment reaches 100%. The procedure or method presented on the student activity sheet is performed coherently and correctly. The exercises or examples of activities performed can stimulate creative and innovative thinking through experimental activities. Descriptions delivered not only develop the potential of students to interact but also open up insights to recognise Indonesia's natural resources and are adaptive (Nurani, 2013).

Character-based modules can surge student competency because the most dominant side that is emphasised in character education is attitude or affect (Puskur, 2010). Shaping characters is better done earlier so that the characters appear sustainable. Elementary school is the starting point for students to acquire knowledge and develop attitudes. Children are more

easily influenced because they have just learned about the environment (Dimopoulos, 2009). This will facilitate the implementation of student character education. What if environmental education in fourth graders uses the developed module? Is there a significant difference in improving students' knowledge and attitudes towards the environment? This study aims to analyse the effect of module implementation on learning environmental topics.

Methods

This study was quasi-experimental with a pre-test, post-test control group design. Research has been conducted on students of Lab School UNNES class IVa as an experimental class and IVb as a control class. Both groups of samples were drawn from populations that had tested for normality and homogeneity. Learning activities were carried out at three natural science class meetings with four hours of study. The concept taught was natural resources, technology, environment and society. Both classes got the same learning topic, a student-centred learning approach, and take place co-operatively. The difference was the teaching material was used as a learning resource. The experimental group was given a module that has been developed as a learning resource. Learning outcomes of knowledge and attitudes to care about the environment were measured before and after learning. Information on improving learning outcomes 'caring for the environment' was from tests and questionnaires related to caring for the environment. The tests were used to observe students' knowledge about environmental education through the integration of learning materials as mentioned in the introduction. The questionnaire was developed based on the dimensions of knowledge, curiosity, investigation, evaluation and verbal commitment. For the dimension of knowledge, the indicator was basic knowledge of the environment that was owned by students. An indicator of the dimension of curiosity is the curiosity that arises about the environment and its problems. The dimensions of investigation and evaluation have indicators on the attitude of investigating and assessing activities that can damage and preserve the situation that has an impact on the proposed solution. Indicators of the dimensions of verbal commitment are activities or behaviours that are actions that care for the environment. In addition to the two data above, the teacher and student responses were also taken regarding the use of the module in learning activities. Data differences in the n-gain pre-test, post-test and environmental care attitudes scores in the two sample groups were analysed using the t-test. Furthermore, if the test results show a significant difference ($p < \alpha 0.05$), the module is stated to affect the knowledge and attitudes to care about the environment. If the average increase in learning outcomes of the experimental group is higher than in the control group, it means the module has a better effect on the learning outcomes of students' knowledge and attitude.

Results and Discussion

The results of the study are described in two main points, namely the learning outcomes of student knowledge and student attitudes. As we know, learning outcomes can be in the form of knowledge, attitudes, and skills. The phrases of attitudes learning outcomes are not intended as constructs that must be taught as knowledge and skills. The attitude, according to the standard process in the 2013 Curriculum, is embodied or taken in learning knowledge and skills as explained in the research method. So that at the end of learning, attitude can be assessed as a part of the learning outcomes.

Knowledge learning outcomes

At the beginning of the measurement using the test, the average score of the test results showed no significant difference between the experimental and control groups. The results of the t-count are in the area of acceptance H_0

$$-t_{(1-\frac{1}{2}\alpha)} < t_{count} < t_{(1-\frac{1}{2}\alpha)}$$

meaning there is no significant difference in knowledge between the control class and the experimental class. The average pre-test in the experimental class = 72.24 and the control class = 71.70 on the rating scale of 100. After treatment, the average post-test score of the experimental class was 84.48, and the control class was 78.35. Based on the calculation of the gain value, the average post-test results in the experimental class increased by 0.42 and in the control class increased by 0.22. The results of testing the difference in the increase in the average pre-test, post-test value can be seen in Table 1.

Table 1: T-test of *pre-test, post-test* (N-gain) experiment and control class

Class	Average	Variance	Dk	t-count	t-table	alpha
Experimental	0.42	0.06	43	2.86	2.02	0.05
Control	0.22	0.04				

Elevated knowledge in the experimental class reached 42% or in the medium category because the environmental concept in the module was not delivered in entirety during the meeting. Knowledge rose in the control class by 22% or in the low category. This difference becomes a reference that elevated environmental understanding is better in the experimental class. The t-test results of the pre-test and post-test gained a score of the two classes also showed that $t\text{-count} > t\text{-table}$, so it can be interpreted that the two classes had significant differences in understanding the material after learning. If the gaps in understanding between the two classes happen due to differences in the teaching materials used, it can be said that the use of character-based EE modules can significantly influence students' knowledge of the environment.

Attitudes learning outcomes

At the beginning of the measurement, a questionnaire was used. The average results showed that there were no significant differences between the experimental and control groups, $t\text{-count} = 1.667$ in the reception area H_0 ,

$$-t_{(1-\frac{1}{2}\alpha)} < t_{count} < t_{(1-\frac{1}{2}\alpha)}$$

meaning there was no significant difference between the characters of the control class and the experimental class. The average results of the measurement of attitude scale in the experimental class = 63.24 and the control class = 67.90 on the rating scale 100. After being given treatment, the average measurement results in the range of the experimental class increased by 7.32 units and at the control class raised by 4.00 units of scale. The results of testing the difference in the increase in the average score on the attitude scale can be seen in Table 2.

Table 2: T-test of the average difference between the psychological scale scores before and after learning in the experimental class and the control class.

Class	Average	Variance	Dk	t-count	t-table	alpha
Experimental	7.32	41.31	43	2.144	2.02	0.05
Control	4.00	8.11				

The character-based EE module is effectively used to engage students to care about the situations around them. Calculation of the average difference in character score scores shows a significant difference. The difference in scores in the experimental class was 7.32, and the control class was 4.00. The magnitude of $t\text{-count} > t\text{-table}$ of $2.144 > 2.02$ so that the two classes have differences in a significant increase in attitude after learning and an increase in attitudes towards environmental care that is higher in the experimental class.

The increase in attitude in the experimental class is influenced by the character-based EE module. Each chapter in the module is given a separate sheet that explains human activities and its impact on the environment. Gough (2011) believes that children who are connected with their environment will have a social attitude and care for their environment. The stories in the module are packaged in persuasive language and teach environmentally friendly attitudes such as throwing trash in its correct place, conserving energy, reusing items that have been thrown away, loving animals, respecting biodiversity and inviting other friends to live a healthy lifestyle. Battistich *et al.* (2000) reinforced the statement that environmental education is effective in preventing adverse effects on children so that environmental attitudes can be embedded. These attitudes become statement items on a psychological scale according to the indicators, so it can be concluded that students with high scores have met the signs of success in character improvement which are classified into four categories namely: knowledge about the environment, curiosity with the environment, investigation and

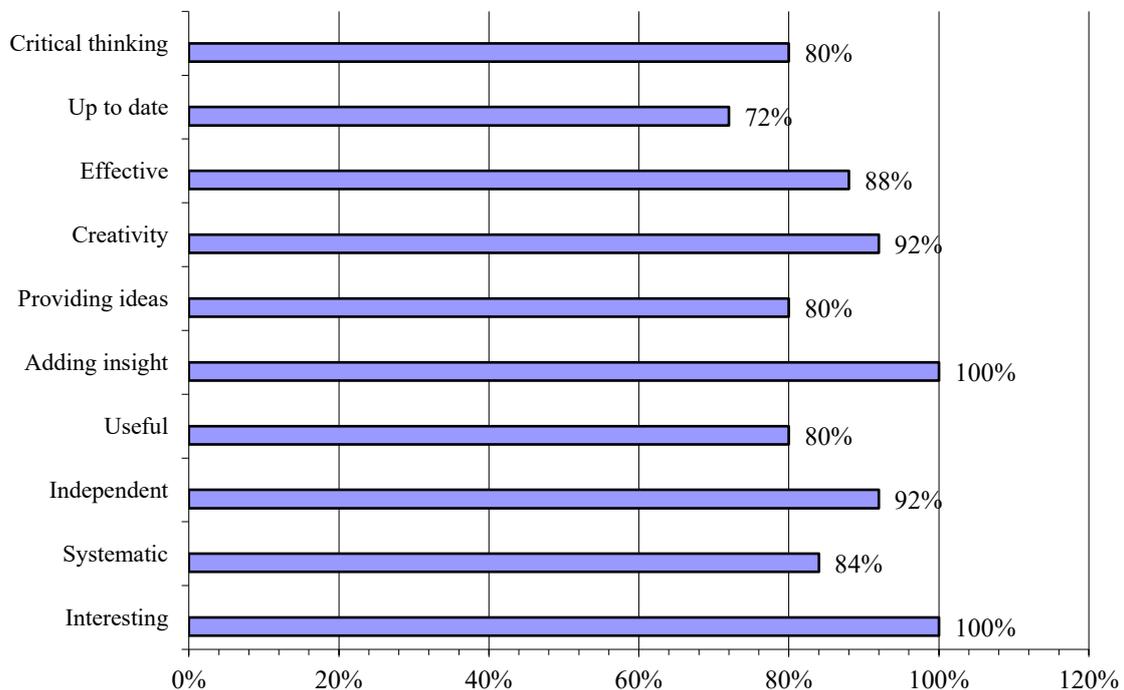


evaluation and verbal commitment for the environment through the actions carried out from the activities of students in the module.

Tan & Pedretti's (2010) findings indicated that there are significant differences between teachers' views on environmental education and what they are practicing now. Challenges and complexities identified by participants include a dense curriculum, lack of resources, lack of harmony between the curriculum and the expectations of the ministries, the low priority of environmental education in schools, access to the outdoors, apathy, and the nature of socio-political action. The use of EE-based character module received good responses from teachers with the percentage of 75% because the material presented was systematic and interesting. Teacher assessment was based on the functioning of the modules in the classroom. The limitations of the modules included in the 25% of teacher assessment results are in the assessment of the images presented that are less useful for conveying messages when learning activities. Pictures or photos do have the property to increase one's interest or motivation in reading, but sometimes not everyone gets the word in the picture.

The character-based EE module lifts students' interest in learning because it is attractive, colourful with lots of pictures. The character-based EE module was rated very well by students with a percentage of 86.8%. The character-based EE module can add insight into the environment because the illustrations depicted are obtained directly from the results of a study of environmental literature. This result is also supported by Sudaryanti & Sigit (2004) who stated that teaching materials made based on local potential can help students civilise the habit of preserving the environment and culture. The students can view in more detail the module and learning that is setup in Figure 1.

Figure 1. Percentage of students' responses on module and EE learning



The evaluation activities in the character-based EE module provide an opportunity for 80% of students to think critically, and 92% believe that the EE module can enhance learning creativity (Figure 1). The discussion sheet is packed with statements or illustrations of stories that are following current conditions. Student evaluations and activities are presented in various forms such as direct observation, practicum, words square, scrabble or environmental themed games. Critical thinking of the evaluation activities that are packaged in a variety of aims to raise understanding to students about the need for environmental education. Karim (2012) states that knowledge gained from the environmental education process, will foster critical thinking, wise decision-making attitudes and productive problem-solving.

The end part of the module attached students' reflection sheets in concluding the learning process. Students could recall the content presented, ask material that is still difficult to understand or like, and actions that can be done through writing reflective journals. Burmeister & Ingo (2013) also have the same opinion that self-reflection activities can make students aware of their knowledge related to the topic being studied and students can also find out their weaknesses. These results suggest that self-efficacy may be an essential motivator of environmental release, and can be used to help encourage involvement in more challenging pro-environment behaviors (Lauren, et. al., 2016). Klöckner (2013) further explains intention to act, control behavior and perceive habits identified as direct predictors of response. The purpose is predicted by attitudes, personal and social norms, and perceived



behavioral control. Personal norms are predicted by social norms, perceived behavioral control, awareness of consequences, assumptions of responsibility, ecological worldviews and the value of self-transcendence. Liobikienė & Juknys's research (2016) showed that people with a robust self-transcendent value orientation, who are guided by normative goals, are more responsive to environmental problems and are more likely to assume responsibilities and behave in more environmentally friendly ways. Transcendence (English: transcendent; Latin: transcendere) is a way of thinking about things that goes beyond what is seen and which can be found in the universe. Based on the model by Klöckner (2013), interventions to change behavior not only need to include attitude campaigns but also focus on de-habitualising behavior, strengthening social support and enhance self-efficacy through real information about how to act.

Student responses to the module about the recent examples in the module only reached 72%. This is made possible by the advancement of the delivery of information nowadays that can be accessed by everyone, so that environmentally themed information can be accessed easily even though sometimes not all of the information is valid. Xia ji (2011) stated that environmental education is starting to be degraded due to the advance of information that is easily obtained anywhere which diminishes curiosity about the state of the surrounding environment. Therefore, as explained by Klöckner (2013) above, accurate information on how to act pro-environmentally is essential and educational intervention through environmental education is needed to change counter-environment habits to pro/care for the environment.

The subjects in this study were fourth graders. Character-based EE modules let students to think critically, provoke creativity, provide opportunities for students to express ideas, educate independence, and the system can be expected to foster intrinsic motivation for students to be pro-environmental. Van der Werff, et al., (2013) explained the obligation-based intrinsic motivation to mediate the relationship between environmental identity and environmentally friendly behavior. Environmental identity is defined as "a sense of identity that transcends the individual and encompasses one's position as part of a living ecosystem." Steg et. al. (2014) found support for environmental self-identity related to intrinsic motivation based on one's obligation (i.e., feelings of moral obligation) to act pro-environmentally, which, in turn influenced pro-environment actions. As expected, Van der Werff et al. (2014) strengthened environmental self-identity can be a cost-effective way to promote pro-environment activities because people with strong environmental self-identity tend to act in an environmentally friendly manner without outside encouragement to do so. Indonesia needs a generation that can act in an environmentally friendly manner without external incentives to do so, but because they are intrinsically motivated to do it.



Conclusion

Character-based EE module affects the improvement of students' knowledge and attitudes to care for the environment. This is indicated by the average rise in the score of student knowledge and attitude of the experimental class students which is higher than the control class. The influence was also strengthened by the responses from both the teacher and students on the learning settings of environmental care themes that were held using the developed learning module resources. Modules direct students to behave in a pro-environment manner so that they are expected to become a generation that is intrinsically motivated to care for the environment.



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