Enhancing students' pro-environmental behavior through project-based learning

Eka Putri Azrai[1*], **Erna Heryanti**[1], **Verdiana Ramadhani**[1], **Marlina Ilyas**[2]

[1] Biology Education, Faculty of Mathematics and Natural Science, Universitas Negeri Jakarta, Indonesia
[2] 54 Public Senior High School of Jakarta, Jakarta, Indonesia

*Corresponding author: verdianaramadhani@gmail.com

ARTICLE INFO	ABSTRACT
	The waste problem that continues to increase throughout the pandemic shows that humans are still carrying out activities that only benefit themselves without caring about nature. This destructive behavior can be changed through an educational process that increases pro-environmental behavior. The purpose of this study is to determine the effectiveness of the project-based learning model implementation of high school students on environmental change material to improve students' pro-environmental behavior. The method used is quasi-experimental using the Discovery Learning model in the control class and the Project Based Learning model in the experimental class. This research was conducted at a senior high school in Jakarta. The research sample consisted of 60 students who were selected by random sampling with 30 students in each class. The pro-environment behavior instrument was adapted from Kasier and Wilson consisted of 40 statements. Data analysis used t-test and the results showed a significance value of 0.002. It can be concluded that using project-based learning model can improve the pro-environmental behavior of high school students. The N-Gain test was also carried out, and turns out the effectiveness of the learning model in both classes was low. This can be happened because teachers are still not used to the Project Based Learning model. In the future, it is still necessary to conduct research involving other factors that affect pro-environmental behavior in the application of learning in schools.

INTRODUCTION

Based on Statistics Indonesia (2021), plastics waste and used cardboard increased by 27-36%, medical waste increased by 30%, and the numbers continued to increase throughout the pandemic. This shows that humans are still doing activities that only benefit themselves regardless of nature, even if this behavior can cause air, soil, water, sea, and other environmental pollution (Flandroy et al., 2018). The high number of diarrhea cases in 2020 is one of the examples of damage caused by water pollution, which reached more than seven million cases (Badan Pusat Statistik Indonesia, 2020). To reduce and eliminate the impact of environmental problems, destructive human behavior must be changed (Janmaimool & Denpaiboon, 2016).

Pro-environmental behavior can be defined as a deliberate action to benefit others or a desire to sacrifice oneself for the environment's sake (Seymour et al., 2018). It includes various types of behavior such as recycling, using public transportation, waste management, saving energy consumption, and purchasing environmentally friendly products . Pro-environmental behavior will be strong when individuals have knowledge in the environmental field and show it to others, making it easier for people to act in accordance with the goals they want to set.

Education is one of the important variables in explaining the level of attention and environmental behavior (Zilahy & Huisingh, 2009). Education provides opportunities for students to learn and apply environmental action skills (Hungerford, 1978) which aims to foster pro-environmental behavior. In promoting pro-environmental behavior, schools, colleges, and training centers play an important role, as individual behavior change can be easily fostered among the younger generation (Hooi Ting & Chin Cheng, 2017; Massaro et al., 2018).

One of the environmental problems in Indonesia can be overcome through learning in schools (Zajuli et al., 2019). Learning about the environment such as changes that occur in the environment, environmental pollution, and efforts to overcome environmental problems are contained in Biology learning about environmental change material in the 10th grade of senior high school. The role of learning in this material is very important because it is the right time to convey knowledge about the environment to educate an environment-friendly generation.

Based on research conducted Zajuli et al. (2019), there is no difference in pro-environmental behavior scores between students who have received environmental material and those who have not been taught at school. This shows that learning biology in environmental materials still has many shortcomings and changes need to be made. Biology learning on environmental materials must be designed in such a way that it can improve students' pro-environmental behavior because the initial model of environmental behavior change is based on the assumption that if a person becomes more knowledgeable about the environment and related topics, he will become more aware of the environment and its problems. The lack of research that applies learning strategies to improve the pro-environmental behavior of students is also the reason for the need for further research.

Project-based learning emphasizes solving problems that occur every day through hands-on learning experiences in the community (Larmer, et al 2015). Project Based Learning applies experiential-based education, and based on real-life problems (Gijbels et al., 2005). Project Based Learning can facilitate students to learn and apply action skills in pro-environmental behavior such as behavior in social groups that focus on conservation and other environmental issues by doing campaigns on existing environmental problems, so it is hoped that using the Project Based Learning model will improve students' pro-environmental behavior.

Previous research Borhan & Ismail (2011) that investigates third-year chemistry major students' attitudes and behaviors towards the environment after using the Project-based learning method, concludes positive results where the PBL method can enhance it. Similar to Kılınç (2010) study, applying Project Based Learning had a beneficial impact on the elementary science major students' pro-environmental behavior. Even though university students have been the subject of numerous studies, more research that attempts to increase student's pro-environmental behavior through Project-based Learning needs to be conducted, especially at younger ages.

Leeming et al. (1997) and Cheong (2005) stated in their study that learning about the environment held with learning methods that encourage more student involvement will be more active in improving students' environmental attitudes and conceptual understanding. Based on Kılınç (2010), learning using the Project Based Learning model can be used to change students' views about the

environment and also make them more pro-environmental. This study aims to determine the effects of the Project-based learning model on students' pro-environmental behavior.

METHODS
Research Design
The research method used was quasi-experimental. The quasi-experimental method was used because this research is an experiment that measures the consequences of the treatment, and the samples are not randomly assigned into groups (Siedlecki, 2020). The variable used is the Project Based Learning model as the independent variable and pro-environmental behavior as the dependent variable. The quasi-experimental design used in this study was the Pretest Posttest Non-equivalent Control Group Design, which was a research design that provides Pretest before being treated, and Posttest after being given treatment in each group to measure the consequences of the treatment (Valente & MacKinnon, 2017).

Population and Samples
The population in this study were all students of a senior high school in Jakarta. Class X Mathematics and Natural Sciences were chosen as the research sample through purposive sampling because those classes studied environmental changes. Then, two of the four X Mathematics and Natural Sciences classes were taken using cluster random sampling technique. This study involved one class as a control class by applying the Discovery Learning model and another class as an experimental class by applying the Project Based Learning model. Then the sample was chosen randomly from the students in each class using a simple random sampling technique. From a total of 71 people, 60 students were obtained consisting of 30 students from the experimental class and 30 students from the control class as the research sample.

Instrument
The research instrument used to measure pro-environmental behavior scores in this study is using a questionnaire with instruments adapted from Kaiser & Wilson (2004). The questionnaire instrument was prepared based on the pro-environment behavior instrument used consisting of 6 indicators, namely: Energy conservation, Transportation and mobility, Waste avoidance, Consumerism, Recycling, Vicarious, and social behavior toward conservation. Data collection was carried out pre-treatment and post-treatment in the control class and experimental class through Google Forms. This instrument consists of 46 statement items with answer choices for positive statements, such as: always (5), often (4), sometimes (3), rarely (2), and never (1). Meanwhile, for negative statements, the opposite is: always (1), often (2), sometimes (3), rarely (4) and never (5). There is also an implementation observation sheet to assess the implementation of the learning syntax carried out with the learning model in the control class and the experimental class.

Validity testing was carried out to see the accuracy or suitability of the research instrument items. The validity test was measured by the Pearson Product Moment formula using the SPSS application. Based on the tests carried out, 6 items were declared invalid from a total of 46 items. Furthermore, the valid question items on the instrument of each variable are measured in the level of reliability. The instruments that have been declared valid are then calculated for reliability using the Alpha Cronbach, and the results show a reliability coefficient of 0.933 which can be concluded that the instrument is reliable.

Procedure
The preparation stage consists of managing permits to conduct research in schools and preparing learning tools in the form of syllabi, lesson plans, teaching materials, etc. After that, created an instrument to measure pro-environmental behavior, made a learning implementation observation sheet, and carried out briefings with teachers regarding the learning process that will be carried out. The implementation stage consists of the teacher giving a pro-environment behavior questionnaire at the beginning of learning (Pretest) in the experimental class and the control class using Google Forms. Learning begins with preliminary activities such as greetings, prayer, and taking attendance of students, carry out core activities following the applied learning model. In this study project, the experimental class worked on environmental campaigns, where students explored real-world environmental

challenges and came up with solutions. The teacher again gave a pro-environment behavior questionnaire at the end of the lesson (post-test) in the experimental class and the control class using Google Forms.

Data Analysis Techniques

Research data were analyzed using the independent sample t-test. Hypothesis testing was done after the prerequisite tests were carried out, including the normality test using the Kolmogorov-Smirnov test and the homogeneity test using Levene's Test of Equality of Errors Variance. The Normalized Gain test was carried out to show the effectiveness of increasing pro-environmental behavior before and after learning by applying the Discovery Learning model to the control class and the project-based Learning model to the experimental class.

RESULTS AND DISCUSSION

Normality testing was carried out using the Kolmogorov–Smirnov test at alpha 0.05. Based on the normality calculation, the Pretest score in the control class is 0.200, the experimental class is 0.200. Then the calculation of normality on the post-test scores in the control and experimental classes are 0.200 and 0.200, respectively. Calculation of the normality of gain scores in both classes obtained a significance value of 0.200 in the control class and 0.074 in the experimental class. It can be concluded that the research data is normally distributed.

Homogeneity testing was carried out using Levene's test at an alpha of 0.05. Based on the calculation of homogeneity, the significance values of the Pretest and post-test scores were 0.060 and 0.317, respectively. Then the calculation of the homogeneity of gain scores in both classes obtained a significance value of 0.146. It can be concluded that the variance of all research data is the same or homogeneous.

The gain Score is obtained from the difference between the Pretest and post-test scores. The control class had an average pretest and posttest score of 65.40 and 67.12 respectively, while the experimental class had 61.77 and 68.03. Then the average Gain Score for the control class is 1.72 and the experimental class is 6.27 (Figure 1).
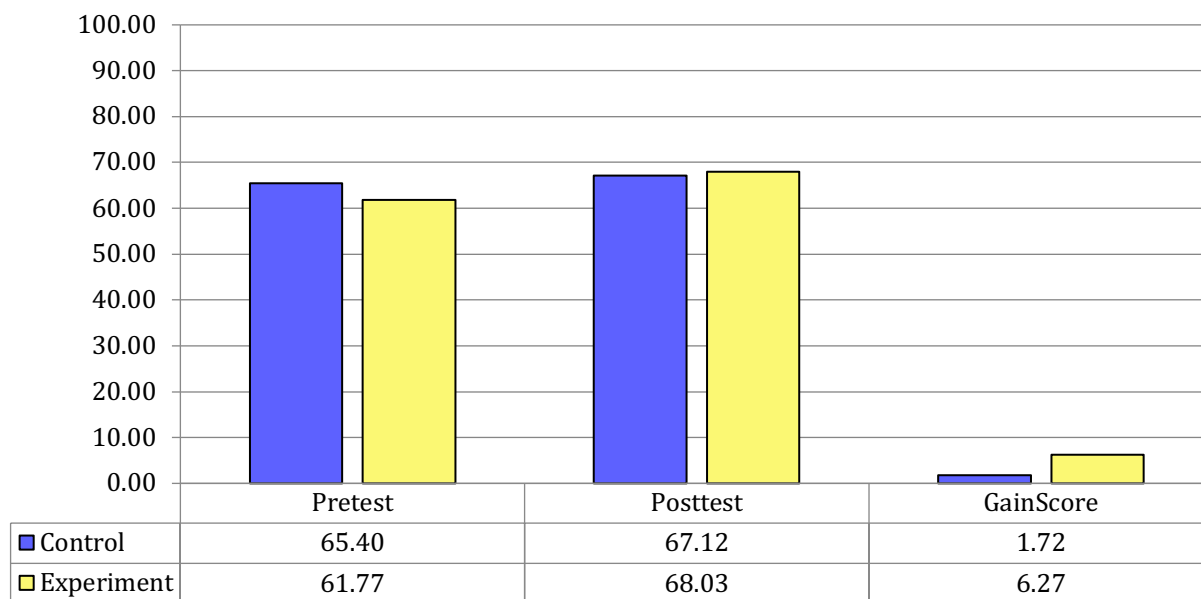

	Pretest	Posttest	GainScore
■ Control	65.40	67.12	1.72
□ Experiment	61.77	68.03	6.27

Figure 1. The average score of Pretest, Posttest, and Gain score students' pro-environmental behavior.

Hypothesis testing in this study was carried out through parametric hypothesis testing using an independent t-test, which obtained a significance value of 0.02. This shows that the significance value is smaller than alpha, i.e. 0.02 < 0.05, which means that there is an effect of implementing the Project Based Learning model on the pro-environmental behavior of students.

The same result is also found Borhan & Ismail (2011) which says that Project Based Learning has a positive effect on pro-environmental behavior. Likewise with Kilinc's research in 2010, there was a positive influence on pro-environmental behavior after the Project Based Learning model was applied

(Kılınç, 2010). Another study conducted in Bogor also shows that Project Based Learning increases junior high school students' concern towards the environment (Oktavian, 2016). Cheong (2005) said that even short-term projects are sufficient to help deal with environmental problems such as waste, saving water, etc., which are forms of behavior that support environmental sustainability.

Individuals who know the environment are considered to be able to reduce environmental problems and have pro-environmental behavior (Köse et al., 2011). But in practice, classroom learning generally only emphasizes memorizing concepts about the environment which makes students not understand the concept of the environment (Zajuli et al., 2019) , especially in actions and behaviors that are beneficial to the environment. This also happens because teachers are often only focused on discovery learning, which leaves the students free to study independently with little to no supervision (Mayer, 2004). Whereas learning may be best supported by teaching practices that allow for a deep understanding of the concepts, principles, and strategies (Mayer, 2004).

The learning process using a project-based learning model on environmental change material provides experience for students in applying their knowledge related to environmental problems to real-world situations to provide an opportunity to improve action skills which is also one of the factors that influence pro-environmental behavior (Hungerford, 1978). Another opinion also says that for pro-environmental behavior to increase, the person must be able to take actions that are useful for the environment (Sawitri et al., 2015). In this study, students directly apply the knowledge of environmental change that they know into the form of a campaign to face the problems of environmental change.

The stages or syntax in the Project Based Learning learning model include first asking questions derived from the phenomena that exist around it; then designing the stages in project completion; developing a project implementation schedule; then collecting, analyzing, and interpreting the data obtained; preparing reports and project presentations; final evaluation of the project process and results (Blumenfeld et al., 1991) .

The project carried out in the experimental class in this study is through an environmental issues campaign which is one way of implementing behavior in social groups that focus on conservation and other environmental issues. In biology learning about environmental change, learners explore cases regarding existing environmental problems and develop ways to deal with them through a three-week group project. The theme of the problems used in the project is related to environmental issues.

Students are given essential questions about how human activities affect various environmental problems and how to reduce or address those problems. Students were divided into 6 groups and asked to choose a problem to be raised into a project. In this learning, students are given the freedom to look for problems, and other research shows that students are comfortable using technology for teaching and learning so that they are aware and interested in the issues that exist around them (Yusop & Sumari, 2013).

Then the students collect data based on library studies and work on worksheets on understanding pollution, understanding pollution according to experts, types of pollution, types of waste, as well as the impact and how to handle environmental problems that are the subject matter. Worksheets are media that can guide students in understanding a concept in a structured way (Miarsyah et al., 2019). The use of worksheets can increase the liveliness of students because they have to solve problems that require them to find the facts of each problem (Gündüz et al., 2016).

The next step is for students to create and distribute the projects they have made in the form of posters on their respective social media and also present the projects carried out in front of the class so that between groups of students there is an exchange of information and knowledge about environmental issues that they raise as the theme of the project. Social Media can also be used as a learning medium (Yusop & Sumari, 2013). The use of social media in the learning process can increase learner engagement and improve understanding of the material (Blaschke, 2014). The use of poster media as a learning process also facilitates learners to be more active and independent in learning (Crichton & Kopp, 2006). Another opinion also said that the media can help students understand the material presented (Rosamsi et al., 2019)

Based on descriptive data analysis (Figure 2), can be seen the difference in the gain score on each aspect of pro-environmental behavior. The difference in value between posttest and pretest was calculated and the biggest increase was in the aspect of behavior in social groups that focus on conservation and other environmental issues, which amounted to 10.87 in experimental classes that

apply the learning model of Project Based Learning. The increase in the value of pro-environmental behavior in this aspect shows that students who previously did not contribute to conservation such as disseminating information about climate change, discussing environmental problems, making or pasting posters about the environment, and behavior in social groups that focus on conservation and other environmental issues, now participate.
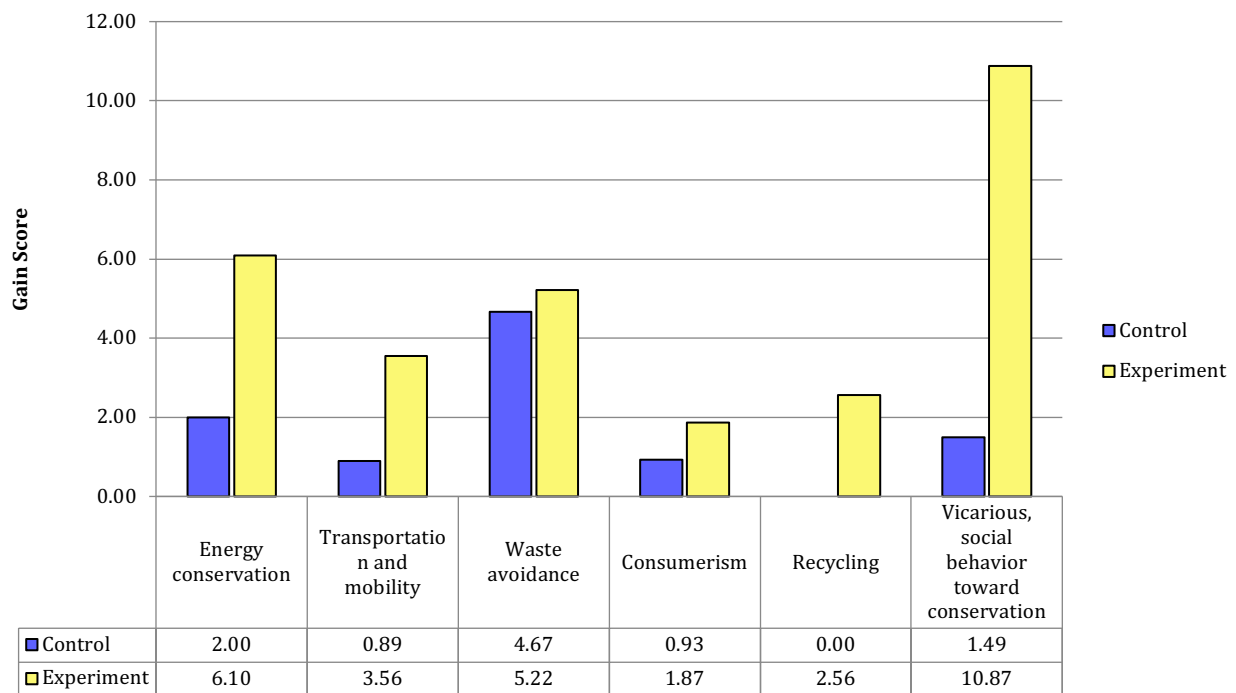

Figure 2. Average Gain Score of each aspect of students' pro-environmental behavior.

Other aspects such as energy conservation, transportation and mobility, avoiding waste production, and Consumerism also increased in the experimental class compared to the control class. Even in the recycling aspect of the control class, there was no increase in the value of pro-environmental behavior at all, compared with the experimental class there was an increase of 2.56. This shows the use of project-based learning Learning model is already suitable to increase knowledge about the environment and improve the pro-environmental behavior of students. The findings also reinforce the theory that knowledge will be better when learning activities involve more complex processes such as analysis, evaluation, to creation (Anderson et al., 2001) which is the syntax of the Project Based Learning model.

Learning in this study has also been done very well which can be seen from the calculation of the observation score of the implementation of learning. Based on the observation data of the implementation of learning, there are differences in the percentage score of the implementation of learning between teachers and students as well as in the control and experimental classes. This can be because teachers are still not used to using the project-based learning model. After all, teaching with the project-based learning model requires the right amount of guidance to achieve the appropriate learning objectives. Where in this learning process there are no two projects or groups with the same project theme so each group has different experiences and knowledge, but each learner needs to achieve the same results (Mufida et al, 2020).

The average value of N-Gain in the experimental class and control class of 0.02 and 0.08, respectively, indicating the effectiveness of the use of learning models in both classes is low. The average value of N-gain, which is classified as low is because the difference in Pretest and Posttest scores in both classes has only a slight difference. The cause of low effectiveness despite the effect of the use of a project-based learning Learning model is that pro-environmental behavior is affected by various things, and this study only provides experiments on one factor, namely knowledge. The knowledge factor was chosen because the initial model of behavior change in the environmental context was based on the assumption that if a person has more knowledge about the environment, then that person will be more aware of the environment and the problems that exist in the environment (Kılınç, 2010),

reducing problems. The increase in the number of environmentally sensitive individuals is only possible through education (Genc, 2015).

Other factors that affect pro-environmental behavior such as social norms, emotions, religion, traditions, and previous experiences (Kılınç, 2010) are very difficult or even uncontrollable in this study. On the other hand, there are also some limitations derived from the study. This study uses a questionnaire that gives the subject freedom to report his behavior. This has a tendency of the subject to report his behavior and attitude more positively (Vanderstoep & Johnston, 2009).

CONCLUSION

Project Based Learning models are effective in improving the pro-environmental behavior of high school students. Students can take actions that are useful for the environment using a project-based learning model, so their pro-environmental behavior increases. The average value of N-gain indicating the effectiveness of the use of learning models in both classes is low. This could happen since teachers are still not used to the project-based learning model.

ACKNOWLEDGMENT

REFERENCES

Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing : a revision of Bloom's taxonomy of educational objectives* (I. Addison Wesley Longman (ed.)).

Badan Pusat Statistik Indonesia. (2020). Statistik Lingkungan Hidup Indonesia. *Badan Pusat Statistik*, 256.

Blaschke, L. M. (2014). Using social media to engage and develop the online learner in self-determined learning. *Research in Learning Technology*, *22*(1063519). https://doi.org/10.3402/rlt.v22.21635

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating Project-Based Learning: Sustaining the Doing, Supporting the Learning. *Educational Psychologist*, *26*(3–4), 369–398. https://doi.org/10.1080/00461520.1991.9653139

Borhan, M. T., & Ismail, Z. (2011). Promoting Environmental Stewardship through Project-Based Learning (PBL). *International Journal of Humanities and Social Science*, *1*(4), 180–186. www.ijhssnet.com

Cheong, I. P. -A. (2005). Educating pre-service teachers for a sustainable environment. *Asia-Pacific Journal of Teacher Education*, *33*(1), 97–110. https://doi.org/10.1080/1359866052000341151

Crichton, S., & Kopp, G. (2006). Multimedia Technologies, Multiple Intelligences, and Teacher Professional Development in an International Education Project. *Innovate: Journal of Online Education*, *2*(3). https://www.learntechlib.org/p/104280/

Flandroy, L., Poutahidis, T., Berg, G., Clarke, G., Dao, M. C., Decaestecker, E., Furman, E., Haahtela, T., Massart, S., Plovier, H., Sanz, Y., & Rook, G. (2018). The impact of human activities and lifestyles on the interlinked microbiota and health of humans and of ecosystems. *Science of the Total Environment*, *627*, 1018–1038. https://doi.org/10.1016/j.scitotenv.2018.01.288

Genc, M. (2015). The project-based learning approach in environmental education. *International Research in Geographical and Environmental Education*, *24*(2), 105–117. https://doi.org/10.1080/10382046.2014.993169

Gijbels, D., Dochy, F., Van Den Bossche, P., & Segers, M. (2005). Effects of problem-based learning: A meta-analysis from the angle of assessment. *Review of Educational Research*, *75*(1), 27–61. https://doi.org/10.3102/00346543075001027

Gündüz, A. Y., Alemdağ, E., Yaşar, S., & Erdem, M. (2016). Design of a problem-based online learning environment and evaluation of its effectiveness. *Turkish Online Journal of Educational Technology*, *15*(3), 49–57. https://eric.ed.gov/?id=EJ1106369

Hooi Ting, D., & Chin Cheng, C. F. (2017). Measuring the marginal effect of pro-environmental behaviour: Guided learning and behavioural enhancement. *Journal of Hospitality, Leisure, Sport and Tourism Education*, *20*(July 2015), 16–26. https://doi.org/10.1016/j.jhlste.2016.12.001

Hungerford, H. R. (1978). *Invigation and Action Skills for Environmental Problem Solving. A Curriculum Development Project Designed to Promote Autonomous Problem Solving in Environmental Education,*

Modules I-VI.

Ichsan, I. Z., Sigit, D. V., Miarsyah, M., Azrai, E. P., & Heryanti, E. (2019). Students' pro-environmental behavior and environmental learning outcomes based on green consumerism. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, *5*(1), 109-116. https://doi.org/10.22219/jpbi.v5i1.6447

Janmaimool, P., & Denpaiboon, C. (2016). Evaluating determinants of rural Villagers' engagement in conservation and waste management behaviors based on integrated conceptual framework of Pro-environmental behavior. *Life Sciences, Society and Policy*, *12*(1). https://doi.org/10.1186/s40504-016-0045-3

Kaiser, F. G., & Wilson, M. (2004). Goal-directed conservation behavior: The specific composition of a general performance. *Personality and Individual Differences*, *36*(7), 1531–1544. https://doi.org/10.1016/j.paid.2003.06.003

Kılınç, A. (2010). Can project-based learning close the gap？ Turkish student teachers and proenvironmental behaviours. *October*, *5*(4), 495–509. https://openaccess.ahievran.edu.tr/xmlui/bitstream/handle/20.500.12513/181/ahmetk%c4%b1l%c4%b1n%c3%a7.pdf?sequence=1&isAllowed=y

Köse, S., Savran Gencer, A., Gezer, K., Erol, G. H., & Bilen, K. (2011). Investigation of Undergraduate Students' Environmental Attitudes. *International Electronic Journal of Environmental Education*, *1*(2), 85–96. https://dergipark.org.tr/en/download/article-file/88981

Larmer, J., Mergendoller, J., & Boss, S. (2015). S*etting the standard for project based learning.* A Proven Approach to Rigorous Classroom Instruction. ASCD.

Leeming, F. C., Porter, B. E., Dwyer, W. O., Cobern, M. K., & Oliver, D. P. (1997). Effects of participation in class activities on children's environmental attitudes and knowledge. *Journal of Environmental Education*, *28*(2), 33–42. https://doi.org/10.1080/00958964.1997.9942821

Li, D., Zhao, L., Ma, S., Shao, S., & Zhang, L. (2019). What influences an individual's pro-environmental behavior? A literature review. *Resources, Conservation and Recycling*, *146*(March), 28–34. https://doi.org/10.1016/j.resconrec.2019.03.024

Massaro, M., Dumay, J., Garlatti, A., & Dal Mas, F. (2018). Practitioners' views on intellectual capital and sustainability. *Journal of Intellectual Capital*, *19*(2), 367–386. https://doi.org/10.1108/jic-02-2017-0033

Mayer, R. E. (2004). Should There Be a Three-Strikes Rule against Pure Discovery Learning? The Case for Guided Methods of Instruction. *American Psychologist*, *59*(1), 14–19. https://doi.org/10.1037/0003-066X.59.1.14

Miarsyah, M., Sigit, D. V., Ichsan, I. Z., Fadrikal, R., & Suprapto, M. (2019). Lekersmulia: Improving indonesian students' environmental responsibility using multimedia in environmental learning. *International Journal of Scientific and Technology Research*, *8*(12), 1639–1643.

Mufida, S. N., Sigit, D. V., & Ristanto, R. H. (2020). Integrated project-based e-learning with science, technology, engineering, arts, and mathematics (PjBeL-STEAM): its effect on science process skills. *Biosfer: Jurnal Pendidikan Biologi, 13*(2), 183-200. https://doi.org/10.21009/biosferjpb.v13n2.183-200

Oktavian, C. N. (2016). Penerapan Model Pembelajaran Berbasis Proyek Untuk Mengembangkan Kepedulian Peserta Didik Terhadap Lingkungan. *Jurnal Geografi Gea*, *15*(2), 15–30. https://doi.org/10.17509/gea.v15i2.3544

Rosamsi, S., Miarsyah, M., & Ristanto, R. H. (2019). Interactive Multimedia Effectiveness in Improving Cell Concept Mastery. *Journal of Biology Education*, *8*(1), 56–61. https://doi.org/10.15294/jbe.v8i1.28154

Sawitri, D. R., Hadiyanto, H., & Hadi, S. P. (2015). Pro-environmental Behavior from a SocialCognitive Theory Perspective. *Procedia Environmental Sciences*, *23*(Ictcred 2014), 27–33. https://doi.org/10.1016/j.proenv.2015.01.005

Seymour, V., King, M., & Antonaci, R. (2018). Understanding the impact of volunteering on pro-environmental behavioural change. *Voluntary Sector Review*, *9*(1), 73–88. https://doi.org/10.1332/204080518X15155917206307

Siedlecki, S. L. (2020). Quasi-Experimental Research Designs. *Clinical Nurse Specialist, 34*(5), 198–202. https://doi.org/10.1097/NUR.0000000000000540

Valente, M. J., & MacKinnon, D. P. (2017). Comparing Models of Change to Estimate the Mediated Effect in the Pretest–Posttest Control Group Design. *Structural Equation Modeling*, *24*(3), 428–450.

https://doi.org/10.1080/10705511.2016.1274657

Vanderstoep, S. W., & Johnson, D. D. (2008). *Research Methods for Everyday Life: Blending Qualitative and Quantitative Approaches*. John Wiley & Sons.

Yusop, F. D., & Sumari, M. (2013). The Use of Social Media Technologies among Malaysian Youth. *Procedia-Social and Behavioral Sciences*, *103*, 1204–1209. https://doi.org/10.1016/j.sbspro.2013.10.448

Zilahy, G., & Huisingh, D. (2009). The roles of academia in Regional Sustainability Initiatives. *Journal of Cleaner Production*, *17*(12), 1057–1066. https://doi.org/10.1016/j.jclepro.2009.03.018