

## Research Article

# Environmental literacy-based on adiwiyata predicate at junior high school in Ponorogo



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### ABSTRACT

The student's environmental literacy (EL) is vital to improving students' awareness of environmental issues. This study was intended to display the role of eco-school program (Adiwiyata) and non-adiwiyata schools towards EL of junior high school students by analyzing EL of students in Ponorogo. The research was conducted in March-October. The survey involved 379 students. The type of research is ex post facto. The assessment used the Middle School Environmental Literacy Survey (MSELS). The results show that the adiwiyata program is related to the increase of EL with the sig value. 0.000. The higher the adiwiyata level, the higher the EL value of the environment. However, the general EL assessment in Ponorogo is still low, that more than 51% of respondents did not reach the score at level 3, which is the standard level of EL. The EL ability of junior high school students between male and female sex is different, with the sig value. 0.004. All data analysis concluded that the level of students' EL was significantly influenced by school type and gender. EL of students may low due to students' lack of understanding of the environment concepts, the limited theories, and concepts transferred to students.



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## INTRODUCTION

Human beings have an essential role in the earth system. They face several global issues, for instance, social, economic, and the environment resulting from their activities toward the environment (Maurer & Bogner, 2020). Environmental problems in Indonesia are increasingly worrying and even impact people's lives and other countries around it (Austin, Schwantes, Gu, & Kasibhatla, 2019; Belinawati, Soesilo, Asteria, & Harmain, 2018). These environmental problems include deforestation (Pauw & Petegem, 2018), households and industrial waste (Cetin & Nisanci, 2010), air pollution in urban areas, smoke and haze from forest and land fires (Driscoll, 2005), pesticides and soil pollutions, as well as decreased soil fertility (Luo et al., 2019). A hug of the human need for natural resources affects nature's balance (Pitman & Daniels, 2016). The total

population on the earth in 2017 is around 7.3 billion and is predicted to be increased around 9.8 billion in 2015. The increasing of humans' dominant activities without environmental management awareness possibly affects environmental issues (Karatekin, 2012).

One of the reasonable endeavors to tackle various environmental issues is to provide a more comprehensive understanding of environmental awareness. Environmental literacy is an awareness of environmental health and the actions necessary to maintain, restore or improve environmental quality for sustainable environmental sustainability (Hares, Eskonheimo, Myllyntaus, & Luukkanen, 2006; Otto & Pensini, 2017). Environmental literacy has several components: ecological knowledge, attitudes, environmentally responsible behavior, and environmental awareness (Karatekin, 2012).

The Ministry of Environment has conducted a behavioral survey in 2012 that states the Environmental Care Behavior Index number nationally, which only reaches 0.57, where the number is considered far from the number 1 (Landriany, 2014). This indicates that the caring behavior environment, one of the components of environmental literacy in some large communities in Indonesia, is still low. Environmental problems are expected to decrease with the spread of environmental education in various schools, especially with the increasing number of schools implementing pro-environment programs (Gkiolmas, Dimakos, Chalkidis, & Stoumpa, 2020; Schubler, Richter, & Mantilla-Contreras, 2019). In Indonesia, many schools have won the title of environmentally friendly school (green school or known as "Adiwiyata" in Indonesia) annually (Haris & Afdaliah, 2016; Tianyu & Meng, 2020).

The adiwiyata program began in 2006, and since 2007, there had been a significant increase in the implementation of the adiwiyata program. The statistical results show that in 2016 the number of adiwiyata schools increased by 7278 from 1351 in 2011 across provinces in Indonesia from public schools, vocational schools, and madrasahs (Goldman, Ayalon, Baum, & Weiss, 2018; Powdthavee, 2021). However, based on 2014 research, adiwiyata had not succeeded in being implemented at high schools in Malang. This is due to several factors, including some students who still do not understand the concept of environmentally friendly schools, some of them still do not care about environmental conditions, lack of community participation, and lack of enthusiasm in the application of environmental education among teachers and school staff (Landriany, 2014). This is in line with the research conducted, indicating that Adiwiyata cannot be effectively implemented due to students' change every new academic year, the socio-economic condition of the students, and the educator's care (Driscoll, 2005). There is no significant difference between eco-school and nonschool in Slovenia (Krnjic & Naglic, 2009). To find out the effectiveness of the adiwiyata program on environmental literacy has been conducted in several studies. Research related to the topic of "environmental literacy in Adiwiyata school students" with the subject of elementary school students in Surakarta-Central Java (Ardoyn, Bowers, & Gaillard, 2020; Meilinda, Prayitno, & Karyanto, 2017), then with the issue of junior high school students (Corbeira, Barreiro, Olmedo, & Modino, 2020; Susilastri & Rustaman, 2010), and with the subject of high school students in Pamekasan-East Java. The researcher sees the importance of in-depth analysis of whether the Adiwiyata program has been able to shape the environmental literacy among students both inside and outside schools as measured by the MSEL (Middle School Environmental Literacy Instrument).

This study aims to show the role of environmental education on environmental literacy in junior high school students by analyzing (a) environmental literacy in Adiwiyata junior high compared to non-Adiwiyata junior high school students, and (b) environmental literacy between male and female students in Adiwiyata and non-Adiwiyata schools.

## METHOD

The research design is *ex post facto* because it involves difficult or impossible variables to manipulate in experiments. Events already occur or are influenced by other impossible factors for researchers to control (in this study is adiwiyata and non-Adiwiyata junior high school students in Ponorogo, East Java Province-Indonesia). This research population is all Adiwiyata and Non-Adiwiyata junior high schools in 21 sub-districts in a total of 91 Junior High schools. The total of Junior High School students in Ponorogo was 21.512, while there were 379 samples used from 21 sub-districts Data were collected using a standardized questionnaire survey. The selection of schools involved in this study is based on school status. The access population is the first secondary school in each sub-district in Ponorogo city with national adiwiyata, provincial adiwiyata, adiwiyata district, and non adiwiyata. The participants divided into students coming from Adiwiyata and non Adiwiyata school students, grade VIII and XI.

The implemented research instruments were the 2006 version of the Middle School Environmental Literacy Survey/MSELS developed and improved by experts (McBeth & Volk, 2009; Silva, Vasconcelos, & Ferreira, 2017). The instruments used have been tested for their validity and reliability. Supporting data is obtained through observations and interviews. The instrument used was MSELS adapted from McBeth & Volk, (2009) that had been tested for validity and reliability. The supporting data were obtained through observation and interviews.

This instrument includes the following: (1) 17 ecological foundation scores; (2) 60 scores on how you think about the environment (Environmental thoughts); (3) 60 scores on what you do to the environment (Environmental action); (4) 55 scores about you and environmental sensitivity (you and your environmental sensitivity); (5) 10 scores about what you feel about the environment (Environmental Feeling); (6) 3 issue identification scores; (7) 6 Issue analysis scores, and (8) 20 action planning scores with a total environmental literacy survey score of 231. Eight indicators of environmental literacy will be grouped into four groups, namely; a) Ecological knowledge / EK (EF17 / ecological foundation), b) Affective environment / EA consisting of environmental thoughts / ET60, you and your environmental sensitivity / ES55, Environmental Feeling / EF10), c) Cognitive Skills / ES (issue Identification / I13, Issue analysis / IA6, action planning / AP20), d) environmental responsibility behavior / ERB (environmental action / EA60) (Ardoin & Bowers, 2020; McBeth & Volk, 2009).

The approach used was cross-sectional with quick search and no respondent treatment. The sampling technique used is the Proportionate stratified random sampling technique (proportional random sampling). Sampling stratification aims to establish the homogeneity of the sub-population, which has the heterogeneity of the number of students in each sub-district. The population is divided into homogeneous groups before the sampling process. In 21 sub-districts and 92 schools, school sampling in each sub-district used simple random sampling using paper with a lottery system. According to Ozsoy, Ertepinar, & Saglam, (2012), the sample survey activity stages were grouped into eight: 1) planning the content, preparing the cost, reviewing the literature, and making the hypothesis; 2) designing the sampling, sampling; 3) compiling the questionnaire, (pretest), make a survey manual; 4) selecting officers and exercises; 5) collecting data; 6) coding; 7) processing data; and 8) analyzing reports and answers to initial survey questions. There were two stages of data analysis performed. The first stage was analyzing the data using descriptive statistics, which is calculating the mean score. This study was intended to display the role of eco-school programs (Adiwiyata) and non-adiwiyata schools towards EL of junior high school students by analyzing EL of students based on gender. Next, inferential statistical analysis was performed. Obtained data were analyzed by One Ways ANOVA dan T-test. The research was held in the odd semester.

## RESULTS AND DISCUSSION

This study analyses the influence of adiwiyata program implementation on environmental literacy level Students. Before analyzing the influence of these two factors, first analyzed using descriptive statistics on all research data. By involving 379 students, the result of the statistical test of environmental literacy consisting of four aspects, the average ERB aspect has the highest average score to 74.18 then EA equal to 68.20. The EK and ES aspects have the lowest average of 40.79. Simultaneously, the sequence of maximum scores were ES, ERB, EK, and EA aspects. The minimum score aspect successively is ES, EK, ERB, and EA. The overall literacy score, EA, ERB, and ES were positive than the percentage of students who mostly have lower average. Simultaneously, the positive EK score indicated that most of the students averagely have a mostly higher score than the average score. Furthermore, the results of environmental literacy that are based on four aspects were obtained in Table 1.

**Table 1.** Distribution four aspect of environmental literacy

Component	N	Min	Max	Mean	Std. Dev	Skewness
Literacy	379	40	78	58.96	7.087	0.147
EK	379	18	88	54.70	14.514	-0.238
EA	379	51	84	68.20	5.815	0.130
ERB	379	50	95	74.18	7.626	0.086
ES	379	3	97	40.79	19.886	0.262

EK – Environmental Knowledge; EA – Environmental Affect; ERB – Environmental Responsible Behaviour; ES – Environmental Skills

In each aspect of environmental literacy, the higher average for EK, EA, ERB, and ES was in the national school of adiwiyata. While the lowest average EK was in non-adiwiyata schools, the lowest EA was in the

regional adiwiyata, the lowest ERB at provincial adiwiyata, and the lowest ES at provincial adiwiyata. In general, the highest literacy value of the per aspect environment was in schools with national adiwiyata levels. The distribution of environmental literacy scores at adiwiyata and non adiwiyata schools can be seen in [Table 2](#).

**Table 2.** Distribution of environmental literacy for each indicator

	Indicator of Environmental Literacy					Literacy
	Stat	EK	EA	ERB	ES	
National	Mean	70.36	72.52	75.06	45.49	65.68
Provincial	Mean	60.94	69.64	72.31	39.43	59.53
District	Mean	52.94	66.30	73.64	42.48	59.42
Non Adiwiyata	Mean	52.52	67.78	74.55	39.97	57.99

The average environmental literacy in women is higher than that of men. Furthermore, the highest average environmental literacy score based on the student school's predicate is in students with the female gender in national adiwiyata schools, districts, and non adiwiyata. Except in adiwiyata schools, the average environmental literacy is higher in men, on the distribution of environmental literacy scores by gender presented in [Table 3](#).

**Table 3.** Environmental literacy based on gender

Demographic		School Level of Adiwiyata				
		National	Provincial	District	Non Adi	Total
		Mean	Mean	Mean	Mean	Mean
Gender	F	66.62	59.17	60.16	59.26	59.86
	M	64.74	60.25	58.48	56.26	57.73
Total		66.68	59.71	59.32	57.76	58.80

In The score per indicator, the EK, ERB, and ES were higher in females, while the EA aspect was higher in males. The distribution of environmental literacy scores of each aspect by gender can be seen in [Table 4](#).

**Table 4.** Distribution of environmental literacy aspect based on gender

Gender	Stat	EK	EA	ERB	ES	Literacy Total
Female	Mean	57.00	67.91	74.49	42.84	59.86
Male	Mean	51.54	68.60	73.75	37.97	57.73

The hypothesis test result showed that based on cumulative distribution frequency of Level > 3 was not more than 51%, so Ho was accepted, so Most respondents (> 51%) would not reach score at level 3 or above on environmental literacy. The second result of the statistical test signification obtained  $0.000 < 0.05$ , and then Ho was rejected. So there is a significant difference in student environmental literacy scores between schools with national, provincial, district, and non-adiwiyata predicates. The third result of the statistical test signification obtained  $0.004 < 0.005$ , and then Ho was rejected. So there is a difference in junior high school students' literacy ability between the gender of men and women. Hypothesis test results can be seen in [Table 5](#).

**Table 5.** Summary of hypothesis test results

No.	Hypothesis	Type Test	Result	Conclusion
1	Most respondents (>51%) will not achieve a score at level 3 or above on environmental literacy	Cumulative Distribution Frequency	Level $\geq$ 37.7% no more than 51%	Ho accepted
2	There is no significant difference in the value of student environmental literacy between schools with national, provincial, district, and non-adiwiyata levels.	One way Anova	Sign 0.000 < 0.05	Ho rejected
3	There is no difference in the literacy ability of junior high school students between the gender of men and women	Independent t test	Sign 0,004 < 0.05	Ho rejected

Based on the analysis results, the researcher first conducted prerequisite analysis tests: the normality and homogeneity test. The normality data test of environment literacy based on the predicate of school obtained results that at adiwiyata national level had sig. The score of 0.107, then the data was normally distributed,

provincial adiwiyata level had sig. The score of 0.200, then the data was normally distributed, adiwiyata district level had sig. The score of 0.200, then the data were normally distributed, and non adiwiyata had sig. Score 0.200, then the data was normally distributed.

The normality test of environment literacy data by gender obtained the effect that females had Sig. The score of 0.200, then the data were normally distributed, and on the males, the Sig. The score was 0.076, and then the data was normally distributed. The homogeneity test was intended to show that the sample data comes from a population with the same variant. Environmental Homogeneity Literacy Test Result on school group and gender of Sig. Score 0.051; environmental literacy in school and sex groups, 203; and homogeneity of environmental literacy in age group and gender of Sig score. 0.057.

The hypothesis test result showed that based on cumulative distribution frequency of level > 3 was not more than 51%,  $H_0$  was accepted, so Most respondents (> 51%) would not reach level 3 or above on environmental literacy. The environmental literacy assessment results of most junior high school students were at level 2 and included in the low category. The assessment of the level of adiwiyata 43.3% was at level 1, and 39.8% were in level 2 while the rest were below level 1 and level 3. However, higher schooling schools have higher environmental literacy scores but did not reach the level of environmental grade literacy at level 3. Although not half of the respondents reached level 3, the adiwiyata program proved to produce higher grades at the higher adiwiyata level. Adiwiyata can enhance environmental literacy, especially in the aspects of environmental knowledge (Nurwidodo, Amin, Ibrohim, & Sueb, 2020). Schools that contain environmental education would provide an environment-related experience that can positively impact learning, attitudes, and the tendency to act or behave responsibly towards the environment, thereby affecting environmental literacy (Ozsoy et al., 2012). These reports reinforce the role of environmentally friendly school programs in building student environmental literacy.

The hypothesis test result showed the significance score of 0.000 < 0,05, so that  $H_0$  was rejected. There was a significant difference in the students' environment literacy value between the school with the national, provincial, regional, and non-adiwiyata levels. Based on the hypothesis test, there was a significant difference between adiwiyata level in junior high school, the higher level of adiwiyata, and the higher the value of environmental literacy. Environmental literacy is one of the main competencies needed to overcome environmental problems. This study showed that environmental literacy in adiwiyata schools is better than in non-adiwiyata schools. In biology subjects at Malang High School, the adiwiyata program's implementation significantly improves student environmental literacy (Nurwidodo et al., 2020). Consistent research related to environmentally sound schools in several countries confirms the positive impact on environmental literacy when schools implement environmental programs, such as green schools in Israel (Goldman et al., 2018) and eco-schools in Turkey (Ozsoy et al., 2012). Also, schools in obtaining eco-school certificates will change student environmental outcomes (Pauw & Petegem, 2018).

Environmental-based schools significantly influence environmental literacy, stating that the knowledge aspect of environmental literacy in school-based environments is significantly more significant than in ordinary schools (Krnel & Naglic, 2009). Besides, environment-based schools make students more aware of environmental issues because they are encouraged by situational factors that directly encourage students to be involved with the facilities available in schools, such as recycling containers, garbage banks, greenhouses (Spinola, 2015). The environment has a positive influence and instills an appreciation in many people. Schools close to the natural environment are more concerned about conservation and care than schools that do not yet have a bachelor's degree.

Also, the observation of 16 teachers from several schools with different predicates, each school predicate is represented by four teachers with other subjects. Interviews and observations are conducted to determine the extent of the teacher's role in teaching environmental literacy in schools. Based on the comments of teachers who teach in schools with higher levels of adiwiyata have broader insights related to the environment. Teachers in non-adiwiyata and adiwiyata schools at the district level have not been able to answer appropriately. Integration related to environmental education with subjects has been seen in national adiwiyata schools, connecting each issue with the environment. All teachers realize that environmental education is essential for schools, but there are some implementation constraints. Lack of facilities and infrastructure and awareness of some educators to jump directly love the environment. Schools with national adiwiyata predicates do more outbound activities outside, namely in the form of extracurricular activities. The more students participate actively in environmental activities by the appropriate instructions, environmental literacy will increase. Students who participate in environmental programs in the right situation and will experience learning in five categories: intellectual skills, verbal information, cognitive strategies, motor skills,

and attitudes (Driscoll, 2005). Learning environmental knowledge is more effective and spans five categories, so learning must be done by focusing on following environmentally appropriate instruction patterns. The instruction pattern should be carried out on all students. Also, schools with government superpower status have considered the facilities needed to facilitate the program's objectives. These activities include raising student concerns, implementing appropriate models to develop resources and activities, building students' ability to take action on environmental issues, providing leadership support to improve student engagement and student engagement and community engagement, assessing the extent to which adiwiyata is integrated in schools, improving the integration of environmentally responsible practices with multiple activities in schools (Landriany, 2014).

The hypothesis test result shows that the significance score of  $0,004 < 0,05$  so that  $H_0$  was rejected so that there was a difference in literacy ability of junior high school students environment between males and females. Females have better environmental literacy skills than males. Female students have a better attitude toward their environment than male students. Stated that female students have a better attitude towards their environment than male students (Cetin & Nisanci, 2010). Gender differences, on a broader perspective, influence students' environmental attitudes that female students are more sensitive to environmental issues (Goldman et al., 2018). Furthermore, female students are more worried about the environment than male students (Luo et al., 2019). Female students have more willingness to behave well in the environment. Based on the study results, found that female students more carried out environmentally-related actions than male students (Sivamoorthy, Nalini, & Kumar, 2013). Women have more important values, beliefs, and proactive attitudes towards the environment than men (Zelezny, Chua, & Aldrich, 2000).

## CONCLUSION

In this study, the implementation of adiwiyata program has a positive impact on junior high school students. In addition to adiwiyata school level, environmental literacy is also influenced by gender. In adiwiyata schools, students have higher knowledge, pro-environmental behavior, affective environment, and cognitive skill scores than non-Adiwiyata schools. Higher differences in environmental literacy aspects between students at the adiwiyata level are only found in knowledge areas, where students at higher adiwiyata levels have better scores. The analysis results showed that adiwiyata program implementation could have a positive impact on environmental literacy. Women than men experience higher environmental literacy scores. Environmental literacy components in environmental knowledge, environmental responsibility behavior, and environmental skills are higher in women, except in environmental affective.

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## REFERENCES

- Ardoin, N. M., & Bowers, A. W. (2020). Early childhood environmental education: a systematic review of the research literature. *Educational Research Review*, 31. doi: <https://doi.org/10.1016/j.edurev.2020.100353>
- Ardoin, N. M., Bowers, A. W., & Gaillard, E. (2020). Environmental education outcomes for conservation: a systematic review. *Biological Conservation*, 241. doi: <https://doi.org/10.1016/j.biocon.2019.108224>
- Austin, K. G., Schwantes, A., Gu, Y., & Kasibhatla, P. S. (2019). What causes deforestation in Indonesia? *Environmental Research Letters*, 14(2), 1–9. doi: <https://doi.org/10.1088/1748-9326/aaf6db>
- Belinawati, R. A. P., Soesilo, T. E. B., Asteria, D., & Harmain, R. (2018). Sustainability: citarum river, government role on the face of SDGs (water and sanitation). *E3S Web of Conferences*, 52, 1–7. doi: <https://doi.org/10.1051/e3sconf/20185200038>
- Cetin, G., & Nisanci, S. H. (2010). The effectiveness of the new 9th grade biology curriculum on students' environmental awareness. *Asia-Pacific Forum on Science Learning and Teaching*, 11(2), 1–25. Retrieved from [https://www.eduhk.hk/apfslt/download/v11\\_issue2\\_files/cetin.pdf](https://www.eduhk.hk/apfslt/download/v11_issue2_files/cetin.pdf)
- Corbeira, C. P., Barreiro, R., Olmedo, M., & Modino, R. D. C. (2020). Recreational snorkeling activities to enhance seascape enjoyment and environmental education in the islas atlánticas de galicia national

park (spain). *Journal of Environmental Management*. doi: <https://doi.org/10.1016/j.jenvman.2020.111065>

- Driscoll, M. P. (2005). *Psychology of learning for instruction* (3rd ed.). Retrieved from <https://www.pearson.com/us/higher-education/program/Driscoll-Psychology-of-Learning-for-Instruction-3rd-Edition/PGM68092.html>
- Gkiolmas, A., Dimakos, C., Chalkidis, A., & Stoumpa, A. (2020). An environmental education project that measures particulate matter via an arduino interface. *Sustainable Futures*, 2. doi: <https://doi.org/10.1016/j.sfr.2020.100027>
- Goldman, D., Ayalon, O., Baum, D., & Weiss, B. (2018). Influence of 'green school certification' on students' environmental literacy and adoption of sustainable practice by schools. *Journal of Cleaner Production*, 183, 1300–1313. doi: <https://doi.org/10.1016/j.jclepro.2018.02.176>
- Hares, M., Eskonheimo, A., Myllyntaus, T., & Luukkanen, O. (2006). Environmental literacy in interpreting endangered sustainability: case studies from thailand and the sudan. *Geoforum*, 37(1), 128–144. doi: <https://doi.org/10.1016/j.geoforum.2005.01.006>
- Haris, I., & Afdaliah, A. (2016). Promoting the greening curriculum: a note on the implementation of environmental education in Indonesian school. *International Journal of Applied Environmental Sciences*, 11(1), 309–323. Retrieved from [https://www.ripublication.com/ijaes16/ijaesv11n1\\_24.pdf](https://www.ripublication.com/ijaes16/ijaesv11n1_24.pdf)
- Karatekin, K. (2012). Environmental literacy in turkey primary schools social studies textbooks. *Procedia - Social and Behavioral Sciences*, 46, 3519–3523. doi: <https://doi.org/10.1016/j.sbspro.2012.06.096>
- Krnel, D., & Naglic, S. (2009). Environmental literacy comparison between eco-schools and ordinary schools in Slovenia. *Science Education International*, 20(1), 5–24. Retrieved from [http://www.icaseonline.net/sei/files/sei\\_v20n1paper1\\_2009.pdf](http://www.icaseonline.net/sei/files/sei_v20n1paper1_2009.pdf)
- Landriany, E. (2014). Implementasi kebijakan adiwiyata dalam upaya mewujudkan pendidikan lingkungan hidup di sma kota malang. *Jurnal Kebijakan Dan Pengembangan Pendidikan*, 2(1), 82–88. doi: <https://doi.org/10.22219/jkpp.v2i1.1739>
- Luo, P., Kang, S., Apip, A., Zhou, M., Lyu, J., Aisyah, S., ... Nover, D. (2019). Water quality trend assessment in jakarta: a rapidly growing asian megacity. *PLoS ONE*, 14(7), 1–17. doi: <https://doi.org/10.1371/journal.pone.0219009>
- Maurer, M., & Bogner, F. X. (2020). Modelling environmental literacy with environmental knowledge, values and (reported) behaviour. *Studies in Educational Evaluation*, 65. doi: <https://doi.org/10.1016/j.stueduc.2020.100863>
- McBeth, W., & Volk, T. L. (2009). The national environmental literacy project: a baseline study of middle grade students in the united states. *Journal of Environmental Education*, 41(1), 55–67. doi: <https://doi.org/10.1080/00958960903210031>
- Meilinda, H., Prayitno, B. A., & Karyanto, P. (2017). Student's environmental literacy profile of adiwiyata green school in surakarta, indonesia. *Journal of Education and Learning (EduLearn)*, 11(3). doi: <https://doi.org/10.11591/edulearn.v11i3.6433>
- Nurwidodo, N., Amin, M., Ibrahim, I., & Sueb, S. (2020). The role of eco-school program (adiwiyata) towards environmental literacy of high school students. *European Journal of Educational Research*, 9(3), 1089–1103. doi: <https://doi.org/10.12973/eu-jer.9.3.1089>
- Otto, S., & Pensini, P. (2017). Nature-based environmental education of children: environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Global Environmental Change*, 47, 88–94. doi: <https://doi.org/10.1016/j.gloenvcha.2017.09.009>
- Ozsoy, S., Ertepinar, H., & Saglam, N. (2012). Can eco-schools improve elementary school students' environmental literacy levels? *Asia-Pacific Forum on Science Learning and Teaching*, 13(2). Retrieved from [https://www.eduhk.hk/apfslt/download/v13\\_issue2\\_files/ozsoy.pdf](https://www.eduhk.hk/apfslt/download/v13_issue2_files/ozsoy.pdf)
- Pauw, J. B., & Petegem, P. V. (2018). Eco-school evaluation beyond labels: the impact of environmental policy, didactics and nature at school on student outcomes. *Environmental Education Research*, 24(9), 1250–1267. doi: <https://doi.org/10.1080/13504622.2017.1307327>
- Pitman, S. D., & Daniels, C. B. (2016). Quantifying ecological literacy in an adult western community: the development and application of a new assessment tool and community standard. *PLoS ONE*, 11(3), 1–18. doi: <https://doi.org/10.1371/journal.pone.0150648>
- Powdthavee, N. (2021). Education and pro-environmental attitudes and behaviours: a nonparametric regression discontinuity analysis of a major schooling reform in england and wales. *Ecological*

- Economics*, 181. doi: <https://doi.org/10.1016/j.ecolecon.2020.106931>
- Schubler, D., Richter, T., & Mantilla-Contreras, J. (2019). Educational approaches to encourage pro-environmental behaviors in madagascar. *Sustainability (Switzerland)*, 11(11). doi: <https://doi.org/10.3390/su11113148>
- Silva, F., Vasconcelos, L., & Ferreira, J. C. (2017). Environmental science education: methodologies to promote ocean literacy. *Fate and Impact of Microplastics in Marine Ecosystems*, 30–31. doi: <https://doi.org/10.1016/B978-0-12-812271-6.00031-4>
- Sivamoorthy, M., Nalini, R., & Kumar, C. S. (2013). Environmental awareness and practices among college students. *International Journal of Humanities and Social Science Invention*, 2(8), 11–15. Retrieved from [http://www.ijhssi.org/papers/v2\(8\)/Version-3/C0283011015.pdf](http://www.ijhssi.org/papers/v2(8)/Version-3/C0283011015.pdf)
- Spinola, H. (2015). Environmental literacy comparison between students taught in eco-schools and ordinary schools in the Madeira Island region of Portugal. *Science Education International*, 26(3), 392–413. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1074869.pdf>
- Susilastri, S. D., & Rustaman, N. Y. (2010). Students' environmental literacy profile in school-based nature and in school that implement the adiwiyata program. *National Seminar on Conservation and Utilization of Natural Resources/Seminar Nasional Konservasi Dan Pemanfaatan Sumber Daya Alam*, 263–269. Retrieved from <https://media.neliti.com/media/publications/169830-ID-none.pdf>
- Tianyu, J., & Meng, L. (2020). Does education increase pro-environmental willingness to pay? evidence from chinese household survey. *Journal of Cleaner Production*, 275. doi: <https://doi.org/10.1016/j.jclepro.2020.122713>
- Zelezny, L. C., Chua, P. P., & Aldrich, C. (2000). Elaborating on gender differences in environmentalism. *Journal of Social Issues*, 56(3). Retrieved from [https://web.stanford.edu/~kcarmel/CC\\_BehavChange\\_Course/readings/Additional Resources/J Soc Issues 2000/zelezny\\_2000\\_6\\_gender\\_b.pdf](https://web.stanford.edu/~kcarmel/CC_BehavChange_Course/readings/Additional Resources/J Soc Issues 2000/zelezny_2000_6_gender_b.pdf)