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Which Value Supports Pro-environmental Behavior? Future Direction for Pre-service Physics Teacher

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Abstract

Although a huge number of studies enhancing pro-environmental behavior (PEB), the environmental quality is still in poor condition. Enhancing PEB needs to consider some aspects, such as the value and location. Pre-service physics teachers have a role in shaping students' PEB because environmental issues are part of the high school physics curriculum. This study aimed to investigate the link between the location, and values (biospheric, altruistic, egoistic, and hedonic), from two different locations in Indonesia. The modified and translated 2-MEV, and E-PVQ scales were used. This study concluded that the values in both locations are in the very high category, in which the values are correlated to PEB. The strongest correlated value is an egoistic value that is related to the self-enhancement indicating the need for self-enhance approaches in the class to promote PEB. The different locations which are in the same country didn't show a significant difference in both values and PEB. Thus, future study could conduct their research in a larger area with a different culture to explore the relationship between PEB with location or other demographic aspects, and the development of activities to enhance PEB need to consider the strong relationship between PEB with egoistic value.

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INTRODUCTION

Encouraging students' environmental behavior needs a relevant approach related to some aspects. Pre-service physics teachers as the future teacher of the physics curriculum that contains environmental issues (Kemdikbud, 2020) do have a role in shaping students' pro-environmental behavior (PEB) throughout the class. Thus, the exploration research of PEB aspects in the pre-service physics teacher is needed (Dinurrohmah et al., 2022).

Despite a huge number of existing research promoting PEB through the class, and the development of environmental learning instruction (Amalia, 2020; Anggraini et al., 2019; Ihlas et al., 2019; Lia, Udaibah, 2016; Prabowo et al., 2021), a specific strategy based on the correlation of location and values with PEB is still needed. However, there is limited empirical evidence for the relationship between socio-demographics and environmental values (Sargisson et al., 2020), the national culture, and PEB (Hea & Filimonau, 2020; Piwowar-Sulej, 2020).

Schools or universities as substantial educational efforts in the environmental problem (Maurer & Bogner, 2020; Sulaeman et al., 2020) can increase environmental knowledge. Environmental knowledge has a role in shaping students' PEB (Chakraborty et al., 2017; Janmaimool & Khajohnmanee, 2019) by stimulating students' values. Therefore schools should focus their environmental education to foster environmental values (Díaz et al., 2020; Djuwita & Benyamin, 2019), and environmental ethics in the curriculum (Abun & P.Racoma, 2017). Based on Value Belief Norm (VBN) theory, fostering environmental value through class is expected to increase the PEB because of their proportional relationship (Stern, 1999), thus the more students have a specific value, the more strongly student will think and behave in line with the value (Thijs Bouman et al., 2018).

In principle, value is described as a human's goal of life that guides their life (Steg et al., 2013), which are divided into self-enhancement values (hedonic and egoistic values) and self-transcendence values (altruistic and biospheric values) (Schwartz, 1994). The relationship between values (biospheric, altruistic, and egoistic) has been investigated in the majority of literature, but less attention was given to the role of hedonic values (Quoquab et al., 2020), even though all the values mostly affect behavior indirectly (Thijs Bouman et al., 2018).

Values consisted of biospheric (reflect a concern for its own sake), altruistic (reflect a concern for the welfare of other human beings), hedonic (reflect comfort and pleasure), and egoistic (reflect a concern for themselves) (Steg et al., 2013; Werff & Steg, 2016). The value aspects are typically measured with the Environmental Schwartz Value Survey (E-SVS), then suggested an alternative method of measuring values using the Environmental Portrait Value Questionnaire (E-PVQ) scale which is structured by indirect questions (Thijs Bouman et al., 2018). PEB is often measured by the New Ecological Paradigm (NEP) scale and the Two Major Environmental Value (2-MEV) scale, which the 2-MEV scales provide complete evidence of people's environmental perceptions in a variety of population groups (Manoli et al., 2019). In 2018, Bogner added appreciation items to the 2-MEV scale, to evaluate the items by participants' feedback, and indirectly promote appreciation to shift the exploitative preferences (Bogner, 2018)the Two Major Environmental Value model (2-MEV.

Given that the link between location, values, and PEB would be useful to determine the best design of teaching and for a basic investigation of the causality between them. We aimed to investigate the link between the location, values, and PEB to determine whether the relationship holds for the two different locations in Indonesia

METHOD

A quantitative research design and survey method were used in this study. The quantitative research design was used to explain the causes of such relationships (Jack Fraenkel, Norman Wallen, Helen, 2012)they have to be mechanically air-conditioned to achieve the required thermal comfort for worshippers especially in harsh climatic regions. This paper describes the physical and operating characteristics typical for the intermittently occupied mosques as well as the results of the thermal optimization of a medium size mosque in the two hot-dry and hot-humid Saudi Arabian cities of Riyadh and Jeddah. The analysis utilizes a direct search optimization technique that is coupled to an hourly energy simulation program. Based on that, design guidelines are presented for the optimum thermal performance of mosques in these two cities in addition to other design and operating factors that need to be considered for mosques in general. © 2009 The Author(s, and the survey method was used to provide in-depth understanding by transforming data into usable statistical analysis (Mkumbachi et al., 2020).

The structural questionnaire was conducted by Google form in the range of June-July 2022, and the statistical tests were analyzed using Microsoft Excel and the IBM SPSS Statistical Package 26. Analysis of data included average scores of values and PEB, correlations among demographic locations, value aspects, and the total score of PEB.

Participants were 86 pre-service physics teachers in two different locations (University A and University B) located on different islands. Since the purpose of the study addresses the differences in demographic location among the students, information on changed domiciles were collected.

The final questionnaire consisted of demographic items, 15 items on the values, and 21 items on PEB aspects. The values were measured using the translated and modified E-PVQ scale in the Indonesian environmental problem context (Thijs Bouman et al., 2018), and the PEB and Appreciation aspects were measured using the translated 2-MEV scale in the Indonesian context (Bogner, 2018)the Two Major Environmental Value model (2-MEV. Questionnaires were subdivided into three sections assessing demographic aspects (section 1), values (section 2), and PEB (section 3). The questionnaires are indirect statements about the environment with a 5-point Likert scale for PEB (1 = I totally disagree, 5 = I totally agree), except for utilization items, which followed a 5-point Likert scale (1 = I totally agree, 5 = I totally disagree), and 7-point Likert scale for values (1 = I totally disagree, 7 = I totally agree).

RESULT AND DISCUSSION

This study aims to explore the PEB and its aspects based on the VBN theory (Stern, 1999) of pre-service physics teachers from two different locations. To clarify the score of values and PEB, we analyzed it into four categories (low, moderate, high, and very high).

Based on the location, participants from both locations have the same average category of PEB, illustrated in Figure 1. Almost all participants have a very high score of PEB means the output of the study program in both universities is in line with the main goal of environmental education (Janmaimool & Khajohnmanee, 2019; Sánchez-Jiménez et al., 2021).

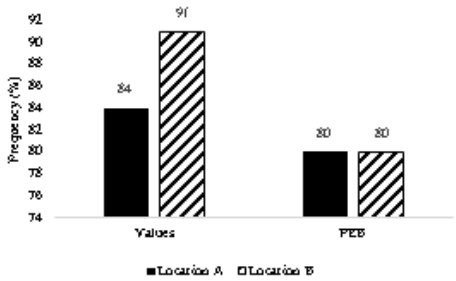

Figure 1. Average category of PEB and values by location

The very high category of participants' PEB is similar to the findings from two studies of undergraduate students in Indonesia, in major environmental engineering, social science education, geography education, and science education (Mkumbachi et al., 2020; Yusup, 2021). However, a different result is shown from another previous study also in Indonesia, in which university students in engineering faculty and overall university students have a moderate category of PEB (Mandra et al., 2021; Sujana et al., 2018). This finding confirms that university students in the environmental science field of knowledge would positively relate to environmental behavior.

Regarding to location aspect in PEB, locations A and B are located on different islands, interestingly the category of PEB is similar, illustrated in Figure 2. The similarities of the PEB category for pre-service physics teacher in location A and B is because of the complex aspects influencing PEB (Onokala et al., 2018), the fewer differences between the two ethnic groups (the national cultural values in both universities) as the significant role in shaping PEB (Chwialkowska et al., 2020; Fu et al., 2018; Hea & Filimonau, 2020), and the phenomena that humans are moving towards the process of becoming more homogeneous (T Bouman et al., 2021; Ghazali, 2019).

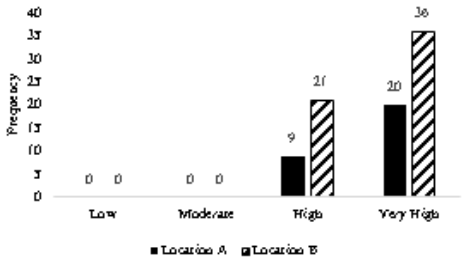

Figure 2. Pre-service physics teachers' PEB category by location

Despite the location aspect, based on VBN theory, PEB itself is indirectly shaped by environmental values (Biospheric, Altruistic, Egoistic, Hedonic) and other aspects (Steg et al., 2013; Stern, 1999). Hence, this study also measured the values of students in both locations illustrated in Figure 3.

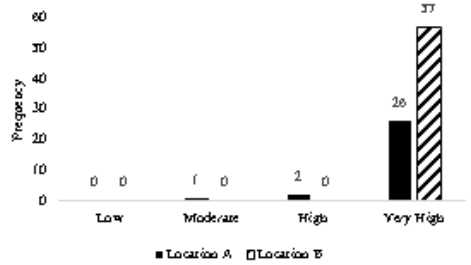

Figure 3. Pre-service physics teachers' values category by location

The majority of pre-service physics teachers in location A and location B have very high categories of values, showing the proportional relationship between values and PEB. According to the VBN theory that included the values as one of the PEB aspects (Stern, 1999), the correlation analysis needs to confirm its relationship as shown in Table 1.

Table 1. The correlation between value aspects, and PEB

	Biospheric	Altruistic	Egoistic	Hedonic	PEB
Biospheric					
Correlation Coefficient	1.000	0.928**	0.387**	0.487**	0.287**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.007
N	86	86	86	86	86
Altruistic					
Correlation Coefficient	0.928**	1.000	0.468**	0.568**	0.292**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.006
N	86	86	86	86	86
Egoistic					
Correlation Coefficient	0.387**	0.468**	1.000	0.734**	0.407**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000
N	86	86	86	86	86
Hedonic					
Correlation Coefficient	0.487**	0.568**	0.734**	1.000	0.328**
Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.002
N	86	86	86	86	86
PEB					
Correlation Coefficient	0.287**	0.292**	0.407**	0.328**	1.000
Sig. (2-tailed)	0.007	0.006	0.000	0.002	0.000
N	86	86	86	86	86

**. Correlation is significant at the 0.01 level (2-tailed).

The result of correlation analysis shows that all the values have a positive correlation with PEB, with each value having a different strength correlation represented in Figure 4.

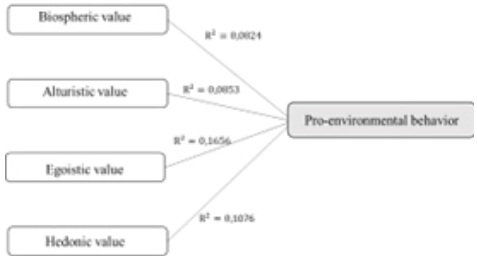

Figure 4. Structural model of correlation between value aspects and PEB.

Egoistic values that reflect a concern for themselves, and hedonic values that reflect comfort and pleasure have a stronger correlation with PEB than altruistic and biospheric values. This finding indicates that in both locations, pre-service physics teachers have the very high category of PEB because minimizing their negative impact on the environment would make them feel pleasure and give benefit themselves. Therefore, promoting egoistic and hedonic values in the education context to obtain a high category of PEB is necessary.

Promoting egoistic values in the education context could be done by designing teaching models or developing activities based on egoistic values. Some studies tried to integrate class activities with environmental context through traditional games (Ihlas et al., 2019), modern games (Ariwibowo et al., 2018), video making (Prabowo et al., 2021), and comics (Lia, Udaibah, 2016) however, the specific objective in the design of teaching is needed to enhance PEB. Enhancing PEB in school needs to consider the strong relationship between PEB with egoistic values.

This study showed a positive correlation between values and PEB, which egoistic values having the strongest correlation. However, looking back to the previous studies, there are diverse findings on the relationship between PEB and its aspects (Janmaimool & Khajohnmanee, 2019) clarifying how complex the aspects of PEB itself are. Studies showed that PEB has a negative correlation with egoistic value (Liu et al., 2018), and PEB also decreases hedonic value (Venhoeven et

al., 2013), but others clarified that there is a strong correlation between altruistic and biospheric values with PEB (Ambarfebrianti & Novianty, 2021; Gkargkavouzia et al., 2019; López-Mosquera & Sánchez, 2012).

Regarding the demographic items, this study shows that there is no correlation between the time of change of domicile with values and PEB as shown in Table 2. It is because the research was conducted in cities that are still in the same country (Indonesia), which have similar norms, values of life, and also similar cultures.

Table 2. The correlation among domicile, values, and PEB

		Value	PEB	Domicile
Value	Correlation Coefficient	1.000	0.452**	-0.210
	Sig. (2-tailed)	0.000	0.000	0.053
	N	86	86	86
PEB	Correlation Coefficient	0.452**	1.000	-0.041
	Sig. (2-tailed)	0.000	0.000	0.706
	N	86	86	86
Domicile	Correlation Coefficient	-0.210	-0.041	1.000
	Sig. (2-tailed)	0.053	0.706	0.000
	N	86	86	86

**. Correlation is significant at the 0.01 level (2-tailed).

Value is one of PEB's indirect aspect (Chung et al., 2019) that are relatively stable over time (T Bouman et al., 2021), thus pre-service physics teacher who lives in similar places for the same period would potentially have a similar category of values, that would influence PEB. To explore the PEB by demographic location, the research could conduct in countries that have different cultures, or characteristics, such as by comparing PEB among countries on different continents.

According to the findings, there is a no different category of pre-service physics teachers' PEB in a different location if the values are still similar. PEB itself is influenced strongest by egoistic and hedonic values, which means in both locations, the best strategy to increase students' category of PEB is to consider the benefit and pleasure of its behavior for students. These findings give the direction for the future study to conduct their research in a larger area with a different culture to explore the relationship between PEB with location or other demographic aspects, and for teachers to develop activities to enhance PEB by considering the strong relationship between PEB with egoistic value.

CONCLUSION

The result of the present study concluded that the values of pre-service physics teachers are in the very high category, which correlated to PEB and then influence the very high category of PEB. The strongest correlated value is an egoistic value that is related to self-enhancement indicating the need for self-enhance approaches in the education field to promote PEB. The differences in location in the same country didn't show a significant difference in both values and PEB, thus future study could conduct their research in a larger area to explore the relationship between PEB and demographic location, and the development of activities to enhance PEB need to consider the strong relationship between PEB with egoistic value.

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REFERENCES

Abun, D., & P.Racoma, A. (2017). Environmental Attitude and Environmental Behavior of Catholic Colleges' Employees in Ilocos Sur, Philippines. *Texila International Journal of Academic Research*, *4*(1), 23–52. https://doi.org/10.21522/tijar.2014.04.01.art003

Amalia, A. V. (2020). *The Development of Alternative Energy Simulation Tools Improve Critical Thinking Skills at Global Warming Materials*. *9*(2), 91–97.

Ambarfebrianti, M., & Novianty, A. (2021). Hubungan orientasi nilai terhadap perilaku pro-lingkungan remaja. *Jurnal Ecopsy*. https://ppjp.ulm.ac.id/journal/index.php/ecopsy/article/view/2021.09.015

Anggraini, F. D., Priyono, A., Prasetyo, B., & Iswari, R. S. (2019). Promoting Children's Conservation Awareness of Macaca fascicularis Through Narrative Video. *Unnes Sciencs Education Journal*, *8*(3), 369–374.

Ariwibowo, L. A., Saptono, S., & Wusqo, I. U. (2018). Developing Science Winning Track Games Media To Identify Communication Skills of Participants in Ecosystem Topic. *Unnes Science Education Journal*, *7*(3), 316–328.

Bogner, F. X. (2018). Environmental Values (2-MEV) and Appreciation of Nature. *Sustainability (Switzerland)*, *10*(2). https://doi.org/10.3390/su10020350

Bouman, T, Steg, L., & Perlaviciute, G. (2021). From values to climate action. In *Cur-*

rent Opinion in Psychology. Elsevier. https://www.sciencedirect.com/science/article/pii/S2352250X21000579

Bouman, Thijs, Steg, L., & Kiers, H. A. . (2018). Measuring values in environmental research: a test of an environmental portrait value questionnaire. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2018.00564

Chakraborty, A., Singh, M. P., & Roy, M. (2017). A study of goal frames shaping pro-environmental behaviour in university students. *International Journal of Sustainability in Higher Education*, *18*(7), 1291–1310. https://doi.org/10.1108/IJSHE-10-2016-0185

Chung, M. G., Kang, H., Dietz, T., Jaimes, P., & Liu, J. (2019). Activating values for encouraging pro-environmental behavior: the role of religious fundamentalism and willingness to sacrifice. *Journal of Environmental Studies and Sciences*. https://doi.org/10.1007/s13412-019-00562-z

Chwialkowska, A., Bhatti, W. A., & Glowik, M. (2020). The influence of cultural values on pro-environmental behavior. *Journal of Cleaner Production*, *268*. https://doi.org/10.1016/j.jclepro.2020.122305

Díaz, M. F., Charry, A., Sellitti, S., Ruzzante, M., Enciso, K., & Burkart, S. (2020). Psychological Factors Influencing Pro-environmental Behavior in Developing Countries: Evidence From Colombian and Nicaraguan Students. *Frontiers in Psychology*, *11*(December). https://doi.org/10.3389/fpsyg.2020.580730

Dinurrohmah, S., Subagiyo, L., Nuryadin, A., & Sulaeman, N. F. (2022). Pro-Environmental Behavior of Students : Trend in Publication. *Jurnal Penelitian Pendidikan IPA*, *8*(6), 2629–2634. https://doi.org/10.29303/jppipa.v8i6.1932

Djuwita, R., & Benyamin, A. (2019). Teaching Pro-Environmental Behavior: A Challenge in Indonesian Schools. *Psychological Research on Urban Society*, *2*(1), 26. https://doi.org/10.7454/proust.v2i1.48

Fu, L., Zhang, Y., Xiong, X., & Bai, Y. (2018). Pro-environmental awareness and behaviors on campus: Evidence from Tianjin, China. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(1), 427–445. https://doi.org/10.12973/ejmste/77953

Ghazali, E. M. (2019). Pro-environmental behaviours and Value-Belief-Norm theory: Assessing unobserved heterogeneity of two ethnic groups. *Sustainability (Switzerland)*, *11*(12). https://doi.org/10.3390/su10023237

Gkargkavouzia, A., Halkos, G., & Matsioria, S. (2019). Environmental behavior in a private-sphere context : Integrating theories of planned behavior and value belief norm , self-identity and habit. *Resources, Conservation & Recycling*, *November 2018*, 1–12. https://doi.org/10.1016/j.resconrec.2019.01.039

Hea, L., & Filimonau, V. (2020). The effect of national culture on pro-environmental behavioural intentions of tourists in the UK and China. *Tourism Management Perspectives*, *35*. https://doi.org/10.1016/j.tmp.2020.100716

Ihlas, Yufiarti, & Edwita. (2019). *Environmental Education Transformation in Early*. *8*(2), 225–233.

Jack Fraenkel, Norman Wallen, Helen, H. (2012). *How to Design and Evaluate Research in Education*.

Janmaimool, P., & Khajohnmanee, S. (2019). Roles of environmental system knowledge in promoting university students' environmental attitudes and pro-environmental behaviors. *Sustainability*. https://www.mdpi.com/511128

Kemdikbud. (2020). Silabus Mata Pelajaran Fisika SMA/MA. In *Http://Kemdikbud.Go.Id/* (Issue 021, pp. 1–3). http://kemdikbud.go.id/main/?lang=id

Lia, Udaibah, & M. (2016). The Use Of Comic As A Learning Medium For Ecology. *Unnes Science Education Journal*, *5*(3), 1418–1423.

Liu, X., Zou, Y., & Wu, J. (2018). Factors influencing public-sphere pro-environmental behavior among Mongolian college students: A test of value-belief-norm theory. *Sustainability (Switzerland)*, *10*(5). https://doi.org/10.3390/su10051384

López-Mosquera, N., & Sánchez, M. (2012). Theory of Planned Behavior and the Value-Belief-Norm Theory explaining willingness to pay for a suburban park. *Journal of Environmental Management*. https://www.sciencedirect.com/science/article/pii/S0301479712004379

Mandra, M. A. S., Parenrengi, S., Muhammad, A., & Ali, T. (2021). *Profil Pro-Environmental Behavior Mahasiswa Fakultas Teknik Universitas Negeri Makassar*. *2003*, 2237–2244.

Manoli, C., C., Bruce, J., Sanlyn, B., & Franz, B. (2019). Measuring environmental perceptions grounded on different theoretical models: The 2-Major Environmental Values (2-MEV) model in comparison with the New Ecological Paradigm (NEP) scale. *Sustainability (Switzerland)*, *11*(5). https://doi.org/10.3390/su11051286

Maurer, M., & Bogner, F. X. (2020). First steps towards sustainability? University freshmen perceptions on nature versus environment. *PLoS ONE*, *15*(6), 1–16. https://doi.org/10.1371/journal.pone.0234560

Mkumbachi, R. L., Astina, I. K., & Handoyo, B. (2020). Environmental awareness and pro-environmental behavior: A case of university students in Malang city. *Jurnal Pendidikan Geografi*, *25*(2), 161–169. https://doi.org/10.17977/um017v25i22020p161

Onokala, U., Banwo, A. O., & Okeowo, F. O. (2018). Predictors of Pro-Environmental Behavior: A Comparison of University Students in the United States and China. *Journal of Management and Sustainability*, *8*(1), 127. https://doi.org/10.5539/jms.v8n1p127

Piwowar-Sulej, K. (2020). Pro-environmental organizational culture: Its essence and a concept for its operationalization. *Sustainability*. https://

www.mdpi.com/721442

Prabowo, S. A., Widiyanti, F., & Billah, A. (2021). The Effect of Environmental Exploration VLOG Assignment Meth- ods on Students ' Biodiversity Literation Abilities. *Unnes Science Education Journal*, *10*(2), 102–109.

Quoquab, F., Jaini, A., & Mohammad, J. (2020). Does it matter who exhibits more green purchase behavior of cosmetic products in Asian culture? A multi-group analysis approach. *International Journal of Environmental Research and Public Health*. https://www.mdpi.com/774948

Sánchez-Jiménez, A., MacMillan, D., Wolff, M., Schlüter, A., & Fujitani, M. (2021). The Importance of Values in Predicting and Encouraging Environmental Behavior: Reflections From a Costa Rican Small-Scale Fishery. *Frontiers in Marine Science*, *8*(February). https://doi.org/10.3389/fmars.2021.543075

Sargisson, R. J., Groot, J. I. M. De, & Steg, L. (2020). The relationship between sociodemographics and environmental values across seven European countries. In *Frontiers in Psychology*. frontiersin.org. https://doi.org/10.3389/fpsyg.2020.02253

Schwartz, S. H. (1994). Are There Universal Aspects in the Structure and Contents of Human Values? *Journal of Social Issues*, *50*(4), 19–45. https://doi.org/10.1111/j.1540-4560.1994.tb01196.x

Steg, L., Berg, A. E. van den, & de Groot, J. (2013). Environmental Psychology. In *British Psychological Society and John Wiley & Sons, Ltd.* (Vol. 7, Issue 1). https://www.researchgate.net/publication/269107473_What_is_governance/link/548173090cf22525dcb61443/download%0Ahttp://www.econ.upf.edu/~reynal/Civil wars_12December2010.pdf%0Ahttps://think-asia.org/handle/11540/8282%0Ahttps://www.jstor.org/stable/41857625

Stern, P. C. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review*, *6*(2), 81–97. https://api.elsevier.com/content/abstract/scopus_id/0033393895

Sujana, K., Hariyadi, S., & Purwanto, E. (2018). Hubungan Antara Sikap Dengan Perilaku Peduli Lingkungan Pada Mahasiswa. *Jurnal Ecopsy*, *5*(2), 81. https://doi.org/10.20527/ecopsy.v5i2.5026

Sulaeman, N. F., Nuryadin, A., Widyastuti, R., & Subagiyo, L. (2020). Air quality index and the urgency of environmental education in Kalimantan. *Jurnal Pendidikan IPA Indonesia*, *9*(3), 371–383. https://doi.org/10.15294/jpii.v9i3.24049

Venhoeven, L. A., Bolderdijk, J. W., & Steg, L. (2013). Explaining the paradox: How pro-environmental behaviour can both thwart and foster well-being. In *Sustainability (Switzerland)* (Vol. 5, Issue 4, pp. 1372–1386). https://doi.org/10.3390/su5041372

Werff, E. van der, & Steg, L. (2016). The psychology of participation and interest in smart energy systems: Comparing the value-belief-norm theory and the value-identity-personal norm model. *Energy Research and Social Science*, *22*, 107–114. https://doi.org/10.1016/j.erss.2016.08.022

Yusup, F. (2021). Profil Literasi Lingkungan Mahasiswa Calon Guru Ipa. *Quantum: Jurnal Inovasi Pendidikan Sains*, *12*(1), 128. https://doi.org/10.20527/quantum.v12i1.10098