JIPI (Jurnal IPA dan Pembelajaran IPA) 9(1), p.204-213, (2025)
p_ISSN: 2614-0500 e_ISSN: 2620-553X
https://jurnal.usk.ac.id/JIPI/index https://doi.org/10.24815/jipi.v9i1.44181

Improving Knowledge and Environmental Awareness Character in the Pancasila Student Profile Strengthening Project Using Low Carbon Emission Food Context in Junior High School

Cut Ina Azzahra[1], Sulastri[1*], Rahmah Johar[2], Mailizar[2], Sri Haryani[3], Muhammad Izzuddin Syakir Ishak[4]

[1*]Chemistry Education, Faculty of Teacher Training and Education, Universitas Syiah Kuala Jl. Tgk. Hasan Krueng Kalee, Kopelma Darussalam, Kecamatan Syiah Kuala, Banda Aceh, 23111, Syiah Kuala, Banda Aceh, Indonesia
[2]Mathematics Education, Faculty of Teacher Training and Education, Universitas Syiah Kuala Jl. Tgk. Hasan Krueng Kalee, Kopelma Darussalam, Kecamatan Syiah Kuala, Banda Aceh, 23111, Syiah Kuala, Banda Aceh, Indonesia
[3]Agricultural Product Technology, Universitas Syiah Kuala Jl. Tgk. Hasan Krueng Kalee, Kopelma Darussalam, Kecamatan Syiah Kuala, Banda Aceh, 23111, Syiah Kuala, Banda Aceh, Indonesia
[4]School of Industrial Technology, Universiti Sains Malaysia, 11800, USM, Georgetown, Penang, Pulau Pinang, Malaysia

*Email: sulastri@usk.ac.id

Article History:
Received date: January 20 2025
Received in revised from: March 18 2025
Accepted date: March 23 2025
Available online: March 26 2025

Citation:
Azzahra, C.I., Sulastri, Johar, R., Mailizar, Haryani, S., & Ishak, M.I.S. 2025. Improving knowledge and environmental awareness character in the pancasila student profile strengthening project using low carbon emission food context in Junior High School. *JIPI (Jurnal IPA dan Pembelajaran IPA)*, 9(1):204-213.

Abstract. Global warming is accelerating and is primarily driven by high greenhouse gas (GHG) emissions. The food sector is a significant contributor to carbon emissions, particularly food production and consumption. Therefore, it is crucial to instill knowledge about low-carbon emission foods in students early by integrating this topic into curricular activities, such as the project for strengthening the profile of pancasila students (P5). This study aims to evaluate the improvement in students' knowledge, attitudes, and behaviors regarding low-carbon emission foods before and after implementing the P5 project. A descriptive quantitative approach with a quasi-experimental method was employed in this study. The subjects consisted of 33 Year 7 students in Banda Aceh, Indonesia. The findings reveal that implementing the P5 project, grounded in low-carbon emission foods, significantly enhanced students' knowledge, attitudes, and environmentally conscious behaviors. The project provided students with theoretical knowledge and promoted behavioral change through practical experiences.
Keywords: Knowledge, environmental awareness character, low carbon emission food context

Introduction

Global warming caused by the accumulation of carbon is referred to as greenhouse gases (GHG). The process of global warming caused by the accumulation of GHG such as carbon dioxide (CO_2) has been widely documented. Human-caused global warming is accelerating, largely due to high levels of GHG emissions, particularly CO_2. Between 2014 and 2023, global warming reached 1.31°C above pre-industrial levels, and CO_2 emissions continue to play a significant role in this increase (Forster et al, 2024).

GHG emissions are pollutants that are one of the factors that damage the environment by increasing the earth's temperature (Kabir et al., 2023). One of the major

impacts of the greenhouse effect is drastic climate change, causing the earth's condition to become unstable, such as the search for polar ice caps, rising sea levels, acid rain, pollution (air, soil and water), and the destruction of the ecosystem order of living things. The importance of GHG lies in their role; GHG such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and water vapour (H_2O) support regulating the temperature on the earth to remain warm and stable (Hui et al., 2022). However, using electronic equipment, motor vehicles, excessive fuel, food distribution, processing and production, and the agriculture and livestock sectors contribute to GHG emissions. Human dependence on energy is gradually driving the rate of environmental change to become damaged, or called environmental degradation. Carbon emissions are the main cause of climate change, a major problem worldwide. One of the main causes of carbon emissions is the food sector, particularly food production and consumption (Mrówczyńska-Kamińska et al., 2021).

Transitioning to a low-carbon diet can reduce global emissions by up to 8 gigatons of CO_2 equivalent per year (FAO, 2020). This aligns with sustainable development goals (SDGs) 13 on climate action. According to Sachs (2015), SDG 13 calls for urgent measures to reduce greenhouse gas emissions, increase resilience to climate change, and integrate adaptation measures into national policies. These actions involve global collaboration and the active role of individuals in reducing carbon emissions. Education-based approaches, especially those implemented early in life, can be key to promoting awareness of individual responsibility for the environment (Sterling, 2010). By providing students with this understanding from an early age, this project can lay the foundation for a generation aware of the importance of individual choices in climate change mitigation.

A study conducted by San Jose State University showed that intensive climate education could positively impact students' long-term behavior regarding carbon emissions (Cordero et al., 2020). Less than 30% of students understand the basic concept of carbon emissions and their contribution to climate change (Leiserowitz et al., 2021). Thus, many students are unaware of the impact of the food they consume on climate change.

Education on low-carbon emission foods should be introduced early in the school environment to reduce negative impacts on the environment. This education aims to raise students' awareness about environmentally friendly food choices and encourage them to play an active role in the carbon emission reduction campaign.

Schools as a place of education are expected to instill an understanding of carbon emissions through learning, extracurricular, co-curricular and habituation activities. The pancasila student profile strengthening project (P5) is a project-based co-curricular activity designed to strengthen efforts to achieve competencies as well as efforts to realize character by the pancasila student profile, which is compiled based on graduate competency standards (Tiyani & Ramadan, 2024). The P5 project provides an opportunity to integrate environmental awareness character education with the context of low-carbon emission food.

Integrating low-carbon food projects into learning offers several advantages. Haatainen and Aksela (2021) state that project-based learning can increase the relevance of learning, student engagement, and understanding of complex problems. In addition, this approach allows students to actively contribute to climate change mitigation through simple behaviors, such as choosing greener foods. In addition, Wackernagel et al. (2009) showed that reducing the carbon footprint of the food sector can be achieved through education about local, organic and plant-based foods that have a lower environmental impact than animal-based foods. A 2019 report from the city of Vancouver shows that many schools in Vancouver have embraced healthy and sustainable food programs, including training on sustainable agriculture, food waste reduction, and provision of organic foods that impact student health and environmental sustainability (Black, 2015).

Several studies have addressed the issue of low-carbon emission diets and environmental education. Lusk et al. (2022) concluded that plant-based diets have the

greatest likelihood of reducing carbon emissions compared to meat-based diets, suggesting that switching to a low-carbon diet could reduce global GHG emissions by 70%. Vermeir and Verbeke (2006) found that knowledge about the environmental impact of students' food choices in high school can influence their attitudes and behaviors towards adopting a more sustainable lifestyle. Steg and Vlek (2009) concluded that attitudes, subjective norms, and perceived behavioral control are central to understanding pro-environmental behavior. Through education, it is possible to change these factors, thus influencing individual intentions and behaviors towards more sustainable actions.

Many studies have examined environmental education and low-carbon emission diets. However, there are still few studies that examine improving the character of environmental awareness with a focus on low-carbon emission foods; it is hoped that students will not only understand the theoretical concepts but also be able to apply their knowledge in their daily lives, thus contributing to climate change mitigation efforts.

Based on the above description, the research questions are as follows: (1) is there an increase in students' knowledge of low-carbon emission foods before and after implementing the P5 project? (2) Is there an increase in the environmental awareness of students involved in the P5 project in terms of attitude and behavior? (3) is there a positive correlation between knowledge and the environmental awareness character of students after the implementation of the P5 project?

Methods

This research is descriptive quantitative research using the quasi-experiment method, namely, distinguishing the pretest and posttest results. The design used in this study is a one-group pretest-posttest design (Manly, 1992). This design is described as follows.

O1 X O2 (1)

Description:
O1 = Pre-test scores on knowledge and character of environmental awareness
X = P5 project-based learning
O2 = Posttest score on knowledge and character of environmental awareness

P5 project learning was conducted in three meetings. The first meeting discussed the definition of carbon emissions, the impact of carbon emissions on the environment, and examples of low-carbon emission foods. In the second meeting, students covered designed posters, brochures, and videos about low-carbon emission food education. In the third meeting, students presented their project results and revisions.

The sampling was done by purposive sampling technique to select one class in one of the junior high schools in Banda Aceh that has implemented the P5 project. There were 33 students involved. Data in this study were collected through pretest data given before the intervention and posttest given after the intervention to measure changes in knowledge and character (attitude and behavior) of environmental awareness.

The instruments used in this study were questionnaires and questionnaires. The questionnaire used to measure knowledge of low carbon emission foods was developed by researchers consisting of 16 multiple choice items. Based on empirical tests, the validity of the questions = 0.374 to 0.587, indicating moderate to high validity and the results of the reliability test of the items obtained a value of $r_{count = 0}$.418 greater than r_{tabel} = 0.344. These instruments have gone through validity and reliability tests as described by (Creswell, 2014).

The environmental awareness character questionnaire contains statements to measure students' attitudes and behaviors when choosing low-carbon emission foods. The character questionnaire uses a Likert scale. The Likert scale for attitudes used five scales from 1 to 5: 1 (not yet aware), 2 (already aware but do not have the desire to do it), 3 (realizing but not sure they can do it), 4 (realizing and already planning to do it) and 5 (aware and ready to do). On the other hand, behavior used four scales from 1 to 4: 1 (never), 2 (rarely), 3 (often) and 4 (always). The analysis results based on the scale are expected to explain the level of students' environmental awareness character (Fink, 2017).

The data obtained from the research results were analyzed using a quantitative approach through the following steps:

1. Descriptive statistics test, according to Frankfort-Nachmias et al. (2019), descriptive statistical tests are techniques used in statistics to describe or summarize the main characteristics of a data set. This test aimed to provide an overview of the data under study without generalizing or drawing further conclusions.
2. Normality test: before analyzing the data, a normality test was carried out using the Shapiro–Wilk test to determine whether the pretest and posttest data were normally distributed. If the significance value (p-value) <0.05, the data is considered not normally distributed (Ghasemi & Zahediasl, 2012).
3. Wilcoxon signed-rank test, because the data was not normally distributed, the analysis of differences in pretest and posttest results was carried out using the Wilcoxon signed-rank test. This test is a non-parametric method used to compare two related measurements (paired data) to determine whether there is a significant change after intervention (Conover, 1999). The results of the Wilcoxon test will show a Z value that measures the difference in pretest and posttest scores and a p-value that is used to determine the significance level of the results (with a criterion of $p<0.05$ indicating a significant difference) (Sheskin, 2011).
4. The correlation test determined the relationship between two variables (Stehlik-Barry & Babinec, 2017): knowledge and character improvement (attitude and behavior) of students' environmental awareness. Since the data obtained were not normally distributed, the Spearman rank correlation test was used (Pallant, 2020)

Results and Discussion

The results of students' pretest and posttest on knowledge and environmental awareness character (in terms of attitude and behavior) after learning are presented in Table 1.

Table 1. Statistical descriptive test

	N	Sum	Mean	Std. Deviation
Knowledge Pretest	33	1262.50	38.2576	10.21707
Knowledge Posttest	33	2443.75	74.0530	11.17173
Attitude Pretest	33	650.00	19.6970	6.97534
Posttest Attitude	33	1218.00	36.9091	8.36422
Behavior Pretest	33	488.00	14.7879	4.07552
Behavioral Posttest	33	949.00	28.7576	5.50585
Valid N (listwise)	33			

Table 1 shows a significant improvement in the average pretest and posttest results for students' knowledge and environmental care character, encompassing attitudes and behaviors. In the knowledge aspect, the average student score increased from 38.26 in the pretest to 74.05 in the posttest, with standard deviations of 10.22 and 11.17, respectively. This demonstrates a notable enhancement in students' understanding of the

material taught. In terms of attitude, the mean score rose from 19.70 in the pretest to 36.91 in the posttest. The standard deviation also increased from 6.98 to 8.36, indicating a slightly more significant variation in students' attitude changes following the learning intervention. For the behavioral aspect, the average score improved from 14.79 in the pretest to 28.76 in the posttest. Similarly, the standard deviation increased from 4.08 to 5.51, reflecting more significant variability in behavior scores after the intervention.

These findings indicate that the learning intervention significantly enhanced students' environmental knowledge and care character, as evidenced by the increases in average pretest and posttest scores across all aspects. Data validity was ensured by maintaining a consistent sample size of 33 students for all measurements. The results of the normality test on knowledge and environmental awareness character (in terms of attitude and behavior) are presented in Table 2.

Table 2. Normality test results

No.	Aspects	Normality significance level	
		Kolmogorov-Smirnov[a]	Shapiro-Wilk
1.	Knowledge	0.077	0.177
2.	Attitude	0.001	0.000
3.	Behavior	0.068	0.027

Based on Table 2, it is concluded that this study is not normally distributed, so it cannot be continued with the paired sample t-test. Therefore, another alternative was used to test the data using a non-parametric test equivalent to the paired sample t-test. The Wilcoxon test analyses data non-parametrically (Gibbons & Chakraborti, 2020). The Wilcoxon test is an alternative test for the paired sample t-test, and several things affect it, namely, if the data obtained from the sample is not interval or ratio type or the data distribution is not normally distributed (Conover, 1999).

Table 3. Wilcoxon test results

No.	Aspects	Wilcoxon test	
		Z	Sig
1.	Knowledge	-5.026	0.000
2.	Attitude	-4.648	0.000
3.	Behavior	-4.940	0.000

From Table 3, the significance level in all aspects of knowledge, attitude and behavior is 0.000, meaning that there is a significant increase in students' knowledge and environmental awareness character (attitude and behavior) about low carbon emission foods after learning to implement project P5.

The correlation between knowledge and environmental awareness character after learning to apply project P5 is presented in Table 4.

The results of the correlation analysis using Spearman's rho in Table 4 show a different relationship between knowledge and the character (attitude and behavior) of students' environmental awareness. The correlation between knowledge and attitude resulted in a p-value = 0.048, which is significant at the 95% confidence level ($p < 0.05$). This indicates that increased students' knowledge is associated with a change in their attitude towards the environment.

Based on the research results, there is an increased students' knowledge is associated with a change in their attitude towards the environment. Ajzen's (1991) theory of planned behavior (TPB) supports this finding, where knowledge often influences attitude formation through understanding and interpreting information. Research by Meinhold & Malkus

(2005) in the journal environment and behavior also shows that environmental knowledge is significantly associated with pro-environmental attitudes in adolescents.

Table 4. Correlation test results

			Knowledge	Attitude	Behavior
Spearman's rho	Knowledge	Correlation Coefficient	1.000	.348*	.105
		Sig. (2-tailed)	.	.048	.559
		N	33	33	33
	Attitude	Correlation Coefficient	.348*	1.000	.501**
		Sig. (2-tailed)	.048	.	.003
		N	33	33	33
	Behavior	Correlation Coefficient	.105	.501**	1.000
		Sig. (2-tailed)	.559	.003	.
		N	33	33	33

In contrast, the correlation between knowledge and behavior had a p-value = 0.559, which was insignificant ($p > 0.05$). This suggests that increasing knowledge alone is not enough to influence changes in student behavior. Kollmuss & Agyeman's (2002) theory explains that the gap between knowledge and behavior often occurs due to other factors, such as habits, social norms, or structural barriers. Similar research by Kaiser et al. (1999) in the journal personality and individual differences found that although environmental knowledge contributes to environmentally friendly behavior, the effect tends to be small without personal motivation and awareness.

The correlation between attitude and behavior resulted in a p-value = 0.003, which is highly significant. This shows that a positive attitude towards the environment strongly relates to environmental awareness behavior. These results are in accordance with the opinion of Ajzen (1991) which states that attitudes are the main predictors of behavior, especially when individuals have control over their actions. Research by Bamberg & Möser (2007) in the journal of environmental psychology supports that strong pro-environmental attitudes often encourage consistent environmentally friendly behavior. Thus, the results of the correlation analysis suggest that while knowledge is important, attitude change is a key step in steering students' behavior towards environmental stewardship. This underscores the need for a learning approach that focuses not only on improving knowledge, but also on building positive attitudes.

Students' attitudes have a greater influence on environmental awareness behavior than their level of knowledge. According to Gifford & Nilsson (2014), attitude is one of the main psychosocial factors influencing pro-environmental behavior, as it reflects an individual's readiness to act by believed environmental values. Students with positive attitudes towards environmental conservation are more likely to engage in concrete actions, such as waste management or energy saving, regardless of how much knowledge they have. Environmental knowledge is often only the basis for attitude formation, but without a positive attitude, the information does not necessarily encourage behavior change. Therefore, developing a caring attitude towards the environment through value education and practical experience is key to success in promoting sustainable behavior among students.

Intervention P5, which focuses on low-carbon emission foods, can increase students' knowledge about reducing carbon emissions in food consumption patterns. Research by Rees & Williams (2020) found that introducing the concept of carbon emissions to secondary school students can improve their understanding of the impact of food choices

on climate change, thus providing information on sources of carbon emissions, such as red meat and other animal-based products, which have a major impact on global warming. As students learn to choose low-emission foodstuffs, they can understand their important role in reducing their carbon footprint through their daily food choices.

The P5 intervention also improved students' environmental awareness character. This character includes a proactive attitude in preserving the environment and more responsible daily habits. Halek et al. (2021) emphasized that developing an environmentally caring character requires integrating education with moral values, creativity, and innovation. This study shows that through participation in environmental programs such as *Adiwiyata*, students not only increase their awareness of the environment but also develop collaborative skills that support collective responsibility for cleanliness and natural resource management.

The increase in knowledge and character of environmental awareness occurs in the classroom and its application in daily life. The P5 intervention enabled students to change their behavior by choosing food that is low in carbon emissions more wisely. Zoller & Scholz's (2004) research showed that a project-based approach can increase students' awareness of the environmental impact of their actions, thus encouraging attitude change. Furthermore, the hands-on experience in project-based learning helps students better understand and appreciate the importance of environmental sustainability (Hmelo-Silver, 2004).

P5 interventions can also affect the social behavior of students in their groups. Students involved in environment-based projects tend to become agents of change in their communities. Leiserowitz et al. (2017) showed that interventions that encourage students to participate in community-based activities, such as campaigns to reduce carbon emissions, can increase broader environmental awareness and behavior. Students who experienced such interventions were more likely to share information and invite their friends to participate in efforts to reduce carbon emissions, such as reducing meat consumption and choosing local and seasonal foods.

Collaborative learning is a method that emphasizes cooperation between students to solve problems or complete projects together (Johnson & Johnson, 2009). In the context of reducing carbon emissions through environmentally friendly food choices, a collaborative approach involves students in groups to plan a campaign to reduce the consumption of foods that produce high carbon emissions. Through discussion and collaboration, students learn to share knowledge and experiences and develop important social and critical skills in implementing positive change in their communities.

This research successfully built the character of environmental awareness in students in a way that is contextual and relevant to their lives. Through practical activities and campaigns, students not only learned about the impact of climate change from food consumption but also about the importance of acting to protect the earth. Their involvement in the activities improved their attitudes towards environmental issues and strengthened the values contained in the pancasila learner profile.

Conclusion

This study demonstrates that the implementation of the pancasila student profile strengthening project (P5) with a focus on low carbon emission foods significantly improved students' environmental knowledge, attitudes and behaviour. The findings suggest that while increased knowledge alone does not directly translate into behaviour change, attitudes play an important role in shaping students' environmental actions. The positive correlation between attitude and behaviour highlights the importance of fostering environmental awareness through value-based education and hands-on learning

experiences. The P5 project effectively integrated theoretical knowledge with practical application, providing students with a deeper understanding of the impact of food choices on climate change. This research supports the need to incorporate project-based environmental education into the curriculum to foster responsible and proactive environmental behaviour among students. By equipping students with strong pro-environmental knowledge and attitudes, such initiatives contribute to long-term climate change mitigation efforts. Future research could explore the long-term sustainability of these behavioural changes and examine additional factors that influence students' willingness to adopt eco-friendly lifestyles beyond the classroom.

Acknowledgement

We thank Syiah Kuala University for financial support for this research (Grant Number:132/UN11.2.1/PG.01.03/SPK/PTNBH/2024). We also thank all participants involved in this research.

References

Ajzen I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50(2):179–211. https://doi.org/10.1016/0749-5978(91)90020

Bamberg, S., & Möser, G. 2007. Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology* 27(1):14–25. https://doi.org/10.1016/j.jenvp.2006.12.002

Black, J.L., Velazquez, C.E., Ahmadi, N., Chapman, G.E., Carten, S., Edward, J., & Rojas, A. 2015. Sustainability and public health nutrition at school: assessing the integration of healthy and environmentally sustainable food initiatives in Vancouver schools. *Public Health Nutrition* 18(13):2379-2391. https://doi.org/10.1017/S1368 980015000531

Conover W.J. 1999. *Practical nonparametric statistics*. Third Edition. John Wiley & Sons, New York.

Cordero E.C., Centeno D., & Todd A.M. 2020. The role of climate change education on individual lifetime carbon emissions. *PloS One* 15(2):e0206266. https://doi.org/10.1371/journal.pone.0206266

Creswell J.W. 2014. *Research design: qualitative, quantitative, and mixed methods approaches*. Sage Publications, Thousand Oaks, California.

El Bilali H., Strassner C., & Ben Hassen T. 2021. Sustainable agri-food systems: environment, economy, society, and policy. *Sustainability* 13:6260. https://doi.org/10.3390/ su13116260

Frankfort-Nachmias C., Leon-Guerrero A., & Davis G. 2019. *Social statistics for a diverse society*. Sage Publications, Thousand Oaks, California.

Fink, A. 2017. *How to conduct surveys: a step-by-step guide*. 5th ed. SAGE Publications, Thousand Oaks, California.

Forster, P.M., Smith, C., Walsh, T., Lamb, W.F., Lamboll, R., Hall, B., & Zhai, P. 2024. Indicators of global climate change 2023: annual update of key indicators of the state

of the climate system and human influence. *Earth System Science Data* 16(6):2625-2658. https://doi.org/10.5194/essd-16-2625-2024

Ghasemi, A., & Zahediasl, S. 2012. Normality tests for statistical analysis: a guide for non-statisticians. *International Journal of Endocrinology and Metabolism* 10(2):486-492. https://pmc.ncbi.nlm.nih.gov/articles/PMC3693611/pdf/ijem-10-486.pdf

Gibbons, J.D., & Chakraborti, S. 2020. *Nonparametric statistical inference*. CRC Press, New York.

Gifford, R., & Nilsson, A. 2014. Personal and social factors that influence pro-environmental concern and behaviour: a review. *International Journal of Psychology* 49(3):141-157. http://psihologietm.ro/download/Gifford.pdf

Haatainen, O., & Aksela, M. 2021. Project-based learning in integrated science education: active teachers' perceptions and practices. *Lumat: International Journal on Math, Science and Technology Education* 9(1):139-158. https://journals-21.hulib.helsinki.fi/lumat/article/view/1392/1497

Hmelo-Silver, C.E. 2004. Problem-based learning: what and how do students learn. *Educational Psychology Review* 16(3):235–266. http://dx.doi.org/10.1023/B:EDPR.0000034022.16470.f3

Johnson, D.W., & Johnson, R.T. 2009. An educational psychology success story: social interdependence theory and cooperative learning. *Educational Researcher* 38(5):365-379. https://doi.org/10.3102/0013189X09339057

Kabir. M., Habiba. U.E., Khan, W., Shah, A., Rahim, S., Patricio, R., & Shafiq, M. 2023. Climate change due to increasing concentration of carbon dioxide and its impacts on environment in 21st century; a mini review. *Journal of King Saud University-Science* 35(5):102693. https://doi.org/10.1016/j.jksus.2023.102693

Kaiser, F.G., Wolfing, S., & Fuhrer, U. 1999. Environmental attitude and ecological behaviour. *Personality and Individual Differences* 30(3):587–597. https://doi.org/10.1006/jevp. 1998.0107

Kollmuss, A., & Agyeman, J. 2002. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research* 8(3):239–260. https://doi.org/10.1080/13504620220145401

Leiserowitz, A., Maibach, E., & Roser-Renouf, C. 2017. Climate change in the American mind: Americans' global warming beliefs and attitudes in April 2017. Yale University and George Mason University. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2298705

Lusk, J.L., Blaustein-Rejto, D., Shah, S., & Tonsor, G.T. 2022. Impact of plant-based meat alternatives on cattle inventories and greenhouse gas emissions. *Environmental Research Letters*. https://doi.org/10.1088/1748-9326%2Fac4fda

Manly, B.F. 1992. *The design and analysis of research studies*. Cambridge University Press, England.

Meinhold, J.L., & Malkus, A.J. 2005. Adolescent environmental behaviors: can knowledge, attitudes, and self-efficacy make a difference? *Environment and Behavior* 37(4):511–532. https://doi.org/10.1177/0013916504269665

Mrówczyńska-Kamińska, A., Bajan, B., Pawłowski, K.P., Genstwa, N., & Zmyślona, J. 2021. Greenhouse gas emissions intensity of food production systems and its determinants. *PloS One* 16(4):e0250995. https://doi.org/10.1371/journal.pone.0250995

Pallant, J. 2020. *SPSS survival manual: a step by step guide to data analysis using IBM SPSS*. Routledge, London.

Sachs, J.D. 2015. *The age of sustainable development*. Columbia University Press.

Sheskin, D.J. 2011. *Handbook of parametric and nonparametric statistical procedures*. CRC Press, Boca Raton, Florida.

Steg, L., & Vlek, C. 2009. Encouraging pro-environmental behaviour: an integrative review and research agenda. *Journal of Environmental Psychology* 29(3):309-317. https://doi.org/10.1016/j.jenvp.2008.10.004

Stehlik-Barry, K., & Babinec, A.J. 2017. *Data analysis with IBM SPSS statistics*. Packt Publishing Ltd, Birmingham.

Sterling, S. 2010. Learning for resilience, or the resilient learner? Towards a necessary reconciliation in a paradigm of sustainable education. *Environmental Education Research* 16(5–6):511–528. https://doi.org/10.4324/9781315868387

Tiyani, T.A., & Ramadan, Z.H. 2024. Analysis of the implementation of the project for strengthening the profile of pancasila students with the sustainable lifestyle theme of the merdeka curriculum for class V at SD Negeri 04 Bungaraya. *Jurnal Educatio (Jurnal Pendidikan Indonesia)* 10(1):521-533. http://dx.doi.org/10.29210/1202424398

Vermeir, I., & Verbeke, W. 2006. Sustainable food consumption: exploring the consumer "attitude–behavioral intention" gap. *Journal of Agricultural and Environmental Ethics* 19:169-194. https://doi.org/10.1007/s10806-005-5485-3

Wackernagel, M., Monfreda, C., Schulz, N.B., Erb, K., Haberl, H., & Krausmann, F. 2004. Calculating national and global ecological footprint time series: resolving conceptual challenges. *Land Use Policy* 21:271-278. https://doi.org/10.1016/j.landusepol.2003.10.006