



Supplementary Book of Green Consumerism: An Innovation of Environmental Learning based on HOTS

Ilmi Zajuli Ichsan, Diana Vivanti Sigit*, Mieke Miarsyah

Master Program of Biology Education, Universitas Negeri Jakarta, Indonesia

Article History:

Received: September 24th, 2019

Revised: October 5th, 2019

Accepted: October 9th, 2019

Published: December 27th, 2019

Keywords:

Environmental learning,
Higher-order thinking skills,
Supplementary book

*Correspondence Address:

dianav@unj.ac.id

Abstract: Learning in the 21st-century, students are required to have a good understanding of the latest environmental issues, namely the ability of Higher-Order Thinking Skills (HOTS). Environmental learning at the Junior High School level in public school and Islamic-based schools requires deepening of the material by the latest environmental issues such as green consumerism. The purpose of this study was to develop an Android-based Supplementary Book of Green Consumerism (SBGC) for environmental learning in natural science subjects. The research method used in this study was the research and development of Borg and Gall development with a few modifications. This study was only carried out up to the validation stage by experts. The results showed that the SBGC was highly valid with a validation score of 3.70 and the percentage of completeness of 92.50 %. Based on the scores obtained, it can be concluded that SBGC is suitable to be used in environmental learning. SBGC has the advantage of being based on technology, based on HOTS, as well as simple and attractive. It can be concluded that SBGC can be used in environmental learning at schools.

INTRODUCTION

Environmental learning in the 21st century at the level of Junior High School in public schools and Islamic-based schools (*Madrasah Tsanawiyah*) requires innovation. Environmental learning in the Indonesian Curriculum 2013 (*Kurtilas*) is included in the Natural Science subject on the Biology sub-topic on ecosystems and the environment. This environmental learning is still very low using Higher-Order Thinking Skills (HOTS) based learning. Various studies showed that students' HOTS in studying the environment was still low (Heong et al., 2012; Husamah, Fatmawati, & Setyawan, 2018; Wall, 2015). HOTS is important for students to solve the environmental problem.

Besides the low number of students' HOTS, many current environmental issues are not discussed and studied in class. Current issues such as global warming, climate change, green consumerism, and so on are not discussed by teachers because the material (learning topic) is not the main topic. This resulted in many students did not understand the environmental issues, one the issue was green consumerism (GC). Definition in simple terms, GC can be interpreted as a person's habit of consuming goods or food according to the principle of environmentally friendly (Diaz-Rainey & Ashton, 2011; Ichsan, Sigit, & Miarsyah, 2018; Lavelle, Rau, & Fahy, 2015; Lekakos, Vlachos, & Koritos, 2014; Matthes & Wonneberger, 2014). This GC

habit must be instilled in students at school through learning. GC topics must be included in environmental learning.

The problem that arises was the absence of media and teaching material that specifically discusses GC at the Junior High School level (Ichsan, Sigit, & Miarsyah, 2019). Media and teaching material is important because they make students easier to understand the concepts. This was the basis for the need to develop teaching materials and media of supplementary books containing GC material. This potential to increase student knowledge about GC. Therefore the product developed was named the Supplementary Book of Green Consumerism (SBGC). This book will be used later in environmental learning after the main topic of the ecosystem. This SBGC serves as additional material.

Meanwhile, there are several developed learning media on environmental learning. Most of these studies develop learning media on basic material (Fitriani, Adisyahputra, & Komala, 2018; Grosch, Berger, Gidion, & Romeo, 2014; Snake-Beings, 2017). Other research besides development was about student profile of HOTS and environmental behavior (Braun, Cottrell, & Dierkes, 2018; Schmitt, Aknin, Aksen, & Shwom, 2018; Vicente-Molina, Fernández-Sainz, & Izagirre-Olaizola, 2018). Based on various studies that have been done by many researcher in the world, the purpose of this study was to develop SBGC in environmental learning at the junior high school level. This SBGC product is developed based on Android because is a one of familiar operating system.

METHOD

This research was conducted in August 2019. In this study, the method used was the modified research and development procedures proposed by Borg and Gall (2003). The development steps were (1) data gathering (2) planning

(3) product development (4) expert validation (5) implementation (Gall, Gall, & Borg, 2003). The first stage was done by reviewing relevant literature and needs assessment. The second step was planning the development Supplementary Book of Green Consumerism (SBGC) based on the collected data.

In the third stage, the development was carried out. The SBGC was created using the Thinkable software (thinkable.com). After the product was developed, the next step was expert validation. At this stage, the validation involved 9 people consisted of 3 learning media experts (MD), 3 teaching material experts (ME), and 3 Biology teachers (BT). This study was only conducted up to the expert validation stage while the implementation of the SBGC was carried out in further research. The validation category used are as follows.

Table 1. Categories of Validity

Interval Score	Percentage	Category
$3,25 < x \leq 4,00$	81 % - 100%	Highly Valid
$2,50 \leq x \leq 3,25$	61 % - 80%	Valid
$1,75 < x < 2,50$	41 % - 60%	Less Valid
$1,00 < x < 1,75$	<40%	Not Valid

(Akbar, 2013; Ratumanan & Laurens, 2006)

RESULT AND DISCUSSION

The results of the data gathering showed that students' HOTS scores were in a low category. Then, in the planning stage, the researcher designed the SBGC. The result of SBGC development was an android application that contains 4 menus in Indonesia language. First, the definition of green consumerism. Second, the type of green consumerism. Third, discuss instructions for students to solve environmental problems. Finally, a discussion session. Figure 1 is the appearance of the SBGC cover. The cover designed with a picture that illustrates a variety of green consumerism activities.

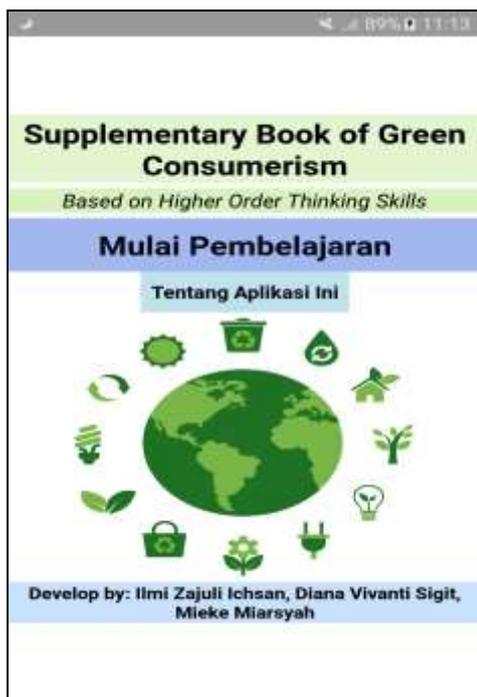


Figure 1. SBGC Cover

Meanwhile, on the main menu, 4 menus are consisting of (1) the definition of green consumerism (2) the type of green consumerism (3) solve environmental problems (4) group discussion. Display the main menu can be seen in Figure 2.



Figure 2. Main Menu Display

Definition menu contain explained about various statements about green consumerism. Meanwhile, the menu of green consumerism types is divided into 6 types of green consumerism consist of energy conservation, transportation, waste avoidance, daily consumption, recycling, and social behavior (Kaiser & Wilson, 2004). For more detail see Figure 3.



Figure 3. Menu of Type Green Consumerism

Then in problem-solving menu, this menu is a characteristic of SBGC based on Higher-Order thinking skills. This menu include an instruction for student to analyze problems, evaluate and create solutions to the problems of green consumerism. This section is according to HOTS (Abdullah et al., 2017; Anderson et al., 2001; Hugerat & Kortam, 2014; Hwang, Lai, Liang, Chu, & Tsai, 2018). For more detail see Figure 4.

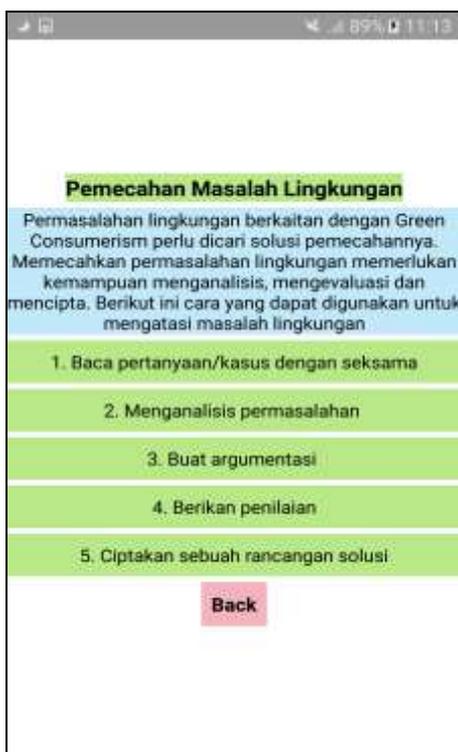


Figure 4. Menu of Solve Environmental Problem

The last menu was about group discussion. This menu contains activities for students to discuss various environmental problems. students are also asked to implement steps to solve environmental problems that have been read on the previous menu. More can be seen in Figure 5.



Figure 5. Menu of Group Discussion

After that, research results have been obtained in the form of validation results from media experts (MD), material experts (ME), and biology teachers (BT). Table 2 showed that first indicator received the highest score from the media expert. Meanwhile, the lowest score is on 4th indicator. First Indicator can get the highest score because the SBGC presented has a good display. Meanwhile, in terms of language, some things need to be improved, such as the use of more effective words. More details can be seen in Table 2.

Table 2. Results of Learning Media Validation

No	Indicator	MD1	MD2	MD3	Avg.
1	Image and color	3.60	4.00	3.80	3.80
2	Format of font	3.75	4.00	3.50	3.75
3	Language clarity	4.00	4.00	3.25	3.75
4	Sentences, words, and punctuation	3.75	3.50	3.25	3.50

After the validation results are presented based on the Media Expert assessment, then the next was the validation results by the teaching material expert. The results of validation by material experts showed that first indicator which is the accuracy of the material, was the highest score. That was because SBGC was a product with relatively new and very contextual teaching material. For more details can be seen in Table 3.

Table 3. Results of the Validation of Teaching Material Expert

No	Indicator	ME1	ME2	ME3	Avg.
1	Material accuracy	4.00	4.00	3.50	3.83
2	Depth of material	4.00	3.80	3.40	3.73
3	Language clarity	4.00	4.00	3.25	3.75
4	Sentences, words, and punctuation	3.50	3.50	3.25	3.42

The last validation was done to Biology teachers, the validation results showed that first indicator received the highest score. That is because the SBGC has a variety of colors. But the lowest score is seen in the second indicator, which is the suitability of material with the syllabus. This can be understood because the SBGC was an additional material that is not include in the syllabus. More details can be seen in Table 4.

Table 4. Biology Teacher Validation Results

No	Indicator	BT1	BT2	BT3	Avg.
1	Image and color	4.00	4.00	3.80	3.93
2	Suitability of material with the syllabus	3.50	3.50	3.25	3.42
3	Language clarity	4.00	4.00	3.50	3.83
4	Sentences, words, and punctuation	4.00	4.00	3.00	3.67

Overall validation results showed an average score of 3.70 with a percentage of completeness 92.50 which means it has a very valid category. It can be said that SBGC is suitable to be used in environmental learning at the Junior High School level, both in public schools and Islamic based schools (*Madrasah Tsanawiyah*). The score in detail can be seen in Table 5.

Table 5. Overall Validation Results

	Score	Avg.	%	Category
MD 1	3.78			
MD 2	3.88			
MD 3	3.45			
ME 1	3.88			
ME 2	3.83	3.70	92.50	Very Valid
ME 3	3.35			
BT 1	3.88			
BT 2	3.88			
BT 3	3.39			

Note: MD (Learning Media Expert); ME (Teaching Material Expert); BT (Biology Teacher)

The results of the SBGC development showed a very valid

category. The various advantages of the SBGC are (1) technology-based (2) HOTS-based (3) simple and attractive. The developed SBGC is already based on technology which can be used on smartphones android. This is in accordance with the development of the 21st-century where information is no longer physical but digital forms. These technological advancements make information easily accessible. Students can access information anytime and anywhere (Jiang et al., 2017; Kamerilova, Kartavykh, Ageeva, Veryaskina, & Ruban, 2016; Reyna, Hanham, & Meier, 2018). So that face-to-face meetings that are deemed insufficient can be replaced with digital products like this.

The second advantage is that the SBGC is based on HOTS. This can be seen from the menu section on how to solve environmental problems. In this menu, students are taught various stages of solving problems. Starting from identifying problems, linking problems and analyzing them, giving arguments, giving assessments, to creating various solutions. The stages of analyzing this problem are in accordance with the aspects of HOTS in C4 aspect. The steps for giving this judgment are the stages of C5. Meanwhile, to create a solution is the C6 stage. This menu is important because there is not much environmental learning based on HOTS (Choudri, Baawain, Al-Sidairi, Al-Nadabi, & Al-Zeidi, 2016; Derman & Gurbuz, 2018; Goldman, Ayalon, Baum, & Haham, 2015). So that the presence of SBGC is an innovation from HOTS-based learning.

The third advantage of SBGC is simple. The simple point is that the SBGC presents simple and clear information. The sentence used has also been adjusted to the level of student ability at the Junior High School level. Also, there is not much written on the SBGC. So that students become easier in learning its contents. This is in accordance with the

function of the SBGC, which is a supplement to the subject topic about ecosystems and the environment that they learn in school. Therefore, at SBGC the topic presented only focuses on the discussion of green consumerism. This is very necessary because learning in the 21st-century is more contextual (Juhanda & Maryanto, 2018; Kartikaningtyas, Kusmayadi, & Riyadi, 2018; Motallebzadeh, Ahmadi, & Hosseinnia, 2018; Musyaddad & Suyanto, 2019; Sadiqin, Santoso, & Sholahuddin, 2017; Suhendar & Wahyuni, 2018). Besides being simple, SBGC is also interesting because there are many illustrations and many colors. This makes students bored in reading SBGC.

Learning green consumerism (GC) at the school level is an important thing. SBGC is one form of innovation in environmental learning that discusses GC. The other efforts can be made by further developing such as developing learning models, worksheets, and developing an environmental learning curriculum. Students at the junior high school level, both in public schools and schools based on Islamic learning (*Madrasah Tsanawiyah*) the use of teaching materials and media based on HOTS is still very low. This has an impact on the low HOTS of students in environmental learning (Arnon, Orion, & Carmi, 2015; Garcia, 2015; Taft, 2015). The implementation of SBGC needs to be done in further research to find out the increase in students' HOTS in learning to use SBGC.

In addition to increasing HOTS, the presence of SBGC is also expected to result in changes in students' pro-environmental behavior. That is because knowledge is important, but the point of environmental learning is the change in behavior in protecting the environment (Bissinger & Bogner, 2018; Panno et al., 2017; Truelove & Gillis, 2018). Various efforts can be used one of them by using this SBGC as teaching the material and learning media. In addition to learning

through schools, approaches to the surrounding community must also be taken so that they participate in protecting the environment.

CONCLUSION

Based on the research results, it can be concluded that the Supplementary Book of Green Consumerism (SBGC) was suitable and can be used in learning. The advantages of SBGC are technology-based, containing HOTS, and simple. SBGC implementation is needed to see the effectiveness of the product when it is used when learning in class.

ACKNOWLEDGMENT

Thank you to all experts and teachers participated in this research. Hopefully, the results of this research are useful in learning.

REFERENCES

- Abdullah, A. H., Mokhtar, M., Halim, N. D. A., Ali, D. F., Tahir, L. M., & Kohar, U. H. A. (2017). Mathematics teachers' level of knowledge and practice on the implementation of higher-order thinking skills (HOTS). *Eurasia Journal of Mathematics, Science and Technology Education*, 13(1), 3–17. <https://doi.org/10.12973/eurasia.2017.00601a>
- Akbar, S. (2013). *Instrumen Perangkat Pembelajaran*. Bandung: PT. Remaja Rosdakarya.
- Anderson, L. W., Krathwohl, D. R., Airasian, W., Cruikshank, K. A., Mayer, R. E., & Pintrich, P. R. (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational outcomes: Complete edition*. New York: Longman.
- Arnon, S., Orion, N., & Carmi, N. (2015). Environmental literacy components and their promotion by institutions of higher education: an Israeli case study. *Environmental Education*

- Research*, 21(7), 1029–1055.
<https://doi.org/10.1080/13504622.2014.966656>
- Bissinger, K., & Bogner, F. X. (2018). Environmental literacy in practice: education on tropical rainforests and climate change. *Environment, Development and Sustainability*, 20(5), 2079–2094.
<https://doi.org/10.1007/s10668-017-9978-9>
- Braun, T., Cottrell, R., & Dierkes, P. (2018). Fostering changes in attitude, knowledge and behavior: demographic variation in environmental education effects. *Environmental Education Research*, 24(6), 899–920.
<https://doi.org/10.1080/13504622.2017.1343279>
- Choudri, B. S., Baawain, M., Al-Sidairi, A., Al-Nadabi, H., & Al-Zeidi, K. (2016). Perception, knowledge and attitude towards environmental issues and management among residents of Al-Suwaiq Wilayah, Sultanate of Oman. *International Journal of Sustainable Development and World Ecology*, 23(5), 433–440.
<https://doi.org/10.1080/13504509.2015.1136857>
- Derman, M., & Gurbuz, H. (2018). Environmental Education in the Science Curriculum in Different Countries: Turkey, Australia, Singapore, Ireland, and Canada. *Journal of Education in Science, Environment and Health*, 129–141.
<https://doi.org/10.21891/jeseh.409495>
- Diaz-Rainey, I., & Ashton, J. K. (2011). Profiling potential green electricity tariff adopters: Green consumerism as an environmental policy tool? *Business Strategy and the Environment*, 20(7), 456–470.
<https://doi.org/10.1002/bse.699>
- Fitriani, U., Adisyahputra, A., & Komala, R. (2018). Eco-friendly website development in biology learning based on project activities on environmental pollution. *Biosfer: Jurnal Pendidikan Biologi*, 11(1), 32–46.
<https://doi.org/10.21009/biosferjpb.11-1.4>
- Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Educational Research An Introduction*. San Fransisco: Pearson Education.
- Garcia, L. C. (2015). Environmental Science Issues for Higher- Order Thinking Skills (HOTS) Development: A Case Study in the Philippines. In *Biology Education and Research in a Changing Planet* (pp. 45–54).
<https://doi.org/10.1007/978-981-287-524-2>
- Goldman, D., Ayalon, O., Baum, D., & Haham, S. (2015). Major matters: Relationship between academic major and university students' environmental literacy and citizenship as reflected in their voting decisions and environmental activism. *International Journal of Environmental and Science Education*, 10(5), 671–693.
<https://doi.org/10.12973/ijese.2015.260a>
- Grosch, M., Berger, R., Gidion, G., & Romeo, M. (2014). Which Media Services do Students Use in Fact? Results of an International Empirical Survey. *Procedia - Social and Behavioral Sciences*, 141, 795–806.
<https://doi.org/10.1016/j.sbspro.2014.05.139>
- Heong, Y. M., Yunos, J., Othman, W., Hassan, R., Kiong, T. T., & Mohamad, M. M. (2012). The needs analysis of learning higher order thinking skills for generating ideas. *Procedia - Social and Behavioral Sciences*, 59, 197–203.
<https://doi.org/10.1016/j.sbspro.2012.09.265>

- Hugerat, M., & Kortam, N. (2014). Improving higher order thinking skills among freshmen by teaching science through inquiry. *Eurasia Journal of Mathematics, Science and Technology Education*, 10(5), 447–454. <https://doi.org/10.12973/eurasia.2014.1107a>
- Husamah, H., Fatmawati, D., & Setyawan, D. (2018). OIDDE Learning Model: Improving Higher Order Thinking Skills of Biology Teacher Candidates. *International Journal of Instruction*, 11(2), 249–264.
- Hwang, G.-J., Lai, C.-L., Liang, J.-C., Chu, H.-C., & Tsai, C.-C. (2018). A long-term experiment to investigate the relationships between high school students' perceptions of mobile learning and peer interaction and higher-order thinking tendencies. *Educational Technology Research and Development*, 66(1), 75–93. <https://doi.org/10.1007/s11423-017-9540-3>
- Ichsan, I. Z., Sigit, D. V., & Miarsyah, M. (2018). Learning Environment: Gender Profile of Students' Pro-Environmental Behavior (PEB) based on Green Consumerism. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, 3(2), 97–107. <https://doi.org/10.24042/tadris.v3i2.3358>
- Ichsan, I. Z., Sigit, D. V., & Miarsyah, M. (2019). Environmental Learning Based on Higher Order Thinking Skills: A Needs Assessment. *International Journal for Educational and Vocational Studies*, 1(1), 21–24. <https://doi.org/10.29103/ijevs.v1i1.1389>
- Jiang, B., Yang, J., Lv, Z., Tian, K., Meng, Q., & Yan, Y. (2017). Internet cross-media retrieval based on deep learning. *Journal of Visual Communication and Image Representation*, 48, 356–366. <https://doi.org/10.1016/j.jvcir.2017.02.011>
- Juhanda, A., & Maryanto, Y. (2018). The emergence of biological problems in electronic school books (bse) class x reviewed from the scientific knowledge domain of scientific literacy. *Biosfer: Jurnal Pendidikan Biologi*, 11(2), 121–125. <https://doi.org/10.21009/biosferjpb.v11n2.121-125>
- Kaiser, F. G., & Wilson, M. (2004). Goal-directed conservation behavior: The specific composition of a general performance. *Personality and Individual Differences*, 36(7), 1531–1544. <https://doi.org/10.1016/j.paid.2003.06.003>
- Kamerilova, G. S., Kartavykh, M. A., Ageeva, E. L., Veryaskina, M. A., & Ruban, E. M. (2016). Electronic informational and educational environment as a factor of competence-oriented higher pedagogical education in the sphere of health, safety and environment. *International Journal of Environmental and Science Education*, 11(13), 6185–6194.
- Kartikaningtyas, V., Kusmayadi, T. A., & Riyadi, R. (2018). The effect of brain based learning with contextual approach viewed from adversity quotient. *Journal of Physics: Conference Series*, 1022.
- Lavelle, M. J., Rau, H., & Fahy, F. (2015). Different shades of green? Unpacking habitual and occasional pro-environmental behavior. *Global Environmental Change*, 35, 368–378. <https://doi.org/10.1016/j.gloenvcha.2015.09.021>
- Lekakos, G., Vlachos, P., & Koritos, C. (2014). Green is good but is usability better? Consumer reactions to environmental initiatives in e-banking services. *Ethics and*

- Information Technology*, 16(2), 103–117. <https://doi.org/10.1007/s10676-014-9337-6>
- Matthes, J., & Wonneberger, A. (2014). The skeptical green consumer revisited: Testing the relationship between green consumerism and skepticism toward advertising. *Journal of Advertising*, 43(2), 115–127. <https://doi.org/10.1080/00913367.2013.834804>
- Motallebzadeh, K., Ahmadi, F., & Hosseinnia, M. (2018). Relationship between 21st century skills, speaking and writing skills: A structural equation modelling approach. *International Journal of Instruction*, 11(3), 265–276. <https://doi.org/10.12973/iji.2018.11319a>
- Musyaddad, A., & Suyanto, S. (2019). Evoking the four dimensions of student knowledge in ecosystem: effectiveness of real object, web, and blended learning. *Biosfer: Jurnal Pendidikan Biologi*, 12(2).
- Panno, A., Giacomantonio, M., Carrus, G., Maricchiolo, F., Pirchio, S., & Mannetti, L. (2017). Mindfulness, Pro-environmental Behavior, and Belief in Climate Change: The Mediating Role of Social Dominance. *Environment and Behavior*, 50(8). <https://doi.org/10.1177/0013916517718887>
- Ratumanan, T. ., & Laurens, T. (2006). *Evaluasi Hasil Belajar yang Relevan dengan Kurikulum Berbasis Kompetensi*. Surabaya: Unesa University Press.
- Reyna, J., Hanham, J., & Meier, P. (2018). The Internet explosion, digital media principles and implications to communicate effectively in the digital space. *E-Learning and Digital Media*, 15(1), 36–52. <https://doi.org/10.1177/2042753018754361>
- Sadiqin, I. K., Santoso, U. T., & Sholahuddin, A. (2017). Students ' Difficulties on Science Learning with Prototype Problem-Solving Based Teaching and Learning Material: A Study Evaluation of Development Research. *Advances in Social Science, Education and Humanities Research*, 100, 279–282.
- Schmitt, M. T., Aknin, L. B., Axsen, J., & Shwom, R. L. (2018). Unpacking the Relationships Between Pro-environmental Behavior, Life Satisfaction, and Perceived Ecological Threat. *Ecological Economics*, 143, 130–140. <https://doi.org/10.1016/j.ecolecon.2017.07.007>
- Snake-Beings, E. (2017). “It”s on the tip of my Google’: Intra-active performance and the non-totalising learning environment. *E-Learning and Digital Media*, 14(1–2), 38–51. <https://doi.org/10.1177/2042753017692429>
- Suhendar, S., & Wahyuni, A. (2018). Achievement and response of students at favorite junior high schools in sukabumi on trends in international mathematics and science study (timss) questions. *Biosfer: Jurnal Pendidikan Biologi*, 11(2), 126–133. <https://doi.org/10.21009/biosferjpb.v11n2.126-133>
- Taft, M. M. (2015). Higher - Order Critical Thinking in Teacher Preparation. In *Transformative Researchers and Educators for Democracy* (pp. 57–73).
- Truelove, H. B., & Gillis, A. J. (2018). Perception of pro-environmental behavior. *Global Environmental Change*, 49(February), 175–185. <https://doi.org/10.1016/j.gloenvcha.2018.02.009>
- Vicente-Molina, M. A., Fernández-Sainz,

- A., & Izagirre-Olaizola, J. (2018). Does gender make a difference in pro-environmental behavior? The case of the Basque Country University students. *Journal of Cleaner Production*, 176, 89–98. <https://doi.org/10.1016/j.jclepro.2017.12.079>
- Wall, T. F. (2015). The Transferability of Higher Order Cognitive Skills. *Procedia - Social and Behavioral Sciences*, 174, 233–238. <https://doi.org/10.1016/j.sbspro.2015.01.652>