



## Learning Environment: Gender Profile of Students' Pro-Environmental Behavior (PEB) based on Green Consumerism

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**Abstract:** The damage to nature and the changing situation of the surrounding environment certainly make you anxious. The role of students in safeguarding nature is certainly one of the important points in determining the sustainability of green consumerism. The purpose of this study is to see the influence of gender in the students' Pro-Environmental Behavior (PEB) in understanding the concept of green consumerism. The research was conducted in July-August 2018. The research was located at State Junior High School (SMPN) 1 of South Tambun, Bekasi, West Java, Indonesia. The method used was a survey with simple random sampling to obtain 214 samples consisted of 107 male students and 107 female students. PEB score of male students was 63.86 and 64.34 for female students. Data analysis used was t-test with a confidence level of 95%. The results of the t-test showed that there were no differences in green consumerism in terms Pro-Environmental Behavior between male and female. This shows that there needs to be an effort in evaluation by the teachers to improve the male and female students Pro-Environmental Behavior.

## INTRODUCTION

Recent environmental changes have led many to express their opinions about environmental issues. Starting from the problem of forest damage that occurs due to illegal logging (Margono, Potapov, Turubanova, Stolle, & Hansen, 2014). Damage to forests certainly has a bad impact on survival in the coming years. Factors that cause damage to the forest are due to poorly controlled mining and extraction of natural resources (Abood, Lee, Burivalova, Garcia-Ulloa, & Koh, 2015). This causes the energy source to run out quickly. Besides that, it can also cause more severe global warming which has now occurred. In principle, it is increasingly worsening the current environmental conditions.

Many of the analyzes lead to one answer which is green consumerism. A good environment will be maintained if the community care for and protect the environment from pollution. Green consumerism is one of the important things in maintaining the sustainability of human consumption so that the environment is maintained (Han & Yoon, 2015; Lekakos, Vlachos, & Koritos, 2014). Green consumerism is a society's understanding of consumer goods that are more environmentally friendly. The purchase of environmentally friendly products is greatly influenced by many factors, the only advertisement (Matthes & Wonneberger, 2014). Meanwhile, education plays an important role as well so that people can be smart in choosing

and understanding the importance of green consumerism.

A person's understanding of green consumerism can be attributed to someone's Pro-Environmental Behavior (PEB) in living their daily lives, in this case, junior high school students. A good PEB from junior high school students certainly affects the surrounding environment (Ting & Cheng, 2017). Students as one of the actors in protecting the environment have many roles. Student behavior in maintaining the environment is reflected through PEB. Students who have high PEB usually have a high tendency to maintaining the environment. PEB can be reflected if a student can master and understand the concept of green consumerism. This makes green consumerism very important to be understood by students at various levels to have an impact on PEB (Steinhorst & Klöckner, 2017; Yu, Yu, & Chao, 2017). One of them are students at the junior high school. Students in junior high school are not majored in science and social studies. This causes environmental learning to be very effective at this level because all students will get the same material. Students at this level are students who are quite ready to accept science learning at school, including learning the environmental material. The learning must, of course, be delivered interestingly so that students do not get bored (Hidayati & Wuryandari, 2012; Seechaliao, 2017).

Middle school students are students who have characteristics in which they are building their knowledge. One that relates to a student's success in learning Science is gender (Vincent-Ruz & Schunn, 2017). It plays a role because gender determines how one must behave. Gender is thought to be closely related to green consumerism. Science learning on the environmental material is important to learn. This is because, in this modern era, there has been a shift in trends in environmental learning, for this reason,

gender factors of the junior high school students must be examined (Sax et al., 2017). Based on the existing problems, it was found that many environmental problems have not been resolved, while the role of students has not been too visible in maintaining their environment, so it is necessary to measure the PEB of the students. So that the emergence of the urgency and purpose of this study is to see the influence of gender on the PEB score of the junior high school students.

## METHOD

The method used in the research was surveys techniques. The survey was conducted with instruments directly to the students in the class. Instruments that have been given to the students are then collected to obtain the PEB scores. The samples were 214 students of State Junior High School (SMPN) 1 of South Tambun, Bekasi, West Java, Indonesia. This school was chosen because it has students with good academic skills in Bekasi. This school also has a program based on students' environmental concepts in their learning activities. The research was conducted in July-August 2018. Samples were randomized through simple random sampling technique in order to obtain a sample of 107 male students and 107 female students. The data was tested for its normality and homogeneity then the analysis continued with independent t-test with a 95% confidence level.

The instrument used in this study was a standardized instrument that was modified slightly. The goal was to match the characteristics of the sample taken. the instruments used was the one proposed by Kaiser and Wilson (Kaiser & Wilson, 2004). The details can be seen in Table 1.

**Table 1.** PEB Aspects for Junior High School Students

Number	Aspects	Items
1	Energy Conservation	1,2
2	Transportation	3,4*
3	Waste Avoidance	5,6
4	Consumerism	7,8,9*,10*

Number	Aspects	Items
5	Recycling	11,12
6	Vicarious, Social Behavior	13,14,15

Note: \*negative items

The hypothesis in this study was based on various previous studies so that a guess can be obtained. The hypothesis can be seen below. More clearly can be formulated as follows:

H<sub>0</sub>: There is no difference in the PEB score between male and female student of junior high school.

H<sub>1</sub>: There is a difference in the PEB score between male and female student of junior high school.

### RESULT AND DISCUSSION

Based on the data collected, the average PEB score of male students was 63.86 while 64.34 for female students (score range 0-100). Data is presented in graphic to see a comparison of the average PEB score of male and female students. More details can be seen in Figure 1.

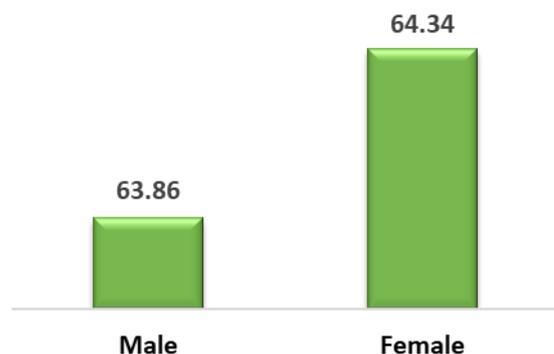


Figure 1. The Average PEB Score of Male and Female Students

It was seen that the PEB score of female students was slightly higher than the PEB score of male students. However, the difference in score is not too significant. The further analysis should be carried out to identify the difference of PEB score between male and female students. The results of the tests for

normality and homogeneity showed that the data was normally distributed and homogeneous so that the t-test could be carried out. T-test results were obtained and can be seen in Table 2.

Table 2. Results of t-Test of the PEB Scores of the Male and Female Students

Sig.	t	df	Sig.(2-tailed)
.613	-.320	212	.750

The clearer results related to the PEB of students are described in the details. Based on the results of the t-test, it can be concluded that H<sub>0</sub> is accepted, which means there is no difference in PEB score between male and female students. This is done to analyze further which points are superior between Male (M) and Female (F). More details can be seen in Table 3.

Table 3. Student PEB Scores on Each Item

No	Item	M	F
1	I turn off the light when I going to sleep	3.89	4.12
2	To dry clothes, I use sunlight	4.61	4.71
3	I go to school using public transportation, bicycle, or on foot	3.34	3.64
4	I use a private car or rent more during an excursion than using public transportation*	2.45	2.51
5	I am reusing used paper	2.78	2.82
6	I use a personal tote bag to shop	2.64	2.66
7	I buy products that are environmentally friendly	3.51	3.33
8	I consume organic food products because they are more environmentally friendly	3.53	3.47
9	I like to buy food in Styrofoam because it is practical and light*	2.83	3.07
10	I use insect repellent spray*	2.74	2.97

No	Item	M	F
11	I separate organic waste and plastic waste	3.21	3.00
12	I bought recycled items because it supports go green	2.92	2.83
13	I contribute financially to environmental organizations	3.21	2.96
14	I take part in the community to clean the environment	3.46	3.53
15	I invite people through social media to be more concerned about the environment	2.78	2.63

Note: M (Male), F (Female)

Score range 1-5

a) positive item, apply: always = 5, often = 4, sometimes = 3, rarely = 2, never = 1

b) \*negative item, apply: always = 1, often = 2, sometimes = 3, rarely = 4, never = 5

The score contained in Table 3 for each item has a range of 1-5. It is seen that in some aspects of PEB, male students are higher and in some other points, female students are higher. This shows that students' PEB based on gender have variations in every point. This is because every gender has its own characteristics in aspect of PEB (Meyer, 2016).

In items 1-6 it appears that the PEB scores of female students are superior to that of men. This indicates that the female students' PEB in this aspect is better than the male student's PEB. This can happen because female students are indeed more economical in using energy. One example is when they sleep, they usually turn off their light. Even if they use light, they usually use dimmer. Unlike male students who are very wasteful in using energy. Male students tend to be more wasteful in using energy because they are not used to doing things faster, and sometimes they don't think too much about their surroundings. This discovery further proves that gender turns out to have a role

in PEB and student knowledge, for that the teacher must begin to pay attention to gender factors in learning (Gullberg, Andersson, Danielsson, Scantlebury, & Hussénius, 2018; Price, Kares, Segovia, & Loyd, 2018; Sax et al., 2017).

Another aspect that is superior for female students is the aspect of transportation. This is due to the fact that more female students use public transport and rental vehicles that can fit many people. The rent car can fit 5-8 people. Meanwhile, male students tend to be reluctant to use this rental vehicle. They prefer to use private vehicles. Psychologically, men want to stand out compared to other men. This gender difference also influences classroom learning (Chander & Muthukrishnan, 2015; Lekakos et al., 2014; Price et al., 2018).

The next discussion is about recycling aspects in points 5 and 6. In this aspect also the PEB score of female students is higher than the PEB score of male students. The reason is that female students often use durable items, for example in using paper. The female students more often use small paper for them to take notes. This habit is certainly very good in the concept of protecting the environment, it would be better if the learning did not use paper at all then it would be better so that the paper will not be wasted (Meishar-Tal & Shonfeld, 2018). In addition, paper producers have also begun to think about innovations so that paper production becomes more environmentally friendly (Silva, Pavan, Oliveira, & Ometto, 2015).

In addition, the problem of shopping using a tote bag is a habit of female students in shopping at the market. This can be seen with the many tote bags with many motifs that are often bought by female students. While men sometimes give priority to prestige rather than having to use a tote bag, because this is not a normal habit. The use of this tote bag is a form to support the use of

environmentally friendly green products (Dangelico, Pujari, & Pontrandolfo, 2017; Sangroya & Nayak, 2017). More and more of its use also affects the industrial sector to design products favored by young people who love the environment (Gu, Chhajed, Petruzzi, & Yalabik, 2015).

Next is the aspect of green consumerism which is reflected in points 7 to 10. In points 7 and 8 it can be illustrated that PEB male students are higher than PEB female students. This result is different from the results in points 1 to 6, where the PEB score is higher for women. In this case, male students have a higher PEB score because they are better able to maintain their food. In men, they tend to be able to regulate food intake. They can manage various foods they consume. This habit is very good because someone's economy can be better maintained so as not to waste food (Arnold, Kibbe, Hartig, & Kaiser, 2018; Kanchanabhandhu & Woraphong, 2016; McCarthy & Liu, 2017). Unlike female students, in this case, it tends to be easier to be tempted or vice versa to do a diet that is too tight. A diet that is too tight is also not good for health (Iwata, Tsuzuki, Iwata, & Terasawa, 2017).

In points 9 and 10, the PEB score of female students is superior to the PEB score of male students. This is because female students are usually more selective in buying food in the canteen. This is certainly very positive. Also, female students do not like using insect repellent because it makes them feel uncomfortable. Usually, they prefer to use mosquito repellents that do not cause odor. This activity is a form of keeping the air from being contaminated with harmful chemicals so that the environment is maintained (Lavelle, Rau, & Fahy, 2015). The next aspect is recycling which is reflected in points 11 and 12. The PEB score of male students, in this case, is far superior to the PEB score of female students most likely

because male students are more daring in sorting trash. Psychologically, this environmental safeguard behavior is not that easy to do, especially for students who have low PEB (Freed, 2018).

Final discussion about social contributions. Male students prefer to contribute socially to the environment using the money by contributing to environmental organizations and participating in campaigns on social media. While female students prefer to take part directly in community service to clean up the damaged environment, both of these things prove that precisely female students prefer to interact directly with their environment compared to male students. However, we also have to realize that campaigning for the invitation to protect the environment through social media is also a positive thing. Social media has the benefit of disseminating information related to learning (Blaschke, 2014; Boholano, 2017; Yusop & Sumari, 2013). In addition, social media can also be used as a learning medium (Yusop & Sumari, 2013).

Overall male and female students have their respective advantages in PEB. The teacher actually also has a role in educating his students to have a high PEB, both male students and female students. A high student PEB is certainly very useful for future environmental sustainability. The solution that can be offered is a lot to be able to intervene to students so that their PEB score becomes higher (Truelove & Gillis, 2018). The older the student should also be more aware of how important PEB is for the sustainability of the future environment (Jonell, Crona, Brown, Rönnbäck, & Troell, 2016; Krettenauer, 2017; Yu et al., 2017).

The possible intervention is by the teacher. A teacher is also known as a facilitator in learning. The facilitator essentially directs students to do things as freely as possible but continues toward

the same learning goals. Teachers cannot govern students, because now student center based learning (Tyabaev, Sedelnikova, & Voytovich, 2015). Our common goal is certainly towards a better understanding of students about green consumerism. This understanding of green consumerism can be invested since students take the junior high school. This is because, at the junior high school level, students have begun to have sufficient reason to understand that the environment must be maintained. Unfortunately, the environmental issue that discusses green consumerism in this school is still very little discussed, even though it is very good learning based on the issue (Kamaludin, Surtikanti, & Surakusumah, 2018; Paço & Gouveia Rodrigues, 2016; Yavich & Starichenko, 2017).

The discussion of green consumerism in schools regarding learning tools such as syllabus, learning plans, learning media, teaching materials, and student worksheets is still very limited. This causes teachers to have difficulty teaching the concept of green consumerism in schools. We recommend that teachers also do a learning innovation to solve this. Students are invited to search for sources of information related to green consumerism on the internet (Geçer, 2014; Jiang et al., 2017; Reyna, Hanham, & Meier, 2018). In addition, teachers can actually develop their own devices that contain the concept of green consumerism as a whole. Development of learning tools can help break the deadlock (Ichsan, Dewi, Hermawati, & Iriani, 2018; Ito & Kawazoe, 2015). This is certainly very helpful in delivering material in the classroom.

Another alternative that the teacher can do is to build a student center learning atmosphere. This can be done by conducting various activities aimed at preserving the environment. This activity can be designed by the teacher in various ways. The most important thing is that learning must make students active

because it will motivate students (Owens, Sadler, Barlow, & Smith-Walters, 2017). One of them is by doing the processing of plastic waste into a handicraft (Ichsan & Mulyani, 2018). This activity proved to be effective in improving students' motoric abilities. In addition, many activities such as discussion with problems based. This learning is also good for stimulating students' critical thinking (Said & Syarif, 2016). In addition, problem-based learning can also improve student learning outcomes (Gündüz, Alemdağ, Yaşar, & Erdem, 2016; Ichsan, Iriani, & Hermawati, 2018; Khoiriyah & Husamah, 2018; van der Veen & van Oers, 2017). Eco-friendly games can also be applied as a form of innovation (Morganti et al., 2017).

In the end, all parties must be involved in improving PEB students not only teachers who are required. If viewed from the point of view of the leadership of a school principal, for example, he can make rules that require students to bring their own gadgets, so they do not use paper to record (Ferguson, 2017). Students can also be invited to bring their own place to eat. This is very good because there are still many school canteens that are not paying attention to this green consumer. In addition, sanctions given to students who throw trash out of place can be applied. Sanctions given must certainly be a punishment that educates, such as giving sanctions to create a project on green consumerism learning. In addition to punishment, doing a project is very good in studying science lessons (Amaral & Santos, 2018; Jewpanich & Piriyasurawong, 2015; Lou, Chou, Shih, & Chung, 2017). Overall in principle, all parties, including teachers, principals, and parents must be involved in building an understanding of green consumerism of junior high school students so that the PEB students will be better in the future.

## CONCLUSION

The understanding of students' green consumerism as a whole is still considered lacking, as evidenced by the PEB score of male and female students that are still relatively not too high. Specifically, male and female students have their respective advantages in every aspect measured by the PEB instrument. Teachers, parents, and principals have a strategic role in instilling this green consumerism concept to junior high school students. Teachers have a role in improving students' PEB with environmental learning innovations, by developing learning tools.

## REFERENCES

- Abood, S. A., Lee, J. S. H., Burivalova, Z., Garcia-Ulloa, J., & Koh, L. P. (2015). Relative Contributions of the Logging, Fiber, Oil Palm, and Mining Industries to Forest Loss in Indonesia. *Conservation Letters*, 8(1), 58–67. <https://doi.org/10.1111/conl.12103>
- Amaral, J. A. A. D., & Santos, R. J. R. L. D. (2018). Combining project-based learning and community-based research in a research methodology course: The lessons learned. *International Journal of Instruction*, 11(1), 47–60.
- Arnold, O., Kibbe, A., Hartig, T., & Kaiser, F. G. (2018). Capturing the Environmental Impact of Individual Lifestyles: Evidence of the Criterion Validity of the General Ecological Behavior Scale. *Environment and Behavior*, 50(3), 350–372. <https://doi.org/10.1177/0013916517701796>
- Blaschke, L. M. (2014). Using Social Media to Engage and Develop The Online Learner in Self-Determined Learning. *Research in Learning Technology*, 22(1), 1–23.
- Boholano, H. B. (2017). Smart Social Networking: 21st Century Teaching And Learning Skills. *Research in Pedagogy*, 7(1), 21–29. <https://doi.org/10.17810/2015.45>
- Chander, P., & Muthukrishnan, S. (2015). Green consumerism and pollution control. *Journal of Economic Behavior and Organization*, 114, 27–35. <https://doi.org/10.1016/j.jebo.2015.02.013>
- Dangelico, R. M., Pujari, D., & Pontrandolfo, P. (2017). Green Product Innovation in Manufacturing Firms: A Sustainability-Oriented Dynamic Capability Perspective. *Business Strategy and the Environment*, 26(4), 490–506. <https://doi.org/10.1002/bse.1932>
- Ferguson, J. M. (2017). Middle school students' reactions to a 1:1 iPad initiative and a paperless curriculum. *Education and Information Technologies*, 22(3), 1149–1162. <https://doi.org/10.1007/s10639-016-9480-2>
- Freed, A. (2018). The relationship between university students' environmental identity, decision-making process, and behavior. *Environmental Education Research*, 24(3), 474–475. <https://doi.org/10.1080/13504622.2017.1320705>
- Geçer, A. K. (2014). A study on information search and commitment strategies on web environment and internet usage sekf efficacy beliefs of university students'. *The Turkish Online of Educational Technology*, 13(2), 1–17.
- Gu, W., Chhajed, D., Petruzzi, N. C., & Yalabik, B. (2015). Quality design and environmental implications of green consumerism in remanufacturing. *International Journal of Production Economics*, 162, 55–69. <https://doi.org/10.1016/j.ijpe.2014.12.040>

- Gullberg, A., Andersson, K., Danielsson, A., Scantlebury, K., & Hussénus, A. (2018). Pre-Service Teachers' Views of the Child—Reproducing or Challenging Gender Stereotypes in Science in Preschool. *Research in Science Education*, 48(4), 691–715. <https://doi.org/10.1007/s11165-016-9593-z>
- Gündüz, A. Y., Alemdağ, E., Yaşar, S., & Erdem, M. (2016). Design of a Problem-Based Online Learning Environment and Evaluation of its Effectiveness. *The Turkish Online Journal of Educational Technology*, 15(3), 49–57. <https://doi.org/10.1017/CBO9781107415324.004>
- Han, H., & Yoon, H. J. (2015). Hotel customers' environmentally responsible behavioral intention: Impact of key constructs on decision in green consumerism. *International Journal of Hospitality Management*, 45, 22–33. <https://doi.org/10.1016/j.ijhm.2014.11.004>
- Hidayati, N., & Wuryandari, A. I. (2012). Media Design for Learning Indonesian in Junior High School Level. *Procedia - Social and Behavioral Sciences*, 67, 490–499. <https://doi.org/10.1016/j.sbspro.2012.11.354>
- Ichsan, I. Z., Dewi, A. K., Hermawati, F. M., & Iriani, E. (2018). Pembelajaran IPA dan Lingkungan: Analisis Kebutuhan Media Pembelajaran pada SD, SMP, SMA di Tambun Selatan, Bekasi. *JIPVA (Jurnal Pendidikan IPA Veteran)*, 2(2), 131–140. <https://doi.org/10.31331/jipva.v2i2.682>
- Ichsan, I. Z., Iriani, E., & Hermawati, F. M. (2018). Peningkatkan Keterampilan Berpikir Tingkat Tinggi (Higher Order Thinking Skills) Pada Siswa Sekolah Dasar Melalui Video Berbasis Kasus Pencemaran Lingkungan. *Edubiotik: Jurnal Pendidikan, Biologi Dan Terapan*, 3(02), 12–18.
- Ichsan, I. Z., & Mulyani, S. W. W. (2018). Improving Students' Motoric Skills Through Demonstration Method in Recycling Plastic Waste. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 4(2), 189–194. <https://doi.org/10.22219/jpbi.v4i2.5890>
- Ito, H., & Kawazoe, N. (2015). Active Learning for Creating Innovators: Employability Skills beyond Industrial Needs. *International Journal of Higher Education*, 4(2), 81–91. <https://doi.org/10.5430/ijhe.v4n2p81>
- Iwata, H., Tsuzuki, S., Iwata, M., & Terasawa, T. (2017). Ketoacidosis due to a Low-carbohydrate Diet in an Elderly Woman with Dementia and Abnormal Eating Behavior. *Internal Medicine*, 56(19), 2671–2675. <https://doi.org/10.2169/internalmedicine.8689-16>
- Jewpanich, C., & PiriyaSurawong, P. (2015). Project-Based Learning Using Discussion and Lesson-Learned Methods via Social Media Model for Enhancing Problem Solving Skills. *International Education Studies*, 8(6), 24–31. <https://doi.org/10.5539/ies.v8n6p24>
- 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>
- Jonell, M., Crona, B., Brown, K., Rönnbäck, P., & Troell, M. (2016). Eco-labeled seafood: Determinants for (blue) green consumption. *Sustainability*, 8(9), 1–19. <https://doi.org/10.3390/su8090884>
- 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>
- Kamaludin, S., Surtikanti, H. K., & Surakusumah, W. (2018). Developing Issue-Based Teaching Materials to Improve Student Learning Outcomes in Freshwater Biology Course. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 4(2), 161–170.
- Kanchanabhandhu, C., & Woraphong, S. (2016). A model of solid waste management based multilateral cooperation in semi-urban community. *International Journal of Environmental and Science Education*, 11(12), 5762–5775.
- Khoiriyah, A. J., & Husamah, H. (2018). Problem-based learning: Creative thinking skills, problem-solving skills, and learning outcome of seventh grade students. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 4(2), 151–160.  
<https://doi.org/10.22219/jpbi.v4i2.5804>
- Krettenauer, T. (2017). Pro-Environmental Behavior and Adolescent Moral Development. *Journal of Research on Adolescence*, 27(3), 581–593.  
<https://doi.org/10.1111/jora.12300>
- 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>
- Lou, S.-J., Chou, Y.-C., Shih, R.-C., & Chung, C.-C. (2017). A Study of Creativity in CaC2 Steamship-derived STEM Project-based Learning. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(6), 2387–2404.  
<https://doi.org/10.12973/eurasia.2017.01231a>
- Margono, B. A., Potapov, P. V., Turubanova, S., Stolle, F., & Hansen, M. C. (2014). Primary forest cover loss in indonesia over 2000-2012. *Nature Climate Change*, 4(8), 730–735.  
<https://doi.org/10.1038/nclimate2277>
- 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>
- McCarthy, B., & Liu, H. B. (2017). Food waste and the ‘green’ consumer. *Australasian Marketing Journal*, 25(2), 126–132.  
<https://doi.org/10.1016/j.ausmj.2017.04.007>
- Meishar-Tal, H., & Shonfeld, M. (2018). Students’ writing and reading preferences in a paperless classroom. *Interactive Learning Environments*, 0(0), 1–11.  
<https://doi.org/10.1080/10494820.2018.1504306>
- Meyer, A. (2016). Heterogeneity in the preferences and pro-environmental behavior of college students: The effects of years on campus, demographics, and external factors. *Journal of Cleaner Production*, 112, 3451–3463.

- <https://doi.org/10.1016/j.jclepro.2015.10.133>
- Morganti, L., Pallavicini, F., Cadel, E., Candelieri, A., Archetti, F., & Mantovani, F. (2017). Gaming for Earth: Serious games and gamification to engage consumers in pro-environmental behaviours for energy efficiency. *Energy Research and Social Science*, 29(April), 95–102.  
<https://doi.org/10.1016/j.erss.2017.05.001>
- Owens, D. C., Sadler, T. D., Barlow, A. T., & Smith-Walters, C. (2017). Student Motivation from and Resistance to Active Learning Rooted in Essential Science Practices. *Research in Science Education*, 1–25.  
<https://doi.org/10.1007/s11165-017-9688-1>
- Paço, A., & Gouveia Rodrigues, R. (2016). Environmental activism and consumers' perceived responsibility. *International Journal of Consumer Studies*, 40(4), 466–474.  
<https://doi.org/10.1111/ijcs.12272>
- Price, C. A., Kares, F., Segovia, G., & Loyd, A. B. (2018). Staff matter: Gender differences in science, technology, engineering or math (STEM) career interest development in adolescent youth. *Applied Developmental Science*, 0(0), 1–16.  
<https://doi.org/10.1080/10888691.2017.1398090>
- 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>
- Said, A., & Syarif, E. (2016). The Development of Online Tutorial Program Design Using Problem-Based Learning in Open Distance Learning System. *Journal of Education and Practice*, 7(18), 222–229.
- Sangroya, D., & Nayak, J. K. (2017). Factors influencing buying behaviour of green energy consumer. *Journal of Cleaner Production*, 151, 393–405.  
<https://doi.org/10.1016/j.jclepro.2017.03.010>
- Sax, L. J., Lehman, K. J., Jacobs, J. A., Kanny, M. A., Lim, G., Monje-Paulson, L., & Zimmerman, H. B. (2017). Anatomy of an Enduring Gender Gap: The Evolution of Women's Participation in Computer Science. *The Journal of Higher Education*, 88(2), 258–293.  
<https://doi.org/10.1080/00221546.2016.1257306>
- Seechaliao, T. (2017). Instructional Strategies to Support Creativity and Innovation in Education. *Journal of Education and Learning*, 6(4), 201.  
<https://doi.org/10.5539/jel.v6n4p201>
- Silva, D. A. L., Pavan, A. L. R., Oliveira, J. A. De, & Ometto, A. R. (2015). Life cycle assessment of offset paper production in Brazil: Hotspots and cleaner production alternatives. *Journal of Cleaner Production*, 93, 222–233.  
<https://doi.org/10.1016/j.jclepro.2015.01.030>
- Steinhorst, J., & Klöckner, C. A. (2017). Effects of Monetary Versus Environmental Information Framing: Implications for Long-Term Pro-Environmental Behavior and Intrinsic Motivation. *Environment and Behavior*.  
<https://doi.org/10.1177/0013916517725371>
- Ting, D. H., & Cheng, C. F. C. (2017). Measuring the marginal effect of pro-environmental behaviour: Guided learning and behavioural enhancement. *Journal of Hospitality, Leisure, Sport and Tourism Education*, 20(July 2015), 16–26.

- <https://doi.org/10.1016/j.jhlste.2016.12.001>
- 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>
- Tyabaev, A. E., Sedelnikova, S. F., & Voytovich, A. V. (2015). Student-Centered Learning: The Experience of Teaching International Students in Russian Universities. *Procedia - Social and Behavioral Sciences*, 215(June), 84–89. <https://doi.org/10.1016/j.sbspro.2015.11.578>
- van der Veen, C., & van Oers, B. (2017). Advances in research on classroom dialogue: learning outcomes and assessments. *Learning and Instruction*, 48, 1–4. <https://doi.org/10.1016/j.learninstruc.2017.04.002>
- Vincent-Ruz, P., & Schunn, C. D. (2017). The increasingly important role of science competency beliefs for science learning in girls. *Journal of Research in Science Teaching*, 54(6), 790–822. <https://doi.org/10.1002/tea.21387>
- Yavich, R., & Starichenko, B. (2017). Design of Education Methods in a Virtual Environment. *Journal of Education and Training Studies*, 5(9), 176. <https://doi.org/10.11114/jets.v5i9.2613>
- Yu, T. Y., Yu, T. K., & Chao, C. M. (2017). Understanding Taiwanese undergraduate students' pro-environmental behavioral intention towards green products in the fight against climate change. *Journal of Cleaner Production*, 161, 390–402. <https://doi.org/10.1016/j.jclepro.2017.05.115>
- Yusop, F. D., & Sumari, M. (2013). The Use of Social Media Technologies among Malaysian Youth. *Procedia - Social and Behavioral Sciences*, 103, 1204–1209. <https://doi.org/10.1016/j.sbspro.2013.10.448>