



COVID-19 Outbreak on Environment: Profile of Islamic University Students in HOTS-AEP-COVID-19 and PEB-COVID-19

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Abstract: COVID-19 harms the implementation of learning at various levels, including at Islamic universities. Students at Islamic universities must use e-learning for several months until the COVID-19 outbreak ends. Students are also required to have Higher-Order Thinking Skills (HOTS) to solve problems. They are also required to have Pro-Environmental Behavior (PEB) related to COVID-19. Previous research has developed a Higher-Order Thinking Skills Assessment based on Environmental Problem (HOTS-AEP). The purpose of this research was to describe an implementation of e-learning, HOTS, and PEB on students during the COVID-19 outbreak. The method used was descriptive through the survey technique. This research was conducted in March 2020. The instruments used were questionnaires on e-learning and HOTS-AEP related to COVID-19 (HOTS-AEP-COVID-19). Meanwhile, to measure PEB, PEB-COVID-19 was used. All instruments were constructed using Google Form and were distributed to 137 respondents via social media. The results showed that the implementation of e-learning was generally effective (27.74%) and quite effective (43.07%) even though some problems were encountered. Other results showed that students' HOTS were in the poor category (26.20) while the PEB was in the excellent category (84.82). It can be concluded that e-learning during the COVID-19 outbreak has gone well although some innovations are needed. Besides that, HOTS needs to be improved while PEB needs to be maintained.

INTRODUCTION

Pandemic Corona Viruses Disease (COVID-19) that happened in 2020 made the global world experiences disaster (Kirigia & Muthuri, 2020; Tian et al., 2020; Zhou et al., 2020). Various impacts occurred due to the pandemic. It has affected the economic sector, business,

government, even the world of education. The COVID-19 pandemic has caused massive impacts on the global higher education sector (Crawford et al., 2020; Toquero, 2020). Education in Indonesia has experienced a change in learning strategies since the COVID-19 outbreak (Ichsan, Rahmayanti, Purwanto, Sigit,

Singh, et al., 2020) because all formal education activities in schools are closed due to physical distancing policy adopted by Indonesia. The learning strategy has changed from a face-to-face learning system to electronic learning (e-learning).

Changes in the learning system occur at all levels of education, ranging from primary, secondary, to higher education. The implementation of e-learning in higher education has become something that needs further identification. Toquero (2020) discovers that many higher education institutions, both private and state colleges, and universities in the Philippines, are not prepared to implement the online systems. That is due to the previously applied learning system was blended learning. The adoption of the e-learning system caused big changes in students' learning. This needs to be further described, especially the use of e-learning due to the impact of COVID-19. Even so, the use of e-learning is the best way to share learning topics (Elleithy & Sobh, 2015; Lee et al., 2015; Mccutcheon et al., 2015; Nugraini et al., 2013; Qian et al., 2018).

Toquero (2020) states that there is a need to strengthen environmental hygiene practices in all levels of learning. Society awareness starts when students are taught about societal issues, especially health issues in universities. COVID-19 prevention can be done by keeping the environment clean and maintained. Environmental knowledge that can be used in this context is Higher-Order Thinking Skills (HOTS) which is one of the ability to solve problems (Abidinsyah et al., 2019; Afflerbach et al., 2015; Dahl et al., 2018; Yeung, 2015; Zohar & Agmon, 2018). One of the HOTS instruments that have been developed previously is the Higher-Order Thinking Skills Assessment based on Environmental Problem (HOTS-AEP). It was previously used to measure various environmental problems (Ichsan et al., 2019). In this context, HOTS-AEP can be

modified into an instrument to measure students' ability to understand COVID-19. Thus, the instrument was modified into HOTS-AEP-COVID-19 (Ichsan, Rahmayanti, Purwanto, Sigit, Singh, et al., 2020).

Environmental behavior is an important thing in the COVID-19 situation. Students do not have enough knowledge about COVID-19. They must have a Pro-Environmental Behavior (PEB) which is characterized by a variety of behaviors to support aspects of environmental friendliness. In the context of the COVID-19 pandemic, PEB becomes important. PEB is generally associated with environmental behavior that is generally associated with environmentally friendly behavior (Ahmad & Nordin, 2014; Durr et al., 2017; Panno et al., 2017; Runhaar et al., 2019; Takahashi & Selfa, 2015). In this context, PEB can be modified into PEB-COVID-19 which is specifically related to Pro-environmental behavior based on COVID-19 (Ichsan, Rahmayanti, Purwanto, Sigit, & Rahman, 2020).

Previous research on COVID-19 was not focused on the higher education context. The results of research in foreign countries showed that physical distancing policy causes learning to change to e-learning (Ahorsu et al., 2020; Bakker & Wagner, 2020; Erduran, 2020). The lack of research information related to COVID-19 shows that this research is urgent and novel. Information regarding the COVID-19 effects on Islamic universities is useful to construct a suitable strategy. Based on the description, the purpose of this research was to describe the implementation of e-learning on HOTS and PEB during the COVID-19 pandemic.

METHOD

This research was conducted in March 2020 when the pandemic Corona Viruses Disease (COVID-19) was occurring globally in the world, including

Indonesia. This research used a descriptive method with the survey as the data collection technique. The samples involved in this research were 137 students. The sample was determined by employing a simple random sampling technique on Islamic universities (26 Males and 111 Females). The students came from State Islamic University; Universitas Islam Negeri Raden Intan Lampung and Universitas Islam Negeri Alauddin Makassar. These universities were chosen based on geographic aspects.

Previous research has developed Higher-Order Thinking Skills Assessment based on Environmental Problem (HOTS-AEP) for all levels of education (Ichsan et al., 2019) and then modified to match the COVID-19 context called HOTS-AEP-COVID-19 (Ichsan, Rahmayanti, Purwanto, Sigit, Singh, et al., 2020). The HOTS-AEP-COVID-19 was analyzed and evaluated to create a solution regarding the prevention of COVID-19 in the environment.

Then, the instrument for Pro-Environmental Behavior on COVID-19 (PEB-COVID-19) was developed to measure students' behavior (Ichsan, Rahmayanti, Purwanto, Sigit, & Rahman, 2020). PEB-COVID-19 have 3 indicators, namely (1) clean the home and environment to prevent COVID-19, (2) avoid visiting places with a dirty environment, and (3) reduce interactions with various objects that have the

potential to transmit COVID-19 in the environment.

The instruments used in this research were questionnaires about e-learning (Ichsan, Rahmayanti, Purwanto, Sigit, & Rahman, 2020). The analysis of the data was done descriptively by comparing various average scores from each category. The instruments used in this research have been declared as valid and reliable.

The instruments were distributed through online media, especially the Google Forms. That's because when the COVID-19 outbreak occurred, all campus activities stopped applying face-to-face meetings. It was caused by the physical distancing policy in Indonesia. The HOTS-AEP-COVID-19 instrument consisted of 6 items while the PEB-COVID-19 instrument consisted of 10 items. The criteria of HOTS and PEB used are as follows.

Table 1. Categories of HOTS and PEB

Category	Interval Score
Excellent	$X > 81.28$
High	$70.64 < X \leq 81.28$
Moderate	$49.36 < X \leq 70.64$
Low	$38.72 < X \leq 49.36$
Poor	$X \leq 38.72$

Source: Adapted from (Ichsan et al., 2019)

RESULT AND DISCUSSION

The results of the research indicated that most students agreed that e-learning was useful during the COVID-19 outbreak. More detailed results can be seen in Table 2.

Table 2. Percentage of Students' Opinions on E-learning during the COVID-19 Pandemic

No	Item	Strongly Agree	Agree	Doubtful	Disagree	Strongly Disagree
1	The e-learning helps students during COVID-19 outbreaks.	25.55	57.66	13.87	2.19	0.73
2	The e-learning can make students more independent in learning.	5.84	55.47	30.66	8.03	0.00
3	The material that is shared during the e-learning can be learned and can be easily understood.	2.92	26.28	46.72	24.09	0.00
4	The e-learning due to the COVID-19 outbreak promotes question and answer discussions between students, peers, and lecturers.	15.33	60.58	18.25	5.84	0.00
5	During the COVID-19 outbreak, most students are actively involved in the discussion session.	8.03	61.31	20.44	9.49	0.73

The results showed that the majority of students thought that e-learning, assessments, and examinations were quite effective during the COVID-19 outbreak.

However, 35.04 % of students thought that e-learning was not effective in assessment or examinations. More information can be seen in Table 3.

Table 3. Students' Percentage on the Effectiveness of e-learning during the COVID-19 Pandemic

No	Item	Very Effective	Effective	Quite Effective	Not Effective	Very Ineffective
1	In your opinion, has e-learning been effectively used during the COVID-19 pandemic?	5.11	27.74	43.07	22.63	1.46
2	In your opinion, have the assessments and tests through e-learning been effectively used during the COVID-19 pandemic?	4.38	16.06	41.61	35.04	2.92

The results showed that Whatsapp was the most well-known e-learning media used in learning by students. However, the highest percentage of e-learning was obtained by Google Classroom. The e-learning media provided by the universities was the least popular with only 7.30%. the information can be seen in Table 4.

In addition to the type of media used during e-learning, the types of files shared during learning are important. The results showed that the majority of students more easily understood the material using video and pdf. Clearer information about the percentage and type of file can be seen in Table 5.

Table 4. The Types of e-learning Media Used during the COVID-19 Pandemic

No	Types of Media	Respondents	Percentage
1	Website	8	5.84
2	Whatsapp	77	56.20
3	Telegram	4	2.92
4	Line	1	0.73
5	Google Classroom	31	22.63
6	Information system provided from campus	10	7.30
7	Zoom Meeting	6	4.38

Table 5. File Types on e-learning during the COVID-19 Pandemic

No	Type of File	Respondents	Percentage
1	Powerpoint (PPT)	37	27.01
2	Image (JPG / PNG)	2	1.46
3	Video	43	31.39
4	Word document	11	8.03
5	PDF document	44	32.12

Meanwhile, for the duration of the use of e-learning, the majority of respondents (60.58 %) chose 2-3 hours/day. Meanwhile, only 13.14 % chose 4-6 hours/day (Figure 1). This showed that students were not entirely accustomed to using e-learning for a long period. This is an important concern that will affect the effectiveness of e-learning.

The e-learning at the university level also experiences various problems. All these problems will make e-learning less effective. Based on the results of the research, the problem experienced by students was related to cellular signals (57.66 %). Besides, there are also many other problems such as having no cellular data, interrupted wifi connection, slow

smartphone, and other problems as can be seen in Figure 2. Meanwhile, the results of the research also showed that the

majority of students used cellular data that needed to be purchased.

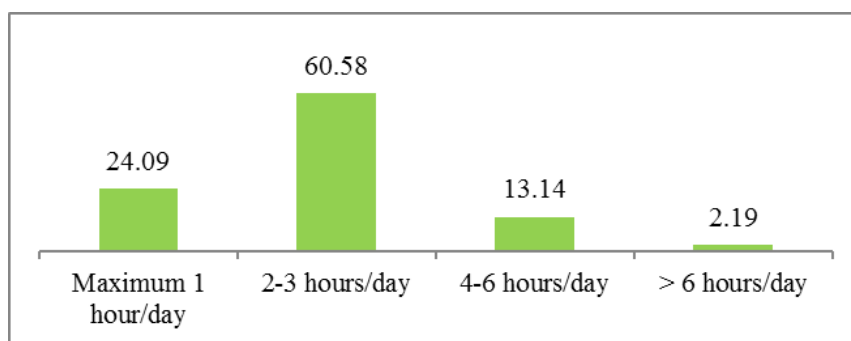


Figure 1. Percentage of Duration

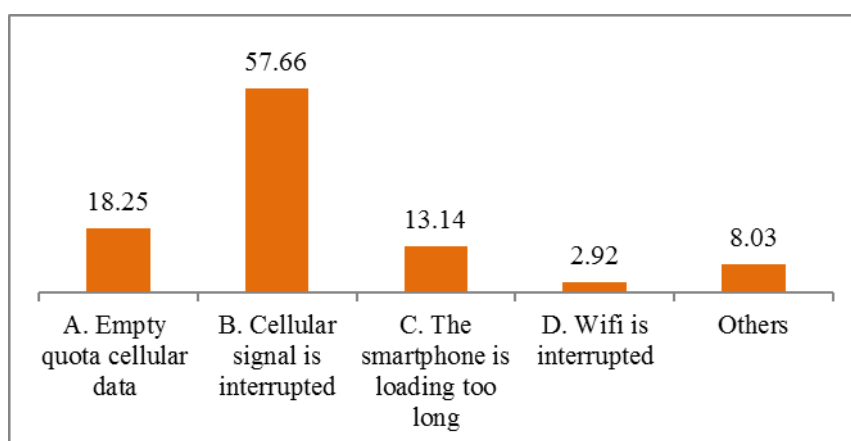


Figure 2. The e-learning Constraints

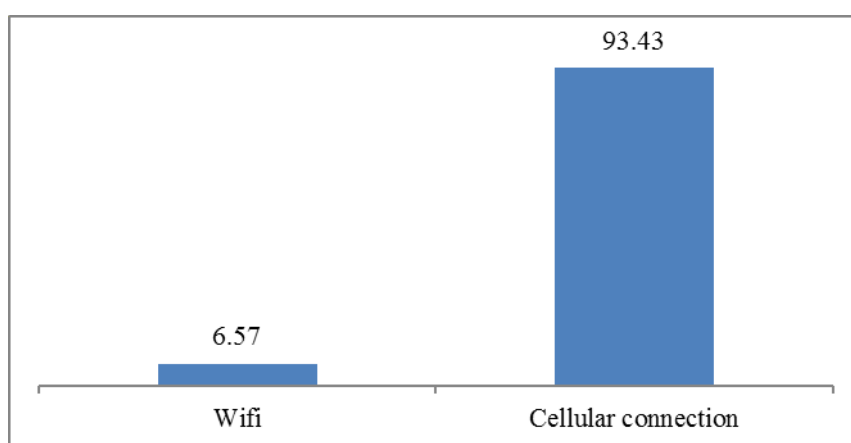


Figure 3. E-learning Connection Types

The results also showed that the students' HOTS was in the poor category. The item of the instrument with the lowest score related to creating ideas to reduce the impact of COVID-19. Meanwhile, in the male students'

perspective, the lowest item related to providing critique and suggestions on environmental protection behavior. It is different from the female students' perspective. Detailed information can be seen in Table 6. In addition to measuring

HOTS, this research also measured PEB in terms of protecting the environment to avoid COVID-19. Based on the results of the research, the lowest PEB score was in item 9 related to shaking hands without touching. This showed that students were having difficulty in applying physical

distancing. That was caused by the fact that shaking hands has become a culture in Indonesian, so it is certainly difficult to change these habits quickly. The details regarding students' PEB scores in terms of preventing COVID-19 can be seen in Table 7.

Table 6. The Students' Average Score on HOTS-AEP-COVID-19

No	Items	All (n=137)	Male (n=26)	Female (n=111)
1	Analyzing environmental factors that increase the spread of COVID-19.	2.47	2.23	2.52
2	Analyze environmental problems that most contribute to COVID-19.	2.50	2.23	2.30
3	Providing opinions and critique on community behavior that does not protect the environment and further spread the COVID-19.	2.77	2.54	2.83
4	Providing critiques and suggestions on behavior that should be done by the community to minimize the COVID-19.	2.42	1.96	2.52
5	Creating ideas about efforts to reduce the impact of the spread of COVID-19 in the environment around the house.	2.40	2.15	2.46
6	Creating a short paragraph about the relationship between the importance of protecting the environment and the spreading of COVID-19.	3.16	2.73	3.26
Raw Score		15.72	13.84	15.89
Average Score (0-100)		26.20	23.07	26.48
Category		Poor	Poor	Poor

Source: Items adapted from Ichsan, Rahmayanti, Purwanto, Sigit, Singh, et al. (2020)

Table 7. The Students' Average Score on PEB-COVID-19

No	Items	All (n=137)	Male (n=26)	Female (n=111)
1	The floor at home is cleaned with anti-bacterial fluids to avoid a variety of bacteria and viruses, including COVID-19.	3.81	3.92	3.78
2	Garbages in the house is disposed into appropriate places to avoid the spread of COVID-19.	4.65	4.81	4.61
3	Air circulation in the house is kept clean so that health is maintained to prevent a decrease in body immunity to prevent COVID-19.	4.51	4.54	4.50
4	I avoid going to public places with the potential to transmit COVID-19.	4.38	4.19	4.42
5	I avoid visiting places with dirty environmental conditions to avoid COVID-19.	4.56	4.35	4.61
6	I avoid traveling to a densely populated neighborhood to avoid COVID-19.	4.44	4.19	4.50
7	I avoid touching equipment such as elevator buttons, banknotes, and other media that have the potential to transmit COVID-19.	3.74	3.62	3.77
8	I wash my hands after touching metal objects in public places, to avoid COVID-19.	4.26	4.31	4.24
9	I shake hands without touching to reduce the impact of COVID-19.	3.64	3.27	3.72
10	If there is trash in the surrounding environment, I will dispose of it and then wash my hands immediately to avoid COVID-19.	4.42	4.42	4.41
Raw Score		42.41	41.62	42.56
Average Score (0-100)		84.82	83.24	85.12
Category		Excellent	Excellent	Excellent

Source: Items adapted from Ichsan, Rahmayanti, Purwanto, Sigit, & Rahman (2020)

The results showed that the e-learning had been going well even though problems were encountered. Overall, e-learning has helped students to continue learning at home during the COVID-19 outbreak. This greatly helps the learning process, given the physical distancing policy that is implemented during the COVID-19 outbreak. Basilaia & Kvavadze (2020) suggest that e-learning format can be useful in the post-pandemic period, especially in the case of students with special needs. The effectiveness of online teaching and learning highly dependent on students' high-level active learning outside of classrooms (Bao, 2020). The implementation of e-learning, must continue to be improved to support learning at all levels (Leeuw et al., 2016; Saadé et al., 2012; Teo et al., 2018; Velasquez & Evans, 2018). Shortcomings and problems experienced by students must be immediately solved. Based on the results of research, interesting new findings are discovered related to the difficulty of students in understanding the various learning materials.

Students have not been accustomed to independent study, Especially, on the topic that requires an explanation directly from the lecturer. Besides, not all students have an understanding of basic concepts. Lecturers have a role to clarify if the students misunderstand a concept. This clarification is important because it prevent misconceptions (Braasch & Goldman, 2010; Coley & Tanner, 2015; Djanette & Fouad, 2014; Keleş & Kefeli, 2010).

In addition to the results of research on e-learning, this research showed that students' HOTS scores as measured by HOTS-AEP-COVID-19 were in the poor category. This showed that the students' effort to understand the relationship between COVID-19 and environmental pollution must be improved. Students should be able to make innovations to help the government to socialize various

knowledge about COVID-19 to the wider community. That is because students have a role in society to develop various innovations (Ito & Kawazoe, 2015; Lince, 2016; Oncu, 2016; Rahmayanti et al., 2020; Seechaliao, 2017).

The research showed that students' PEB measured using PEB-COVID-19 was in the excellent category. This showed that the students understood the importance of protecting the environment. PEB is one of the important keys to protecting the environment to halt the spread of COVID-19. People who can take care of their environment will be able to make their environment cleaner and healthier. PEB needs to be built by all components of the community to be able to suppress the spread of COVID-19. PEB becomes an important component in building a more friendly environment (Kim & Stepchenkova, 2019; Runhaar et al., 2019; Schmitt et al., 2018; Truelove & Gillis, 2018).

Some findings showed HOTS understanding of COVID-19 was relatively low. Innovations such as the development of e-learning by the universities need to be made so that all students and lecturers can be facilitated and have the same e-learning standards. (Benaida & Namoun, 2018; Chalkiadaki, 2018; Chin & Chen, 2013; Lai, 2016; Yağci, 2017). Bao (2020) explains that to solve problems in e-learning, teachers should consider two phases of teaching, the offline self-learning phase, and the online teaching phase. In the self-learning phase, students should read the subject-specific reading materials before joining the class. In the online teaching phase, teachers should discuss with the students about their understanding and clear their misconceptions. This research found that most of the students were buying internet packet data for virtual learning. So, migrating from traditional or blended learning to e-learning will not possible an easy task as it contains many challenges

like the lack of internet bandwidth for both students and teachers (Crawford et al., 2020). Problems regarding the use of cellular data also need to be solved so that e-learning does not create a new economic problem for students during physical distancing.

CONCLUSION

Based on the results of the research, it was found that the use of e-learning during the COVID-19 outbreak was facing several problems. Besides that, the students' HOTS, measured through HOTS-AEP-COVID-19, were in a low category so it needs to be improved. This improvement needs to be done for students to have in-depth knowledge about the prevention of COVID-19 in their environments. Also, the results of the research showed that the PEB measured by PEB-COVID-19 was already in the excellent category. This indicated that students at Islamic universities have begun to realize the importance of protecting the environment to prevent further transmission of COVID-19. Further research needs to be developed concerning e-learning innovation during COVID-19.

REFERENCES

- Abidinsyah, A., Ramdiah, S., & Royani, M. (2019). The implementation of local wisdom-based learning and HOTS-based assessment: Teacher survey in Banjarmasin. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 5(3), 407–414. <https://doi.org/10.22219/jpbi.v5i3.9910>
- Afflerbach, P., Cho, B. Y., & Kim, J. Y. (2015). Conceptualizing and Assessing Higher-Order Thinking in Reading. *Theory into Practice*, 54(3), 203–212. <https://doi.org/10.1080/00405841.2015.1044367>
- Ahmad, T. B. T., & Nordin, M. S. (2014). University students' subjective knowledge of green computing and pro-environmental behavior. *International Education Studies*, 7(2), 64–74. <https://doi.org/10.5539/ies.v7n2p64>
- Ahorsu, D. K., Lin, C.-Y., Imani, V., Saffari, M., Griffiths, M. D., & Pakpour, A. H. (2020). The Fear of COVID-19 Scale: Development and Initial Validation. *International Journal of Mental Health and Addiction*, 1–9. <https://doi.org/10.1007/s11469-020-00270-8>
- Bakker, A., & Wagner, D. (2020). Pandemic: lessons for today and tomorrow? *Educational Studies in Mathematics*.
- Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, 2(2), 113–115. <https://doi.org/10.1002/hbe2.191>
- Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 coronavirus (COVID-19) pandemic in Georgia. *Pedagogical Research*, 5(4), 1–9. <https://doi.org/10.29333/pr/7937>
- Benaida, M., & Namoun, A. (2018). An Exploratory Study of the Factors Affecting the Perceived Usability of Algerian Educational Websites. *TOJET: The Turkish Online Journal of Educational Technology*, 17(2), 1–12.
- Braasch, J. L. G., & Goldman, S. R. (2010). The role of prior knowledge in learning from analogies in science texts. In *Discourse Processes* (Vol. 47, Issue 6). <https://doi.org/10.1080/01638530903420960>
- Chalkiadaki, A. (2018). A Systematic Literature Review of 21st Century Skills and Competencies in Primary Education. *International Journal of Instruction*, 11(3), 1–16.

- <https://doi.org/10.12973/iji.2018.1131a>
- Chin, K. Y., & Chen, Y. L. (2013). A Mobile Learning Support System for Ubiquitous Learning Environments. *Procedia - Social and Behavioral Sciences*, 73, 14–21. <https://doi.org/10.1016/j.sbspro.2013.02.013>
- Coley, J. D., & Tanner, K. (2015). Relations between intuitive biological thinking and biological misconceptions in biology majors and nonmajors. *CBE Life Sciences Education*, 14(1), 1–19. <https://doi.org/10.1187/cbe.14-06-0094>
- Crawford, J., Butler-Henderson, K., Rudolph, J., & Glowatz, M. (2020). COVID-19: 20 Countries' Higher Education Intra-Period Digital Pedagogy Responses. *Journal of Applied Teaching and Learning (JALT)*, 3(1), 1–20. <https://doi.org/10.37074/jalt.2020.3.1.7>
- Dahl, A. J., Peltier, J. W., & Schibrowsky, J. A. (2018). Critical Thinking and Reflective Learning in the Marketing Education Literature: A Historical Perspective and Future Research Needs. *Journal of Marketing Education*, 40(2), 101–116. <https://doi.org/10.1177/0273475317752452>
- Djanette, B., & Fouad, C. (2014). Determination of University Students' Misconceptions about Light Using Concept Maps. *Procedia - Social and Behavioral Sciences*, 152, 582–589. <https://doi.org/10.1016/j.sbspro.2014.09.247>
- Durr, E., Bilecki, J., & Li, E. (2017). Are Beliefs in the Importance of Pro-Environmental Behaviors Correlated with Pro-Environmental Behaviors at a College Campus? *Sustainability: The Journal of Record*, 10(3), 204–210. <https://doi.org/10.1089/sus.2017.29105.ed>
- Elleithy, K., & Sobh, T. (2015). New Trends in Networking, Computing, E-learning, Systems Sciences, and Engineering. In K. Elleithy & T. Sobh (Eds.), *Lecture Notes in Electrical Engineering* (Vol. 312). Springer International Publishing. <https://doi.org/10.1007/978-3-319-06764-3>
- Erduran, S. (2020). Science Education in the Era of a Pandemic to Education for Understanding and Solving the Covid-19 Crisis? *Science & Education*.
- Ichsan, I. Z., Rahmayanti, H., Purwanto, A., Sigit, D. V., & Rahman, M. M. (2020). PEB-COVID-19: Analysis of Students Behavior and ILMIZI Model in Environmental Learning. *Jurnal Iqra': Kajian Ilmu Pendidikan*, 5(1), 1–11. <https://doi.org/10.25217/ji.v5i1.901>
- Ichsan, I. Z., Rahmayanti, H., Purwanto, A., Sigit, D. V., Singh, C. K. S., & Babu, R. U. M. (2020). HOTS-AEP-COVID-19: Students Knowledge and Digital Worksheet of ILMIZI Environmental Learning Model. *International Journal of Advanced Science and Technology*, 29(6), 5231–5241.
- Ichsan, I. Z., Sigit, D. V., Miarsyah, M., Ali, A., Arif, W. P., & Prayitno, T. A. (2019). HOTS-AEP: Higher order thinking skills from elementary to master students in environmental learning. *European Journal of Educational Research*, 8(4), 935–942. <https://doi.org/10.12973/eu-er.8.4.935>
- 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>
- Keleş, E., & Kefeli, P. (2010).

- Determination of student misconceptions in “photosynthesis and respiration” unit and correcting them with the help of cai material. *Procedia - Social and Behavioral Sciences*, 2(2), 3111–3118. <https://doi.org/10.1016/j.sbspro.2010.03.474>
- Kim, M. S., & Stepchenkova, S. (2019). Altruistic values and environmental knowledge as triggers of pro-environmental behavior among tourists. *Current Issues in Tourism*, 1–6. <https://doi.org/10.1080/13683500.2019.1628188>
- Kirigia, J. M., & Muthuri, R. N. D. K. (2020). The fiscal value of human lives lost from Novel Coronavirus (2019-nCoV) in China. *BMC Research Notes*, 13, 1–5. <https://doi.org/10.21203/rs.2.23296/v1>
- Lai, C. (2016). Integrating E-books into Science Teaching by Preservice Elementary School Teachers To cite this article : Integrating E-books into Science Teaching by Preservice Elementary School Teachers. *Journal of Education in Science, Environment and Health*, 2(1), 57–66.
- Lee, L. W., Mohamed, A. R., & Altamimi, A. A. (2015). Design, Development, and Evaluation of an Automated e-Learning Tutorial System to Instruct Pre-Service Special Educators in the Malay Braille Code. *Asia-Pacific Education Researcher*, 24(3), 481–494. <https://doi.org/10.1007/s40299-014-0219-9>
- Leeuw, R. A. D., Westerman, M., Nelson, E., Ket, J. C. F., & Scheele, F. (2016). Quality specifications in postgraduate medical e-learning: An integrative literature review leading to a postgraduate medical e-learning model. *BMC Medical Education*, 16(1), 1–10. <https://doi.org/10.1186/s12909-016-0700-7>
- Lince, R. (2016). Creative Thinking Ability to Increase Student Mathematical of Junior High School by Applying Models Numbered Heads Together. *Journal of Education and Practice*, 7(6), 206–212.
- Mccutcheon, K., Lohan, M., Traynor, M., & Martin, D. (2015). A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education. *Journal of Advanced Nursing*, 71(2), 255–270. <https://doi.org/10.1111/jan.12509>
- Nugraini, S. H., Choo, K. A., Hin, H. S., & Hoon, T. S. (2013). Students’ feedback of e-av biology website and the learning impact towards biology. *Procedia - Social and Behavioral Sciences*, 103, 860–869. <https://doi.org/10.1016/j.sbspro.2013.10.408>
- Oncu, E. C. (2016). Improved creative thinkers in a class: a model of activity based tasks for improving university students creative thinking abilities. *Educational Research and Reviews*, 11(8), 517–522. <https://doi.org/10.5897/ERR2015.2262>
- 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>
- Qian, K., Owen, N., & Bax, S. (2018). Researching mobile-assisted Chinese-character learning strategies among adult distance learners. *Innovation in Language Learning and Teaching*, 12(1), 56–71.

- <https://doi.org/10.1080/17501229.2018.1418633>
- Rahmayanti, H., Oktaviani, V., & Syani, Y. (2020). Development of sorting waste game android based for early childhood in environmental education. *Journal of Physics: Conference Series*, 1434(1), 012029. <https://doi.org/10.1088/1742-6596/1434/1/012029>
- Runhaar, P., Wagenaar, K., Wesselink, R., & Runhaar, H. (2019). Encouraging Students' Pro-environmental Behaviour: Examining the Interplay Between Student Characteristics and the Situational Strength of Schools. *Journal of Education for Sustainable Development*, 13(1), 45–66. <https://doi.org/10.1177/0973408219840544>
- Saadé, R. G., Morin, D., & Thomas, J. D. E. (2012). Critical thinking in E-learning environments. *Computers in Human Behavior*. <https://doi.org/10.1016/j.chb.2012.03.025>
- 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>
- Seechaliao, T. (2017). Instructional strategies to support creativity and innovation in education. *Journal of Education and Learning*, 6(4), 201–208. <https://doi.org/10.5539/jel.v6n4p201>
- Takahashi, B., & Selfa, T. (2015). Predictors of Pro-Environmental Behavior in Rural American Communities. *Environment and Behavior*, 47(8), 856–876. <https://doi.org/10.1177/0013916514521208>
- Teo, T. S. H., Kim, S. L., & Jiang, L. (2018). E-Learning Implementation in South Korea: Integrating Effectiveness and Legitimacy Perspectives. *Information Systems Frontiers*. <https://doi.org/10.1007/s10796-018-9874-3>
- Tian, S., Hu, N., Lou, J., Chen, K., Kang, X., Xiang, Z., Chen, H., Wang, D., Liu, N., Liu, D., Chen, G., Zhang, Y., Li, D., Li, J., Lian, H., Niu, S., Zhang, L., & Zhang, J. (2020). Characteristics of COVID-19 infection in Beijing. *Journal of Infection*, 80(4), 401–406. <https://doi.org/10.1016/j.jinf.2020.02.018>
- Toquero, C. M. (2020). Challenges and Opportunities for Higher Education amid the COVID-19 Pandemic. *Pedagogical Research*, 5(4). <https://doi.org/10.29333/pr/7947>
- 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>
- Velasquez, D. L., & Evans, N. (2018). Public library websites as electronic branches: A multi-country quantitative evaluation. *Information Research*, 23(1).
- Yağci, M. (2017). A Web-based Blended Learning Environment for Programming Languages : Students' Opinions. *Journal of Education and Training Studies*, 5(3), 211–218. <https://doi.org/10.11114/jets.v5i3.2118>
- Yeung, S. yin S. (2015). Conception of teaching higher order thinking: perspectives of Chinese teachers in Hong Kong. *Curriculum Journal*, 26(4), 553–578. <https://doi.org/10.1080/09585176.2015.1053818>
- Zhou, G., Chen, S., & Chen, Z. (2020). Back to the spring of Wuhan: facts and hope of COVID-19 outbreak.

Frontiers of Medicine, 1–4.
<https://doi.org/10.1007/s11684-020-0758-9>

Zohar, A., & Agmon, V. A. (2018). Raising test scores vs. teaching higher order thinking (hot): senior science teachers' views on how several concurrent policies affect classroom practices. *Research in Science and Technological Education*, 36(2), 243–260. <https://doi.org/10.1080/02635143.2017.1395332>