

The Voices of Students About Climate Change: A Preliminary Research

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ABSTRACT

Hydrometeorological disasters have recently been connected with the phenomenon of climate change. The phenomenon of climate change cannot be avoided and able to be an educational challenge in the future. Mastering the student's concept of climate change is very important for educators to know in preparing students to face global challenges in the future. This study aimed to describe the perception of climate change on 100 respondents randomly of junior high school, senior high school, and university students in Surabaya. By using the study case method through the provision of questionnaires, the results of this data's research were analyzed descriptively qualitative. Based on the research, it can be concluded that the students hard to distinguish the meaning whether is climate change or global warming. The majority of students less appropriate to express the opinion that climate change is caused by the depletion of the ozone layer. In fact, with the problem of low concept necessarily had a smart means to resolve.

Keywords: Perception, Climate change, Study case, and Questioner.

1. INTRODUCTION

The phenomenon of climate change is a real challenge that cannot be avoided lately [1]. This can be evidenced in the analysis conducted by Cook that there are 1980 scientific journals from 29083 writers discusses climate change and global warming [2]. J. Gupta also said that climate change is one of the impacts of environmental problems and can affect the world of education [3].

The topic of climate change also has an important role in the development of continuing education. The larger students know a lot about climate change, the more students are aware of protecting nature in the future. More emphasis on environmental education needs to be done for the purpose of continuing the Development [4]. Therefore, global education must be able to create a sustainable future for all. The lack of knowledge about the concept of climate change of the students were able to become a real threat to survival in the future dating [5]. Considering the importance of discussing climate change in the world of education, researchers want to know how big the concept of junior high school, senior high school and college students in discussing this case.

The cognitive level in understanding a science concept in each educational unit is very different. This case based on the statement of Jean Piaget's developmental theory which states that a child's cognitive level is formed gradually in line with the experience he receives. Generally, students of different ages receive different experiences, so that higher ages have better stages of formal thinking. However, it should be noted that each individual has a different intellectual condition [8]. Since it does not rule out the possibility that junior high school students have a better cognitive level than senior high school students. The cognitive level of students' scientific literacy also needs to be considered, especially discussing climate change. The results of Pisa according to Sach's analysis state that the level of scientific literacy of Indonesian students ranks 102 out of 162 countries. Therefore, there is a need for a reassessment of how much students' perspective errors make scientific literacy reach surprising numbers.

Generally, Growda, Fox and Magelky [10] theorized that the majority of students' misconceptions are (i) does not exactly answer the estimated increase in temperature that has been determined by the IPCC; (ii) the difficulty of understanding the relationship between CFCs, the

ozone hole and climate change; (iii) the warm weather is evidence of the effects of climate change; (iv) all environmental changes are climate change; and (v) students cannot distinguish between weather and climate and are not aware of the long-term nature of climate change. Based on the formulation of Growda et al. which was formulated over the last 24 years, this research was conducted with the aim of describing the students' misconceptions about climate change at this time in several different cognitive levels of students.

2. METHODS

This study uses a case study method by distributing questionnaires through Google Forms to 100 respondents at several levels of education units. The respondents were taken randomly consisting of 40 junior high school students, 40 high school students and 20 college students in several schools in Surabaya. Selection of a random sample aimed for researchers to see how the pure knowledge of the respondents related to climate change. The case study questionnaire used in this study contains 3 main topics of discussion, they are (1) Understanding climate change; (2) The impact of climate change; and (3) Solutions provided to reduce the impact of climate change. There are five questions in the case study questionnaire in the form of 2 multiple choice questions, 3 essay questions, and there are big questions with confidence level answers to each question. The addition of confidence level questions aims to make students answer with the cognitive they have or just guess. The results of the research data were processed mathematically using descriptive statistics, then analyzed on descriptive quantitative.

3. RESULTS AND DISCUSSION

This study discusses 3 main perspectives of students about climate change, namely, (1) Understanding climate change; (2) The impact of climate change; and (3) Solutions provided by students to reduce the impact of climate change. All these discussions were analyzed according to 3 different levels of education units.

3.1. Understanding Climate Change

Asking the definition of climate change is the most important thing when asking a student's basic knowledge. The students are considered to understand a concept if they are able to define the purpose of the problems discussed [11]. In the instrument, the researcher formulates a question that discusses the definition of climate change. Based on the questionnaire that has been made, the results obtained in Figure 1.

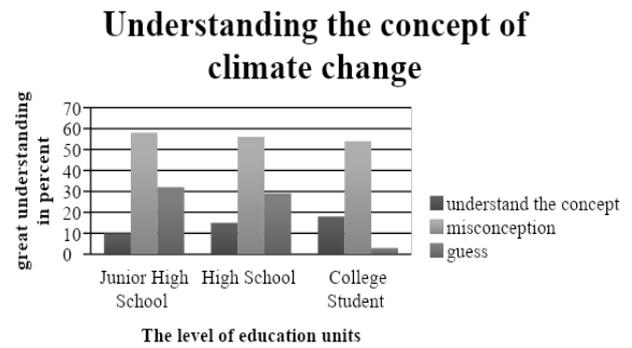


Figure 1 Understanding the concept of climate change.

Based on Figure 1, it can be seen that there are still high misconceptions experienced by the students at every level of the education unit. The percentage of the students who understand the concept also tends to be lower than students who guess. This proves that the level of students' understanding of climate change is still low. This opinion is also reinforced by Hartati's opinion which shows that students' initial understanding of climate change tends to be low [5]. Then the picture is also explained that with every increase in the level of education, the percentage of students who understand the concept increases. Meanwhile, the percentage of students who have misconceptions and guesses tends to decrease as the level of the education unit increases.

This explains that the greater level of the student's education unit, the more information they get. This opinion is in line with Khiyarusoleh's opinion that the level of education of students is influenced by the amount of experience and information obtained during the course of his life [12]. Thus, the magnitude of students' conceptual understanding depends on the level of the education unit and the experience gained. The majority of misconceptions that occur in every educational unit owned by students are that it is difficult to distinguish the meanings of weather, climate, global warming and climate change. The presentation can be presented in Figure 2.

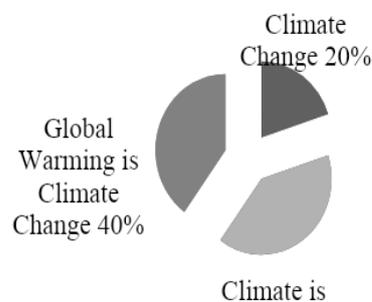


Figure 2 Percentage topic misconception.

Based on Figure 2, it shows that students tend to imply that climate change is the same as climate and global warming. This misperception is in line with Growda's five views on climate change. This illustrates that students' misperceptions are still the same from year

to year. According to Kao Shar misperceptions about climate change is not fully owned by students only. However, there is a possibility of misperceptions coming from the teacher's low understanding [13].

3.2. Impact of Climate Change

The next topic discusses students' perceptions of how the impacts arise from the phenomenon of climate change. The instrument provides to multiple choice questions and an essay question as illustrated in Figure 3.

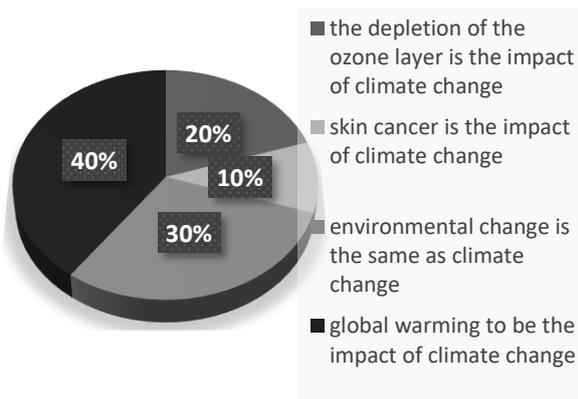


Figure 3 Percentage perception the impact from the respondent's misconception topic

Based on the picture, it can be seen that there are still misperceptions that students have about the impact of the phenomenon of climate change. There are 4 students' misperceptions that can be analyzed, (1) Students think that the depletion of the ozone layer is the impact of climate change; (2) Students think that skin cancer is the impact of climate change; (3) Students think that environmental change is the same as climate change; and (4) Students consider global warming to be the impact of climate change. The misperception about global warming is that the impact of climate change is still relatively high. In this case, it can be seen that students do not understand how the process of climate change occurs. Students tend to get confused between global warming and climate change. These misperceptions have in common with students' perception expressed by Plutzer [14] about the environmental changes is climate change.

3.3. Solutions provided by students to reduce the impact of climate change

The next discussion is to measure the amount of student knowledge to reduce the impact of climate change. In this case, students are given the opportunity to give their ideas about actions that can be taken to reduce the impact of climate change. Based on the questionnaire given, there are various perceptions given by students, including: (1) Using renewable energy sources; (2) Reducing the use of single-use plastics; (3) Carrying out

reforestation; (4) Do 3R (Reuse, Reduce, Recycle); and (5) Reducing the use of products that can increase the effect of greenhouse gases. The idea given is able to describe how the level of students' concern for the environment is based on the knowledge they have. This is in accordance with the solution provided by Adib [15] regarding the idea that the majority of students gave to reduce the impact of climate change. However, the explanation given is only global opinion. Thus, it is necessary to have an instrument regarding the description of the forms of climate action carried out by students.

4. CONCLUSION

Based on the results of the study, it was concluded that the understanding of the concept of climate change at each level of the education unit was very different. Students who have a higher level tend to have a higher understanding of concepts than lower levels. The level of misconception in each educational unit is also lower with increasing levels of education. Student misunderstandings from 1997 and currently have the same topic, namely assuming climate change is the same as weather, climate and global warming. Then there are students who think that the depletion of the ozone layer is the result of climate change. The final discussion is the students' perception regarding the solutions that can be done to reduce the impact of climate change. Most of the students have provided the right solution, this shows that students' awareness of climate change is already high. Thus, the results of this study are used as a reference for developing learning tools, focusing on climate change. Through this approach to the development of learning tools, it can be trusted to reduce the impact of climate change. The approach taken is by connecting with continuing education. Where, sustainable education is able to create quality and highly competitive human resources in the future. Continuing education is also able to make students more creative, active, and concerned about the environment to overcome global problems and climate change.

AUTHORS' CONTRIBUTIONS

Mardiyanti Hartati: conceptualization, method and drafting manuscript. Madlazim: review and editing of manuscript. Eko hariyono: data curation, data visualization and editing.

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REFERENCES

- [1] A. Lehtonen, AO. Salonen, H. Cantell . Climate change education: A new approach for a world of wicked problems. In *Sustainability, human well-being, and the future of education* Palgrave Macmillan, Cham, 2019, pp. 339-374. DOI : https://doi.org/10.1007/978-3-319-78580-6_11
- [2] J. Cook. Closing the “consensus gap” by communicating the scientific consensus on climate change and countering misinformation. *Environ. Res. Lett.* 8(2013)024024. DOI : https://skepticalscience.com/docs/Cook_dissertation.pdf
- [3] J. Gupta, C. Vegelin. Sustainable development goals and inclusive development. *International environmental agreements: Politics, law and economics.* 2016 Jun;16(3):433-48. DOI : <https://doi.org/10.1007/s10784-016-9323-z>
- [4] U.N. Fadhilah, UNESCO Ingin Isu Perubahan Iklim Masuk Ke Kurikulum, *Republika, Research News*, 2016, Retrieved from <https://www.republika.co.id/berita/pendidikan/dunia-kampus/16/09/07/od3w46368-unesco-ingin-isu-perubahan-iklim-masuk-ke-kurikulum>
- [5] M. Hartati, E. Hariyono. Efektifitas Pembelajaran Fisika Terintegrasi Dengan Aksi Iklim Pada Prinsip Sdgs (Sustainable Development Goals) Dalam Meningkatkan Karakter Peduli Lingkungan. *Inovasi Pendidikan Fisika.* 2020 Jul 3;9(3). DOI : <https://ejournal.unesa.ac.id/index.php/inovasi-pendidikan-fisika/article/view/35188/31305>
- [6] S. Capel, M. Whitehead. *Learning to teach physical education in the secondary school: A companion to school experience.* Routledge; 2015 Apr 24.
- [7] M. Amien. Perkembangan Intelektual Siswa-siswa SMP. *Jurnal Ilmu Pendidikan.* 2016 Feb 5;3(4). DOI : <http://journal.um.ac.id/index.php/jip/article/download/1868/1595>
- [8] P.E. Sari, I. Koto, I. Sakti. Hubungan Kecerdasan Intelektual Dan Hasil Belajar Fisika Siswa Kelas XI IPA SMA. *Jurnal Kumparan Fisika*, 2019, 2(1). DOI : <https://doi.org/10.33369/jkf.2.1.49-56>.
- [9] J. Sachs, G. Schmidt-Traub, G. Lafortune. Speaking truth to power about the SDGs. *Sustainable Development Solutions Network.*; 2020 Aug 1. DOI : <http://www.indiaenvironmentportal.org.in/files/file/Speaking-Truth-to-Power-about-the-SDGs.pdf>
- [10] MV. Rajeev Gowda, JC. Fox, RD. Magelky. Students' understanding of climate change: Insights for scientists and educators. *Bulletin of the American Meteorological Society.* 1997 Oct;78(10):2232-40. DOI:https://journals.ametsoc.org/downloadpdf/journals/bams/78/10/1520-0477-78_10_2232.pdf
- [11] P.E. Sari, I. Koto, I. Sakti. Hubungan Kecerdasan Intelektual Dan Hasil Belajar Fisika Siswa Kelas XI IPA SMA. *Jurnal Kumparan Fisika*, 2019, 2(1). DOI : <https://doi.org/10.33369/jkf.2.1.49-56>.
- [12] U. Khiyarusoleh. Konsep Dasar Perkembangan Kognitif Pada Anak Menurut Jean Piaget. *DIALEKTIKA Jurnal Pemikiran Dan Penelitian Pendidikan Dasar.* 2016;5(1). DOI : <http://journal.peradaban.ac.id/index.php/jdpgsd/article/download/17/16>
- [13] JW. To. Design and Synthesis of Porous Carbon for Energy and Environmental Applications (Doctoral dissertation, Stanford University). DOI : <https://search.proquest.com/openview/a16fc4b7bd3e5d047159e500e57be876/1?pq-origsite=gscholar&cbl=44156>
- [14] E. Plutzer, M. McCaffrey, AL. Hannah, J. Rosenau, M. Berbeco, AH. Reid. Climate confusion among US teachers. *Science.* 2016 Feb 12;351(6274):664-5. DOI:https://smile.oregonstate.edu/sites/smile.oregonstate.edu/files/climateconfusion_article.pdf
- [15] M. Adib, Climate change adaptation strategies in the highland by vegetable farmers. *Bio Kultur*, 2014, 3, 420-9. DOI : https://www.researchgate.net/publication/350867621_Climate_change_adaptation_strategies_in_the_highland_by_vegetable_farmers
- [16] S. Anggaryni, Madlazim, E. Hariyono, J. Phys. Conf.Ser., 2019, 1417(2019)012090. DOI : <https://ejournal.unesa.ac.id/index.php/inovasi-pendidikan-fisika/article/view/35188/31305>
- [17] MN. Jauhariyah, BK. Prahani, K. Syahidi, UA. Deta, NA. Lestari, E Hariyono. ESD for physics: how to infuse education for sustainable development (ESD) to the physics curricula?. In *Journal of Physics: Conference Series 2021* Feb 1 (Vol. 1747, No. 1, p. 012032). IOP Publishing. DOI : <https://iopscience.iop.org/article/10.1088/1742-6596/1747/1/012032/pdf>