
Global Warming: Heating Up the Science Classroom

“What for, Sir?” asked Mark as Ador wrapped up his instructions regarding the final output for the chapter. Ador, a ninth grade science teacher in Ilocos Norte, Philippines asked his students to print slogans on plywood to be placed in strategic places in the town plaza. Mark and his classmates became uneasy as they scrambled to think of powerful slogans. Mark was becoming restless. He convinced his group mates to not make the signs. “Global warming will kill all humans, eventually,” Mark said. “So what is the point?” Ador was perplexed by these statements. He wondered how he would convince students that the assignment was worth their time.

Rhoda, another ninth grade science teacher in a neighboring high school, watched her students as they engaged in a debate about global warming. Two groups of students were seated facing one another. Rhoda had asked her students whether global warming was primarily caused by human activities. “Global warming is real.” That was Christy’s concluding statement to defend her group’s position on the topic. Her group mates applauded and cheered. On the other side of the classroom was a group of students who seemed to be bored by the academic exchange of ideas. Irene and two of her group mates were the only ones who seemed to be interested in defending their positions on the topic. “Global warming is caused by natural and human-induced activities. To say that only humans are contributing to global warming is not accurate,” Irene said. This statement seemed to be on target. The class was now interested in knowing who won the debate. Rhoda explained that the activity was not meant to be a competition. Still, a group of students asked, “So which position is correct then?” Rhoda tried to find an answer.

A Warning for Warming

Global warming was the central topic of Ador and Rhoda's ninth grade science classes. Warning about this catastrophic phenomenon was posted all over media and social networking sites. It was a topic that transcended all aspects of daily life.

Global warming, as the term denotes, is an increase in average temperature causing negative influences on atmospheric conditions, weather, and climate. A majority of today's scientists believe that global warming is caused by human activities. The increase in greenhouse gases in the atmosphere is considered the major culprit. Carbon dioxide, for example, is known to largely come from the burning of fossil fuels, land use changes, and industrialization.¹ On the other hand, a handful of skeptics dismissed the claims on increasing global temperatures and argued that this was part of the earth's normal cycle of warming and cooling.

The Intergovernmental Panel on Climate Change² projected an increase of 1.4°C to 5.8°C from 1990 to 2100 in the global average surface temperature. This warming caused increases in extreme weather conditions due to changes in the distribution of heat and energy flow.³ Global warming could increase the emergence of diseases, decrease agricultural productivity, cause sea level rise, and negatively affect terrestrial and marine organisms.

In the Philippines, the impacts of global warming were evident. The burden was now on the shoulders of every Filipino. As one of the most vulnerable countries in the world, the Philippines had already suffered some of the negative impacts of global warming such as prolonged drought, abnormal precipitation rates, flooding, environmental degradation, and increasing temperatures. In particular, the province of Ilocos Norte, located in the northern part of Luzon, had experienced extremely warm weather, reaching heat indices of more than 40°C. There were storm surges in coastal areas of the province caused by abnormal weather conditions. In a Senate Report, Ilocos Norte topped the list of highly vulnerable provinces during the 2010 El Niño. The prolonged drought resulted in the loss of approximately 20 billion Php (429 million USD)ⁱ for the country.⁴

Socioscientific Issues in the Classroom

Socioscientific issues are controversial in nature. These are basically social problems or dilemmas that are complex, open-ended, and contentious while having ties to science.⁵ When presented to high school students, socioscientific issues tend to stimulate critical thinking and promote intellectual, ethical, and moral development. Reasoning based on one's beliefs and assumptions plays an important role in teaching through the use of socioscientific issues.

Using socioscientific issues in the classroom is a pedagogical intervention which originated from the tenets of STS (science, technology, and society). Socioscientific issues allow students to see the other side of science. These issues provide focus on instructional procedures since these could help students develop a conceptual understanding of science as well as instill in them an appreciation of the interdependence between science and societal affairs. In the context of classroom teaching, socioscientific issues could help students develop logical reasoning skills. They could also learn from multiple perspectives as they interact with their peers. Teachers who plan to employ socioscientific issues in their classrooms need to be knowledgeable of the issue, skillful in guiding the classroom discussion, and conversant with the use of critical thinking.

i 0.021 PHP = 1 USD as of Oct. 2 2015.

Global warming is a socioscientific issue that has generated different views and actions worldwide. There are other socioscientific issues that warrant attention in modern society. In the province of Ilocos Norte, the potential socioscientific issues that could be infused in teaching and learning include deforestation, threats of oil spills, the effects of quarrying and mining, siltation, dwindling marine resources, and conservation of endangered species, among others.

In this particular case, the ninth grade science classes of Ador and Rhoda are completing the lesson on global warming as part of a unit on earth science. In the K to 12 basic education curriculum for science, part of the Grade 9 program is climatic phenomena such as global warming and El Niño. The use of socioscientific issues in ninth grade science is consistent with the primary aim of science education — to develop scientifically literate and responsible citizens capable of making informed decisions.

Looking Back at the Science Classes of Ador and Rhoda

Ador's class appreciated the information about global warming. What happened to the class then? Ador planned to dedicate three days to the discussion on global warming. He carefully selected the materials to be presented in class. As usual, he used his computer-aided presentations. Ador's lecture centered on pictures showing the negative effects of global warming. Some of the students became uneasy as they looked at each picture. Some were talking with each other while others seemed uninterested with the series of pictures being flashed on the screen.

"Sir, these pictures are really frightening," commented one student. Another student shouted, "It's photo shopped." A raucous laughter engulfed the room. This irritated Ador and so he stopped flashing the pictures. He then asked the student who disturbed the class to explain global warming. The entire class suddenly became quiet. Convinced that he needed to show the other pictures, Ador continued flashing the pictures. At the end the session, he distributed copies of an editorial cartoon showing how skeptics viewed global warming. The cartoon was titled, "The Last Global Warming Non-believer." It depicted a man who was lying on the beach under the sun and reading a newspaper with a headline, "Alaska's glaciers melting fast." The man was submerged in water. His companions were running for their lives while he seemed undisturbed. Another round of laughter from the students was heard as they looked at the editorial cartoon. Ador then required the students to write an essay regarding the editorial cartoon. The students complied. To Ador's surprise, the majority of the students explained what global warming is. One student wrote just three sentences which he copied from the materials provided by Ador.

To vary his activities for the second day, Ador planned to have the students watch a video. Ador started the class by saying, "Class, let us watch a movie this time." The students' excitement was evident. Some students made unnecessary noise. Ador then asked the students to help him set up the equipment to be used for film viewing. "Have you seen this movie before?" asked Ador. Ador showed his class the movie *An Inconvenient Truth*. Most of the students seemed surprised and replied that they had not seen the movie. A handful raised their hands saying that they had seen the movie. "It is so negative" commented one student. "*Nagbuteng!* (Frightening!)" another student shouted. Ador ignored the students' comments. Then he hit the play button and started the film. Most of the students watched intently while others seemed uninterested. There were a few who moved around the room chatting with their classmates. Other students started drawing some odd figures on their notebooks. The students' behavior started to get on Ador's nerves. Ador controlled his temper. He hit the pause button and said, "I will give you work to do after watching this movie so you better behave now." After finishing the movie, the bell rang, so there was no more time for the activity. He then made it an assignment for his students. He also assigned them to bring the materials for the next class session.

The culminating class session for the lesson on global warming started with the question, "What did you learn from the movie *An Inconvenient Truth*?" A number of students explained their position on global warming. He was satisfied and so he started instructing the students for the next activity. Ador announced, "Today, you will work in groups and think of a powerful slogan that could be painted on the plywood you brought. Your outputs will be posted around the town plaza." Mark raised his hand and asked, "What for, Sir?" Mark and his classmates became uneasy as they scrambled to think of a powerful slogan to be printed. Mark started convincing his group mates not to accomplish the given task since global warming was happening anyway. "Global warming will kill all humans, eventually," Mark continued. Ador was speechless. He was disturbed by such statements from a Grade 9 student. How would he handle these? Had the pictures and movie been too powerful to leave his students feeling hopeless? He leaned on his chair and reflected. The bell rang and the students rushed to get to their next class.

In a neighboring public secondary school, Rhoda was assigned to teach ninth grade science. She taught a section with more than 40 students. She had been with the school for over five years. She was also a product of this secondary school where she graduated with honors.

Rhoda's class was heating up as the debate on global warming started. The students insisted that a winner be declared. Prior to this meeting, Rhoda's students were active and seemed to be engaged with the topic.

The second day started normally in Rhoda's class. Her students seemed to be prepared for another round of discussions. Rhoda earlier asked her students to bring drawing materials so they could have something to use for the day's activities. "Today, I will let you work individually and come up with a comic strip highlighting what you learned about our previous discussion on global warming," Rhoda explained. All students were on task.

After the students finished their work, Rhoda called on a few of the students to briefly present their outputs to the class. Christy volunteered and showed to her classmates the comic strip she prepared. She explained that global warming is primarily human-induced due to the burning of coal and other fossil fuels. She said that according to her mother, who was an environmental activist, power plants that burn fossil fuels are contributors to the increasing concentration of carbon dioxide in the atmosphere. Suddenly, one student stood and commented, "Irene's father works in a power plant. Maybe we could ask Irene about it." The class started to applaud and make noise. Irene was caught unguarded by this sudden revelation. She froze for a bit and seemed to ignore the statement from her classmate. Rhoda noticed Irene's reaction but pretended to ignore it. The period was almost over and the presentations were not finished. She then stopped the presentations and reminded her class to be ready for tomorrow's debate on the topic global warming.

Rhoda engaged her Grade 9 students into an academic debate on the issue whether or not global warming is primarily caused by human activities. The students on both sides started to make noise as the speakers finished outlining their positions. What Rhoda could not understand was that majority of the students on the negative side appeared uninterested. These students did not even care to read about the topic regarding the side assigned to them. These students started complaining, "Ma'am, I do not want to participate because I want to be on the other side." The other students agreed and so noised ensued within the classroom. Rhoda remained unfazed and told her class to push through with the planned debate. It appeared that only Christy and Irene were prepared with their speeches to defend their positions. "Global warming is real," Christy concluded. Her group mates applauded and cheered leading the entire class into an unnecessary disturbance. "Global warming is caused by natural and human-induced activities. To say that only humans are contributing to global warming is not accurate," Irene said. After she left the podium, there was no reaction from the class. A group of students on the side

began to ask: "So which position is correct then?" There was noise all around forcing Rhoda to say that the activity was not meant to be a competition. Rhoda stood still as she thought about the best way to deal with her students. She had a mind full of questions, apprehensions, and regrets.

Endnotes

- 1 Maslin, M. "Global warming: A very short introduction." 2009. New York: Oxford University Press.
- 2 Intergovernmental Panel on Climate Change. "Climate change and biodiversity." 2002.
- 3 Francis, D. and Hengeveld, H. "Extreme weather and climate change." 1998. Ontario, Canada: Ministry of Supply and Services.
- 4 Senate Economic Planning Office. "Improving resiliency: Addressing the threat of climate change." 2010.
- 5 Sadler, T.D. "Informal reasoning regarding socioscientific issues: A critical review of research." 2004. *Journal of Research in Science Teaching*, 41(5), 513-536.