

# Using Teacher Training to Create a Sustainability Class

*Students' learning about sustainability and creating sustainable action plans for their school*



Photos: Robyn Isaak-Kwon

By Robyn Isaak-Kwon

SOME MATH TEACHERS might feel out of their element at a summer professional development course focused on energy and sustainability; however, in the summer of 2016, I attended a five-day Summer Teaching Institute entitled Framing Energy through Sustainable Building Science Technology. I signed up for the class because the topic was sustainability. Even though I was teaching mathematics, I was working on my Master's degree in conservation science. What I didn't realize was that exactly two weeks later I, along with two other teachers at the institute, would be teaching our own sustainability class. We ran it as a two-week 70-hour summer course as those were the parameters of the teaching opportunity. The ideas and activities from our course can be used for a standalone program or separately as part of an existing class or program for students aged 14–18.

## Background

The Sustainability and Sustainable Building Science Technology Institute, a one-week experience that was sponsored in part by South Seattle College and the National Science Foundation Project Grant no. 1406320, had a theme for each day: sustainability, problem/project-based learning, energy in the Pacific Northwest, high-performing buildings, and group work and presentations.

My team — Hrudya Nair, Nanotechnology/Physics Teacher at North Seattle College; Bruce Morris, Science Teacher at Auburn High School; and I — decided for the

class we would teach, we would combine this daily theme idea with the project-based learning model that we had been shown at the Institute. Project-based learning is also the model that is used for all classes at Cleveland High School in Seattle, WA, the school in which we would be teaching.

We also chose to incorporate the place-based learning model during which students can learn from their surroundings. Smith and Sobel point out that the real difference between place and community-based education and more traditional education is that the focus of the former is on the community, both learning from and contributing to the place where you are.<sup>1</sup> Learning takes place beyond the classroom, and it is done with others rather than in isolation. There should be a sense of community when working together on a common goal of continually becoming more sustainable.

Hungerford and Volk describe the Issue Investigation and Action Model of learning (IIAM).<sup>2</sup> After reading their article, I knew I wanted my students to go through this process. In a simplified version of this model, the students learn what the issues are, generate an action plan, do research, and present their findings. It was stated in the article that when the environmental instruction was focused on student ownership and empowerment, there was a positive behavior change. Based on the main goals of IIAM, we gave students a chance to choose the issue that is important to them when they develop their action plan. Letting students have a say in what they are doing increases motivation. A requirement of the class was for students to present an action plan with their community, Cleveland High School, where they had the free-

dom to choose what their project would be within the large, multi-faceted topic of sustainability.

The following week, July 18–22, 2016, my team members and I worked to arrange speakers, field trips, and activities that would help our students to gain an understanding of what sustainability is, and to create an action plan that they would carry out during the 2016–2017 school year. I had previously thought of sustainability in terms of how it pertains to the natural environment, but at the Institute, I came to see how it applies to the built environment as well. Thus, the title of the high school class we were creating and teaching would be *Sustainability in the Built Environment: Energy, Water, Waste*.

## The two-week course

The project-based learning model can increase student motivation because the process of identifying a problem and coming up with a solution to the problem gives the students reasons to learn the material.<sup>3</sup> The IIAM of learning, where students are given the task of organizing a group after being introduced to the assignment, fits nicely with project-based learning. This should be done on the first day of instruction so that during the unit, students can focus on learning what they need to know, in order to accomplish their project goal. This also gives students reasons for why they should learn the material. The students presented their projects to an authentic audience of both instructors, peers, and community members. After the project presentation, the students should be given time for reflections.<sup>4</sup> We provided a survey for them to reflect on their experience after they did their presentations.

### Day 1: Sustainability

When the class started, most students didn't know what sustainability was when we asked them to define it. The World Commission on Environment and Development starts Chapter 2, of *Our Common Future*, with a definition of sustainable development. It states, "Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs."<sup>5</sup> That definition has evolved to include the subcategories of the environment, social equity, and economics. We looked at all of these components during our class.

The day opened with an icebreaker activity where students were given cards to match. One set of cards had each of the 50 United States' net annual carbon dioxide emissions and other had the U.S. population. Each student was given at least one CO<sub>2</sub> card and one population card. They were to find their match and calculate the CO<sub>2</sub> emissions per capita. Then, as a class, they needed to list them from least to greatest. This led to a discussion about what would contribute to the CO<sub>2</sub> emissions as well as the differences among the states. CO<sub>2</sub> emissions can be found at <https://www.eia.gov/environment/emissions/state/>. US populations can be found at <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>.

This activity was followed by a guest speaker, a teacher from Seattle College, presenting "Global Issues and Sustainable Development."

Finally, the Resource Conservation Specialist from the



local public school district presented information to the students about the high school, and what resources were available to students through the district and presented some project ideas. We introduced the project they would be doing to get them thinking about what they wanted to do and asked them to create their groups.

Each day of the class ended with questions for students to answer before they left. Today we asked students to answer 1) what they learned and 2) ideas they have for their project.

### Day 2: Energy use

According to the U.S. Energy Information Administration, about 40% of all energy used in the United States in 2015 was consumed for building use.<sup>6</sup> Due to large energy consumption in the built environment, it is well worth our time to find ways to reduce energy in that area.

We went to the Smart Building Center in the Pacific Tower Building, by Metro bus, to hear presentations and do activities about energy use. Students also learned about tools that are available to monitor and analyze energy use. When we got back, we gave students a power bill and they filled out questions about the parts of a local power bill, which helped them to understand how amount of energy consumption, type of energy used, and time of year effects the power bill. They were also asked to make predictions about power use based on the graph that compared the current year to the previous year.

### Day 3: Careers in sustainability

Students did activities that focused on energy (follow-up from the previous day). We started with a presentation that explained how to calculate a building's Energy Unit Intensity (EUI), and then asked students to calculate the EUI for their school. The second part of the presentation discussed how to

compare buildings' EUI, and students were asked to answer questions comparing their school to the national average for K–12 schools, the average for Western Washington high schools, and the average for Seattle high schools.

Next, we showed videos on CO<sub>2</sub> and had a class discussion. The students like this one in particular <https://www.npr.org/news/specials/climate/video/krulwich.html>.<sup>7</sup>

The morning concluded after students did an activity called Polar Bears and Petroleum from *Smart Consumers: An Educator's Guide to Exploring Consumer Issues and the Environment*.<sup>8</sup> In this activity students get an energy type fact sheet and a wildlife fact sheet before creating posters and sharing with each other how types of energy impact wildlife.

In the afternoon we had speakers who discussed how they are addressing the issues of sustainability in their work environment. They also talked about the pathways they took to get to where they are. This gave students a chance to see how they can make a difference through career choices.

#### **Day 4: Water**

We took a tour of our local wastewater treatment plant. As we were getting ready to leave, we showed slides about how we use water and what could be done to reduce our water use to get students thinking. We were able to take this trip completely cost-free due to the Wheels to Water program.<sup>9</sup> While this is a program that is unique to our area, I recommend starting with your county website and the facilities you want to visit to see what resources are available. When we got back, a Facilities Engineer from Fred Hutchinson Cancer Research Center delivered a presentation about what he and his crew are doing to reduce energy use and recycle water.

#### **Day 5: Garbage**

We took a tour of our local landfill so that students could get a sense of the magnitude of the garbage that is thrown away in this area. There was time when we got back for students to reflect on this and think more about their projects. This would be a good day to discuss waste and some sort of a refuse game. Another idea would be to have students go to your county solid waste division and make true or false cards. One set of cards that I have used in the past is shown in *Appendix A*.

#### **Day 6: Recycling**

This day we went to Recology Cleanscapes and the South Transfer Station. Recology Cleanscapes is the company that picks up the garbage at Cleveland High School, and it goes to South Transfer Station before being hauled off to Columbia Ridge Landfill by train. Recology Cleanscapes sorts recycling and sends the materials off to other companies that buy the sorted materials in order to make new products. Recology also has two in-house artists who have permission to use any materials that are brought into Recology for creating and selling their art. It was interesting for all of us to hear from them and to see the art they have created from our trash.

#### **Day 7: Solutions in sustainability**

On this day we visited the Bullitt Center, where students saw the roles buildings can play in addressing sustainability.

## **Summary of Teacher Institute Supply and Demand: Framing Energy Through Sustainable Building Science Technology**

The two-week program consisted of the following:

- Presentations by the instructors of the course and guest speakers
- A project requirement to create a teaching unit in sustainable building science technology that could be used for our target audience
- A visit to Smart Building Center where we were taught about energy and local energy use, and how we can monitor and reduce our energy use
- Visits to high performing buildings where the presenters showed what they were doing to become more sustainable in their building operations
- Time to work on our projects with professionals in the sustainability field available who provide assistance and resources
- Group presentations of projects

To see the agenda, speaker biographies, and pictures, go to <http://georgetown.seattlecolleges.edu/general/proceedings.aspx>.

Green buildings are buildings that conserve energy and water use, while maintaining a high-level indoor environment quality, and use materials that are highly efficient and/or made from recycled materials.<sup>10</sup> There is a need to not only build “Green” buildings, but to use them and their surrounding environments for educational opportunities.<sup>11</sup> Some suggestions given in Cole’s article were to have alternate forms of energy (such as solar panels), use and show machines that reuse water, plant native gardens, use recycled materials, and have signs or interactive stations that provide education and explain how these are all part of a larger whole with the goal of sustainability and conservation. The Bullitt Center is doing all of these things. They even have composting toilets. On their website, they are referred to as “the greenest commercial building in the world.” To read more about the Bullitt Center go to <http://www.bullittcenter.org/>.

When we got back, we showed videos about Seattle Youth Climate Action Network (CAN), a youth group that was started by students who participated in volunteer programs through the local zoo, aquarium, and science center, that focus on climate change, so students could see what other local students are doing to promote more sustainable behaviors. We also had a representative from the YMCA Earth Service Corp come and talk with them about their program and what they have to offer youth in the area. We felt it was important to show what other students their age group are doing and participating in to address environmental issues in their area. Our goal with this was to inspire and empower our students, and to highlight further opportunities for getting involved in conservation issues in their community.

We ended with the video, *The Story of Stuff* (<https://>



[storyofstuff.org/movies/story-of-stuff/](http://storyofstuff.org/movies/story-of-stuff/)), and had the students fill out questions to reflect on the concept of consumption.

### Day 8: Research for project

We had a professional for each group act as a resource to help students as they did research for their project. For their projects, the groups identified the problems of wasting water, garbage and recycling not being disposed of properly, and wasting energy by leaving lights on and windows open with air conditioning running, respectively.

### Day 9: Work day

Students filled out select pages from *Appendix B* of the Sustainable Design Project Teacher Manual.<sup>12</sup> Teachers then confirmed that each group's plan was fully developed, and then students spent the rest of the day in the computer lab working on their PowerPoint presentations.

### Day 10: Presentation of action plans

Students presented their action plans through PowerPoint presentations to my teaching team, our supervisor, and members of the sustainability profession. Each member of the audience was given a rubric to assess the students' work. Students were also given rubrics to evaluate each other. When discussing the student action plans, we emphasized how many projects get started and don't get followed through on and how the objective of their projects is for them to be something that will last.

## Reflections

Understanding sustainability is essential for our students and everyone who shares the planet if we are going to continue to enjoy the biodiversity that we have now. Through this course, the students had an opportunity to see what some of the issues in sustainability are, they experienced what people are doing to address these issues, and they talked with them and asked questions. After learning about what it means to be sustainable, they were given time to reflect on their own behaviors and those of their school community, and identify an issue they wanted to address within that community. The students created an action plan and presented that plan to their instructors (two co-teachers and I), peers, and other community members who mentioned that they want to see the student's presentations. During the following school year, they could implement their action plans and earn up to 20 community service hours, which is a requirement for graduation. If they did all the work and attended the entire two weeks, they earned a 0.5 elective credit toward graduation requirements as well.

If I were to run this program again, I would structure it so that the students met one more week in which they would do all the prep work for their action plan so that they could be ready to carry it out when the year started. They would thereby get service hours for that work rather than waiting for the school year to start.

It is also worth noting that while the focus of the class was sustainability, students did a great deal of math to interpret and analyze data. It is data that drives our decisions about sustainability.

The best resource I found for field trips and other resources was through our county website. King County Solid Waste provides a booklet every year with many resources for teachers.<sup>13</sup>

## Next steps

Cleveland High School's website homepage features the phrase, "Real-world preparation for success in personalized, relevant, and rigorous small learning communities." The two-week *Sustainability in the Built Environment: Energy, Water, Waste* course was just that kind of experience for our students. My hope is that they continue to learn more about sustainability so that their choices become more sustainable and that they may share their knowledge and influence others to make more sustainable choices.

---

**Robyn Isaak-Kwon** is currently a mathematics teacher and The Environmental Club advisor at Lindbergh High School in Renton, Washington. Robyn is finishing her Master of Arts in biology degree through Miami University's Project Dragonfly partnered with Woodland Park Zoo.

## References:

1. Smith, G. A., & Sobel, D. R. (2010). Place- and community-based education in schools. [electronic resource]. New York, NY : Routledge, 2010.
2. Hungerford, H.R. & Volk, T.L. (1990). Changing learner behavior through environmental education. *The Journal of Environmental Education*, 21(3), pp. 8–21.
3. Blumenfeld, P.C., Soloway, E., Marx, R.W., Krajcik, J.S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: sustaining the doing, supporting the learning. *Educational Psychologist*, 26 (3-4), 369-398.
4. New Tech Network. (n.d.). Tutorial-What is project based learning? Retrieved 4/15/2018 from <http://www.newtechnetwork.org/about/video/tutorial-what-pbl>.
5. World Commission on Environment and Development. (1987). Our common future. Retrieved 4/15/2018 from <http://www.un-documents.net/our-common-future.pdf>.
6. U.S. Energy Information Administration. (2016, April 6). How much energy is consumed in residential and commercial buildings in the United States? Retrieved 4/15/2018 from <http://www.eia.gov/tools/faqs/faq.cfm?id=86&t=1>.
7. Krulwich, R. (2007). Global warming: It's all about carbon [Episodes 1-4]. National Public Radio. Videos retrieved from <http://www.npr.org/2007/05/01/9943298/episode-1-its-all-about-carbon>.
8. Smart consumers: An educator's guide to exploring consumer issues and the environment. (2004). World Wildlife Fund.
9. King County. (2016). Wheels to water. Wastewater services education programs. Retrieved 4/15/2018 from [http://www.kingcounty.gov/services/environment/wastewater/~link.aspx?\\_id=IC180BEF8F1B4786AA0800641D0B7253&z=z](http://www.kingcounty.gov/services/environment/wastewater/~link.aspx?_id=IC180BEF8F1B4786AA0800641D0B7253&z=z).
10. Kriss, J. (2014, August 6). What is green building? US Green Building Council. Retrieved from <http://www.usgbc.org/articles/what-green-building>.
11. Cole, L. B. (2014). The teaching green school building: a framework for linking architecture and environmental education. *Environmental Education Research*, 20(6), 836-857.
12. Wheeler, G., Bergsman, K., Thumlert, C., & Kelly, B. (2010). Sustainable Design Project Teacher Manual Version 2.0. Olympia, WA: Office of Superintendent of Public Instruction.
13. Education & schools assistance. (n.d.). Retrieved from <https://kingcounty.gov/depts/dnrp/solid-waste/programs/education.aspx>.