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## Embedding Sustainability and Experiential Learning to Encourage Student-Led, Climate-Resilient Solutions at BSU

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# Embedding Sustainability and Experiential Learning to Encourage Student-Led, Climate-Resilient Solutions at BSU

*Diana Fox, Wanchunzi Yu, Robert Hellström, and Xiangrong Liu*

Climate change presents many global challenges because of glacier retreat, and coral reef deterioration, species extinction, and rising overall temperatures and sea levels, causing a multitude of problems, among them the complete submergence of islands in the world's oceans. Other than for the most vulnerable on the frontlines of its destruction, it is often difficult for many to see its immediate and potential effects in people's own locales.

At BSU, there is a team of faculty who actively integrate the concepts, foundations, and application of sustainability into teaching our students. Through different instruments and pedagogies, the instructors make this dialogue and potential action more accessible to students. Students benefit from these teachings because of hands-on experiences in the field, getting firsthand data, enhanced career readiness, and better placement opportunities with internal and external (regional and global) collaboration. The following are some examples of these learning practices.

## Dr. Diana Fox's Course

I grew up with a conservation ethic. A child during the energy crisis of the 1970s, I was continually reminded to turn off lights and taps, inculcating a lifelong habit. Later, my dad introduced me to a friend who told me about the century-long negotiation led by the Maori to gain legal personhood for the Whanganui River, which they claimed



*Dr. Diana Fox speaking to students at a Fall 2021 Sustainability Program Harvesting event. Photo: BSU Sustainability Program Intern, Elizabeth Whalen.*

as their ancestor. In 2017, that ideal was realized. Conversations at home about the personhood of "nature" ignited my imagination long before I discovered ecological anthropology. I share this story here as I do with my students: as a storytelling species, we can harness the power of empathetic stories in the classroom, imagining new possibilities such as a river being an ancestor rather than "a resource."

Exploring the varied ways that humans construct relationships with nature, from cosmologies that envision ourselves outside of "nature" to those that ensconce us firmly within an interconnected web of beings, is a necessary feature of sustainability thinking in my classrooms. Cultural diversity is analogous to biological diversity, variation offering endless opportunities to imagine new worlds into reality. "Our way of life" is not inevitable, and when we wake to human plasticity, we also wake to the opportunities for hopeful change. But how?

I pose this question to students, sparking their curiosity, creating an inquiry into the myriad of configurations of human cultural lifeways in relation to Earth. We can harness these and necessary new ways of thought that are ever-responsive to changing conditions, to live harmoniously with other living beings—including ancestor rivers, forests, mountains, seas, rocks. Whether through policies or poetry; learning about the meaning of a carbon footprint; supporting local farms toward food sovereign communities; marching in the streets with handmade signs; registering voters; reducing/reusing/recycling; addressing the psychology of climate anxiety, my students reflect on reshaping our consciousness, perceiving ourselves as part of an interdependent, interrelated whole. I subscribe to the late bell hooks' notion of *engaged pedagogy* grounded in the idea of a classroom comprised of whole people and directed toward liberatory change, connecting the classroom to the world. We cultivate hope, to unpack the ways in which systems of power have shaped what is taken to be universal knowledge, exposing ourselves to new knowledge systems revived from cultures whose epistemologies and ontologies have been repressed through oppressive systems. I emphasize that working for equity is working for sustainability: racial, gender, social, and environmental justice are intertwined.

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“I feel more comfortable and empowered in creating solutions for climate change. Exposure and engagement of farming culture is so crucial in developing passionate, environmental students including myself!”

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Rendering stories as pedagogy, I’ve also become more flexible with assignments, varying my modes of evaluation to include letter-writing campaigns as political engagement, activism, food diaries, as tools of self-discovery. Students research Indigenous cultural traditional foodways. Last year, we visited our permaculture garden—which I wish would be renamed, “Indigenous-wisdom-garden,” decolonizing the Western androcentricity of the idea of “permaculture,” a set of practices and ideas long implemented by global Indigenous peoples before institutionalized as “permaculture.” At the place of re-enacted Indigenous-wisdom, students reflect on transforming broken systems, experiencing healthier and respectful relationships with Mother Earth.

### Sustainability CUBEs and COIL Project in Dr. Xiangrong Liu’s Service Operations Management Course

Dr. Liu’s Service Operations course, MGMT 426, integrated Collaborative University Business Experiences (CUBEs) and Collaborative Online International Learning (COIL) to help increase students’ awareness of sustainability and stimulate their interest in applying managerial tools to solve sustainability problems.

As the first to experience CUBEs, two sections of MGMT 426 students received a project from the Sustainability Program to explore the database of the weather station at the BSU permaculture garden in fall 2021. This weather station was installed in fall 2015 and has been collecting data every 15 minutes since. Students conducted individual projects, each choosing one month of data in one dimension (for example, temperature or wind speed). Students applied what they learned about data analysis to inform decisions and actions regarding this service operation. As an example, one student used wind speed data in August to

assess corn pollination, supporting corn’s growth.

In spring 2022, students in the same MGMT 426 course worked on a research project endorsed by Sodexo, which provides dining services to BSU and other universities, and catering services to many organizations nationally and internationally. The project was an investigation of current sustainability practices at Sodexo, in order to provide suggestions for further improvements. BSU students utilized the American Association of Sustainability in Higher Education (AASHE) Resource Hub, to which BSU just subscribed as a member, to conduct the background research. Further, through a six-week virtual collaboration with students in a Business English course at Heilbronn University of Applied Sciences (HHN) in Germany, teams of two to four students from BSU and four to six students from HHN addressed one type of dining service from each university. Students in both universities not only improved their cultural competence, but also benefited from the comparisons of sustainability practices between the two universities. Students made final presentations of their recommendations for each university to dining services.



*Dr. Xiangrong Liu speaking to students at a Fall 2021 Harvesting event. Photo: BSU Sustainability Program Intern, Elizabeth Whalen.*



*BSU student and fall 2021 Sustainability Program Intern, Jenalyn Warcup, participating in the Fall 2021 Harvesting event. Photo: BSU Sustainability Program Intern, Elizabeth Whalen.*





BSU spring 2022 MGMT426 students in the Sodexo CUBEs project. Photo: Xiangrong Liu.

Among the areas they addressed were waste reduction, local purchasing, energy saving, and menu design.

Funded by the Academic Innovation Grant in 2019, the CUBEs initiative provides equal opportunities for students who are not able to take advantage of internships or other professional opportunities. One example of success is a student who obtained her dream job as a consultant to evaluate sustainability practices in local restaurants. With her sustainability minor, and capstone projects in sustainability, particularly the Sodexo CUBEs project addressed above, she stood out among over 300 applicants.

In addition, with the support of the BSU International Office, the COIL project with German students gave economically disadvantaged students an opportunity to interact with students from another country, enhancing their intercultural competence without having to finance travel.

Finally, these collaborations increased student awareness of sustainability issues (such as the effect of climate changes on organic farming, the use of business intelligence/technology in sustainable operations, and systematic overview of business sustainable operations) through hands-on experience without extra time or the need to leave campus. They also provided the clients/organizations with young people's views, attitudes, and determinations regarding sustainability practices.

## Sustainability CUBEs Project in Dr. Wanchunzi Yu's Time Series Analysis Class

The Time Series Analysis course is designed to educate students to visualize the trend of climate data locally and/or globally, including temperature, precipitation, and snowfall, and analyze the significance of the climate data. In this course, students not only learn the concepts and ideas but also conduct group research projects on climate change.

Climate change is a global challenge that has been at the forefront of public concern for the past few decades. Understanding it, as well as the direction it is heading, is of the utmost importance. There has been extensive research in the past that has addressed

this issue on a global scale, yet the results have not resonated with or convinced populations of the local implications of such research. With the support of the BSU Sustainability Program and CUBEs, students from the Math 398 course analyzed the real data collected every 15 minutes at the BSU permaculture garden including air temperature, soil temperature, wind speed, dew point, etc. Every student in my class picked two variables, and analyzed data either hourly, daily, or monthly. Even though the New England region has sustained no massive wildfire breakouts like California and no extensive ecosystem breakdowns (yet) like in the case of Australia's coral reefs, the effects of climate change don't have to be so dramatic for them to affect our livelihoods. In this research, our students found the trend of increasing temperature, which may affect the growing strawberries at the BSU permaculture garden. Other studies show that in the case of Massachusetts, the cranberry growing industry, which has been the state's primary agricultural industry since the early 1800s, has suffered due to increased temperatures. Warmer spring and autumn seasons act as catalysts for the continued emergence of pests and fungi, both of which can substantially reduce crop yields.

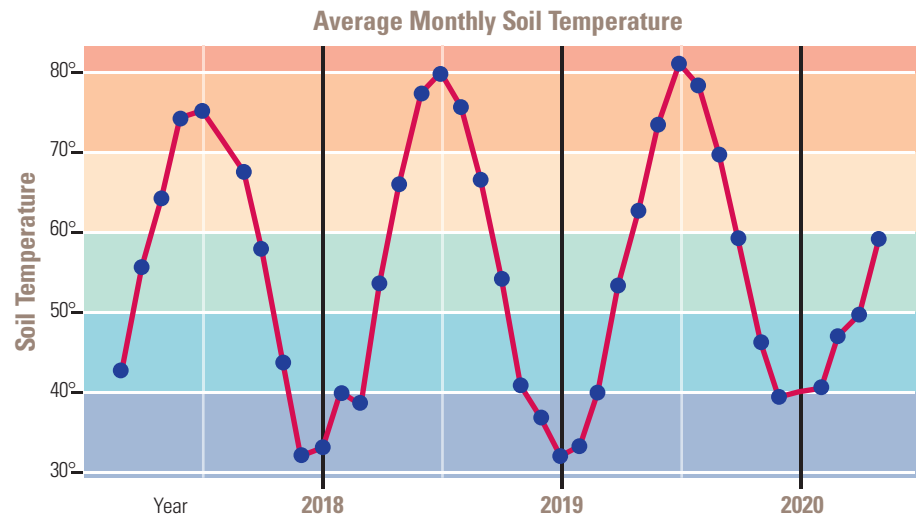


Figure 1: Average Monthly Soil Temperature Plot of BSU Permaculture Garden from Students' Research.

This real-life course project provided students with applied and useful statistical skills to conduct research and also promoted communication and collaboration between students from different majors (mathematics, statistics, computer science, and finance), which opened the door for interdisciplinary projects, including delving into statistical analyses related to important climate learning questions.

## Dr. Rob Hellström's Peer-to-Peer (P2P) Student Exchange

Farmers from diverse ecoregions around the world have stories of climate resilience to share and college students

are eager to listen and to be part of a solution that enhances food security. In 2021, Dr. Hellström led a team to establish an international peer-to-peer (P2P) student exchange featuring innovative farmer engagement, novel instrumentation, citizen science, and data sharing/visualization. A committee of agriculturalists and university professors from Massachusetts, Ohio, and Chile, the “Soil Keepers Roundtable,” met during biweekly Zoom sessions to plan student-farmer engagements and progress. A “Student Summit” consisting of 10 undergraduate students from BSU, The Ohio State University (OSU), and Universidad de Concepción held weekly Zoom meetings led by a graduate student

from OSU to listen to farmers’ stories and evaluate and compare the lived experience of climate change. The P2P team initiated, renewed, and enhanced dialogue between the farmers and the scientific and academic communities, thereby building relations. There were several outcomes.

One of the goals was to identify the climate monitoring needs of local farmers and challenge students to find their own solutions. A geography undergraduate student supported through the ATP Summer grant designed and deployed the low-cost BEARSense project at the Soule Homestead Education Center and Farm in southeastern Massachusetts. The goal of



BSU students and Dr. Hellström (far right) present a donation and learn about sustainable farming practices from Frank V. Albani Jr. (far left), former Executive Director, and Katie Roberts (second from right), Education Coordinator at the Soule Homestead Education Center in Middleborough, MA, March 2022. Photo: Xiangrong Liu.



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this project was to build and deploy a fully functional weather station that can be replicated at other locations in the United States and internationally. Another geography undergraduate student with ATP Summer grant support worked with the P2P team of students to develop a list of engaging questions to open dialog with farmers' perspectives on climate resilience and food security. Results were expressed in the form of powerful poetry and sculptures symbolizing the strength and resilience of small-scale farms in light of fluctuating climate extremes of temperature and rainfall.

Dr. Hellström particularly enjoys leading place-based learning, whereby students and local citizens learn through outdoor excursions to gain firsthand appreciation of how traditional farms operate under challenging conditions and to understand how advances in technology, such as hydroponics at Freight Farms in Boston, can serve urban communities. Students assist by helping to set up automatic weather stations at local farms and on campus and then analyze the data to gain an appreciation of microclimate variability between different locations.

Students summed up the P2P experience: "I got an opportunity to learn and express myself! More importantly, the ability to collaborate with like-minded

individuals and feel a sense of strength together. In addition, another feeling of sense of familiarity with sustainable approaches along with the culture of farming. Interviewing farmers broadened my perspective and highly influenced my artistic vision. I feel more comfortable and empowered in creating solutions for climate change. Exposure and engagement of farming culture is so crucial in developing passionate, environmental students including myself." Dr. Hellström's initiatives help connect people through a common interest, particularly empowering students to devise sustainable solutions to adverse impacts of an increasingly erratic climate system.

### Conclusion

Our collective scholarly and teaching endeavors draw from a toolbox of interdisciplinary student engagement, experiential learning strategies, telling stories to highlight native origins in sustainability, and partnerships with international universities. Most importantly, we encourage students to identify problems and collaboratively find solutions and develop action plans to mitigate and adapt to local climate change challenges.



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