**Name:** Karen Horikawa
**Email:** Karen Horikawa <khorikawa@wilmingtonfriends.org>
**Role**: Eighth Grade Biology Teacher, Wilmington Friends School, Wilmington, DE
**PI's name**: David Stern

**Teaching and Learning Ecology Using a Classroom Algal Photobioreactor**

**Karen Horikawa, Wilmington Friends School, DE**; Co-Authors: David Stern, Shawn Kenaley, and Tiffany Fleming, Boyce Thompson Institute for Plant Research, NY.

The algal photobioreactor laboratory (APBL) is a project-based activity designed to teach about ecology and increase awareness of sustainable biofuel production systems. APBL was introduced in an eighth grade biology class at a Quaker independent school in Wilmington, Delaware. This investigation increased the students' interest in ecology and sustainable systems thinking as well as provided hands-on learning opportunities relative to core concepts in environmental science and microbiology. Students increased their facility with the process of scientific investigation and engineering solutions to real-world challenges via hypothesis testing, experimental design, data analysis and modeling, and exploring the downstream implications of their work. APBL also enriched the students' learning experience(s), as the laboratory principles (scientific discovery, ecological stewardship, and sustainability) aligned with the school's core beliefs of environmental conservation and stewardship.

Students grew the alga *Chlorella protothecoides* in photobioreactors using laboratory protocols shared by the Boyce Thompson Institute's Curriculum Development Project in Plant Biology Program. Using eight nutrient-light combinations, they designed model ecosystems (photobioreactors) to support optimum algal growth for seven days. Students collaborated in groups of three to choose growth conditions and construct the photobioreactors. Upon establishing their own "model ecosystems," they observed varying shades of green in their setups indicating differences in algal (population) growth by ecosystem. Cell concentration per nutrient-light combination was measured using a spectrophotometer (optical density at 550 nm). Students presented data via charts, graphs, and photos, and then, prepared a final summary of their findings. Insightful questions were raised regarding the carbon footprint of biofuels and interspecific differences in growth among algae. Students also discerned from their study of ecology that biofuels could play an important role in mitigating global environmental and energy challenges. Their investigations also demonstrated that they too have a future role in shaping and preserving the natural world. Future plans to collaborate with another classroom are underway to compare species differences in reactor-grown algae and their potential utility (pros and cons) as biofuel feedstocks.

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