

COMMUNITY GRANTS PROGRAM



CASE STUDY

Green Chemistry Training for High School Teachers: Pollution Prevention

The American Chemical Society (ACS) is the world's largest scientific society and one of the world's leading sources of authoritative scientific information. A nonprofit organization, chartered by Congress, ACS is at the forefront of the evolving worldwide chemical enterprise and the premier professional home for chemists, chemical engineers and related professions around the globe. The mission is to advance the broader chemistry enterprise and its practitioners for the benefit of Earth and its people. The ACS is dedicated to: advancing science, advocating for chemistry, enabling career development, educating the public, supporting future chemists and promoting diversity.

The New York Section of the ACS (NYACS) is one of the regional organizations dedicated to promoting the mission of the national ACS. The NYACS has a long tradition of service in the advancement of the chemical sciences through education at all levels including organizing the ACS Mid Atlantic Regional Meeting (MARM). Green chemistry, the design of chemical products and processes that reduce or eliminate the generation of hazardous substances, was one of the featured topics of this conference in 2016. Growing and expanding green chemistry knowledge for local teachers is a priority of the organization.

Challenge

Currently, chemistry teachers are trained and instructed to use traditional laboratory exercises established decades ago in order to demonstrate chemistry concepts. Many common high school level laboratory exercises use highly hazardous chemicals, creating a high risk of exposure for students. With the presence of hazardous chemicals in laboratory exercises, many accidents occur in schools; 62% due to human error and 17% intentional acts.¹ By eliminating hazardous chemicals and providing alternative lab exercises teachers can create a safer and environmentally friendly learning environment.

Solution

With support from the New York State Pollution Prevention Institute (NYSP2I), NYACS partnered with Beyond Benign, a world-renowned green chemistry education organization based in Wilmington, MA, to execute the Green Chemistry Training for High School Teachers: Pollution Prevention in New York City Schools initiative. Beyond Benign is dedicated to providing future and current scientists, educators and citizens with the tools to teach and learn about green chemistry in order to create a sustainable future. Recognized as a leader for delivering high quality teacher professional development, Beyond Benign are leaders in facilitated teacher trainings across the globe resulting in 3,500 teachers introducing green chemistry to their students.

The Green Chemistry Training for High School Teachers: Pollution Prevention in New York City Schools initiative is aimed at the reduction of hazardous chemical use in high school classrooms, by training and providing 25 to 30 teachers with an introduction to green chemistry. Green chemistry offers a concrete path towards achieving goals of sustainability by instructing scientists how to design products that minimize hazardous materials and waste along with utilizing energy efficient processes from renewable feedstock that are biodegradable.

CHALLENGE

- Many traditional high school laboratory exercises use extremely hazardous chemicals, which creates high risk exposure for high school students
- With the presence of hazardous chemicals in laboratory exercises, many accidents occur in schools; 62% due to human error and 17% intentional acts

SOLUTION

- With support from NYSP2I, NYACS partnered with Beyond Benign to execute the Green Chemistry Training for High School Teachers: Pollution Prevention in New York City Schools initiative

RESULTS

- A total of 25 high school teachers were trained in green chemistry education
- By using green chemistry education, it was estimated that schools could save 71% to 84% per experiment which equals over \$1,000 in total savings for 500 students
- 89% of participants anticipated implementing 3 or more green chemistry labs
- 100% of participants would recommend this workshop to a colleague

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Green Chemistry presents a perfect platform for discussing the opportunities and benefits of careers in chemistry and science in our society, while stressing the importance of environmental responsibility. This message is one that resonates with young people and helps to inspire the next generation of scientists.

By applying green chemistry principles, schools in New York metropolitan area will effectively reduce use of hazardous chemicals. This initiative provided teachers with the resources and tools needed to effectively implement green chemistry concepts and practices into their classrooms.



Photo Credit: Beyond Benign

Results

A total of 25 teachers were trained in green chemistry education through webinars, workshops, online courses, or conferences. 89% of participants anticipate implementing three or more green chemistry labs and 100% of participants would recommend this workshop to a colleague. Pre-survey respondents acknowledged storing nitrate compounds (44%), silver compounds (22%), lead compounds (11%) and other chemicals of concern (22%). Based on the labs participants anticipate implementing, a reduction in the use of nitrates, silver and lead is expected. Additionally, by using green chemistry education, it has been estimated that schools could financially save up to 84% per experiment. For example, by switching the traditional Clock Reaction to the Greener Vitamin C Clock Reaction with 500 students, there is an overall cost savings \$1,091.85 in the purchasing and waste disposal costs and a reduction in waste from 29.5 gallons to 7.5 gallons eliminating the use of chemicals of concerns such as ammonium persulfate and potassium nitrate.



¹Hazardous Chemical Incidents in Schools – United States, 2002 – 2007, CDC, MMMMWR Weekly, November 7, 2008, 57(44), 1197-1200.

TESTIMONIAL

“There is a great deal of enthusiasm and interest around bringing green chemistry principles and practices to the teachers of New York City. This project fostered the opportunity to work with partners dedicated to providing tools and resources for pollution prevention.”

– Kate Anderson, Director of Education
Beyond Benign

Q & A

Q. “Did the workshop meet your expectations?”

A. “Yes, I had no idea what green chemistry was and now I have a deep understanding of its importance.”

Q. “Did the workshop increase your knowledge of green chemistry?”

A. “Yes, it gave alternatives to use and replace certain compounds.”

– Green Chemistry Training
Participants Reflections

NYSP2I PARTNERS



New York Manufacturing Extension Partnership

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