



University of Michigan – Flint

Green Chemistry education and outreach are a labor of love — After becoming a Green Chemistry Commitment signer in 2017, the Department of Chemistry at UM-Flint launched the first Bachelor of Science in Green Chemistry program in 2018. This is the first and only undergraduate program focusing on Green Chemistry in the United States. The program provides students a core chemistry education with exposure to diverse fields such as sustainable design, life-cycle analysis, toxicology, and electives centered around environmental justice. UM-Flint sees the value in training their students as Green Chemists as the chemical industry looks to hire graduates with the skills to solve complex problems related to sustainability. Professors Nick Kingsley and Jessica Tischler say: “Getting students interested in green chemistry has been the easy part. Many students are very passionate about environmental issues and are eager to learn and find more ways to be involved.”

A major strength of the Department of Chemistry at UM-Flint is its student group, who recently received the ACS Green Chapter Awards (2017-18 and 2018-19). This group of dedicated students made it a goal to win it again the following year – and did. In fact, the Chemistry Club at UM-Flint has received a Chapter Award for the last 18 years, nine of which were outstanding. The Demo Squad, the outreach group within the Chemistry Club, is very active and performs a variety of K-12 outreach events as well as events for pre-K and University-age students. For many years and in line with the Green Chemistry Principles, UM-Flint focused on establishing a culture of safety while performing demos, both for students performing them and for the audience. In line with these efforts, the students must complete a risk assessment form before performing any demos and must obtain any additional safety training as required by the assessment, such as cryogen training. They discuss what safety measures are being taken and why it reduces the risk and actively seek substitutions wherever possible to reduce risks. In the 2018-2019 school year, the Chemistry Club developed an hour-long Green Demo program for elementary and middle school students. Existing experiments recommended by Beyond Benign such as the biomimicry match game, Sharklet, and ocean acidification were modified for different grade-levels and a nanomaterials section was added to the program. An overview of this program was presented at the Spring ACS National Meeting in 2019. The Club hope to continue adding to their Green Demo program and be recognized as an ACS Green Student Chapter.

To departments looking to sign the Green Chemistry Commitment, Nick and Jessica have words of advice: “Be bold and innovative in your conversations. Go to ACS, GC&E, and BCCE meetings if you can and seek out the Green Chemistry education community. Get comfortable with self-promoting. Engage with faculty at campus-wide teaching and learning events. It’s a lot of figuring it out as you go.”

Why does University of Michigan – Flint participate in the Green Chemistry Commitment?

Leading the way in Green Chemistry education

Students at UM-Flint can get exposed to Green Chemistry principles related to sustainability, environmental justice and systems thinking across many different departments including, English, Sociology, Engineering, and Geography Planning and Environment. To broaden the program opportunities for students, UM-Flint is in the process of developing a Green Chemistry track to their Bachelor of Arts degree.

Be your own Green

Regarding signing the Green Chemistry Commitment, Nick and Jessica say: “You don’t have to have all the answers to start! Departments should realize that every step moving forward in Green Chemistry is important and everyone is doing unique things in green chemistry.”



What is Green Chemistry?

Green chemistry is the design of chemical products and processes that reduce and/or eliminate the use or generation of hazardous substances. This approach requires an open and interdisciplinary view of material and product design, applying the principle that it is better to consider waste and hazard prevention options during the design and development phase, rather than disposing, treating and handling waste and hazardous chemicals after a process or material has been developed.

The Green Chemistry Commitment (GCC) is

helping to *transform chemistry education* in college and university chemistry departments that strive to:

- prepare world class chemists whose skills are well aligned with the needs of the planet and its inhabitants in the 21st century, and
- design and develop innovative, efficient, and environmentally sound solutions to the safety and effectiveness of chemical products and processes.

The Green Chemistry Commitment offers access to a broad and supportive community of chemistry experts and a flexible framework for green chemistry curriculum and training. With multiple pathways to the implementation of green chemistry education, the Green Chemistry Commitment sets a benchmark to track progress on specific learning and research objectives.

With the GCC, college and university faculty can band together to share resources and experience to shift how and what the next generation of chemists learn. Students will enter the workforce armed with the necessary skills, knowledge, and confidence to be leaders in making the principles of green chemistry standard practice in all fields and sub-disciplines of chemistry.

Why introduce the Green Chemistry Commitment?

During the last 15 years, individual teachers, professors, and chemistry departments have introduced green chemistry concepts into lectures and lab activities, outreach initiatives, and some have even used green chemistry as the basis for academic research projects. The Green Chemistry Commitment seeks to build on the efforts of leaders in the field and systematically change chemistry education. The Green Chemistry Commitment aims to facilitate and support the development of a consortium program that unites the green chemistry community around shared goals and a common vision to:

- expand the community of green chemists
- grow departmental resources
- improve connections to industry and job opportunities in green chemistry
- affect systematic and lasting change in chemistry education

“The Green Chemistry Commitment gave us the curricular foundation, support, confidence and networking opportunities we needed to build our program”

Quote from Nick Kingsley, Jessica Tischler

“The goal of Green Chemistry is for the term to disappear and it simply becomes how we practice chemistry.”

John C. Warner Co-author of “Green Chemistry: Theory and Practice” and Founder of the Warner Babcock Institute for Green Chemistry

Who is part of the Green Chemistry Commitment?

Colleges, universities, and industry leaders from around the world have signed the Green Chemistry Commitment for access to shared up-to-date resources, collaborative discussions and projects, improved curriculum, and accountability to track progress on specific learning and research goals.

The Green Chemistry Commitment is shaped and led by a Faculty Advisory Board comprised of faculty members of chemistry departments from across the United States, representing large and small academic institutions.

The supporting organization for the Green Chemistry Commitment is Beyond Benign (www.beyondbenign.org), a non-profit organization 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.

Beyond Benign’s vision is to revolutionize the way chemistry is taught to better prepare students to engage with their world while connecting chemistry, human health, and the environment. Beyond Benign is led by Dr. John Warner, a founder of the field of green chemistry and co-author of *Green Chemistry: Theory and Practice*, and Dr. Amy Cannon, the world’s first PhD in green chemistry.