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August 15, 2018

Prof. Thomas Schmidt  
Chair, Council on Teaching  
UI Office of the Executive Vice President and Provost

Dear members of the UI Council on Teaching,

This summer, with the support of the Teaching in Higher Education Travel Award, I was honored to represent the University of Iowa at the 22nd Green Chemistry and Engineering Conference, where I gave an invited oral presentation on our progress in developing sustainable curriculum for our organic chemistry instructional lab course for non-majors (CHEM:2410 Organic Chemistry Laboratory). A key outcome from my attendance at this meeting is a renewed appreciation for using the student-produced compounds from one experiment as starting materials for the next experiment. This approach teaches students the importance of considering the life-cycle of the materials that we use, so as to minimize impact on the environment. Consequently, I am working with my team-teaching partner Dr. Shuvendu Das to test some new examples of these procedures for the Fall 2018 CHEM:2410 course. To support this process, I am meeting weekly with a team of 12 graduate teaching assistants and the instructional staff, disseminating the insights and innovations I've brought back from this GC&E conference.

The abstract of my presentation is provided on the attached page, along with brief discussion of several networking and learning opportunities that are stimulating new innovations for better organic chemistry laboratory instruction here at University of Iowa.

Thank you for your generous support of our work!

Sincerely yours,

Gregory K. Friestad  
*Associate Professor, Chemistry*

## **Travel Funds Report to the Council on Teaching**

Gregory K. Friestad, Department of Chemistry

August 15, 2018

### **22nd Green Chemistry and Engineering Conference, Portland Oregon, June 18-20, 2018**

#### **Presentation Abstract:**

GC&E 260: Gregory K. Friestad, University of Iowa, Iowa City, Iowa, United States "Sustainability and biological perspectives: A coherent curriculum for the organic chemistry instructional lab"

*Abstract:* The organic chemistry instructional laboratory often includes students from diverse majors outside of chemistry: Pre-medicine, pre-pharmacy, and pre-veterinary students are accompanied by chemistry, biology, environmental science, and engineering majors. During a long-overdue refresh of our curriculum in this course, we recognized the need to engage all these diverse student populations via their interests in environmental responsibility and biological connections. At the same time, we wanted to continue offering our chemistry majors practical techniques of broad utility in research and career objectives. To address these dual purposes, we built a curriculum consisting of both in-house and modified literature experiments using normal glassware and preparative scale, with environmentally benign measures such as aqueous and solvent-free reactions. Development, implementation and outcomes in this full-year equivalent course will be discussed.

#### **Discussions with professional contacts:**

Attending the GC&E conference allowed me to meet with professionals who work in sustainable chemistry in a variety of capacities, including instructional development, industry R&D, and academic research programs. Here I list specific colleagues and new contacts with whom I had personal conversations, exchanging ideas about sustainability in organic chemistry: I was able to learn new perspectives on how sustainable chemistry plays a role in the pharmaceutical industry (Feng Xu, Process Chemistry, Merck & Co., Inc. and Neil Strotman, Bristol-Myers Squibb), and how academic researchers are discovering new tools to make chemistry processes and products less impactful on the environment (Jim Hutchison, Professor, University of Oregon and Mukund Sibi, University Distinguished Professor, North Dakota State University). I also interacted with several academic instructional faculty (Natalia Blank, Norwich University; Peter Bell, Tarleton State University; Michael T. Wentzel, Augsburg College; and Jane Wissinger, University of Minnesota) who provided me with new insights on adapting sustainability initiatives to instructional laboratories in all sizes and types of institutions.

#### **Research presentation sessions attended:**

In order to stimulate new ideas for implementation in the instructional labs, it was very enlightening to attend a variety of oral and poster presentations from research groups around the world who work in the areas of Green Chemistry and Sustainability. For example, "Greener Design in the Pharmaceutical Industry: From Discovery to Commercial Processes" included talks from industry professionals from around the world, and gave several examples of how drug candidates were made with minimized impact on the environment. A special symposium entitled "Continuous Processing: An Enabling Technology for Green Chemistry" taught me some cutting edge engineering aspects of how to do organic chemistry in continuous flow mode, rather than the traditional batch mode that we have always taught our undergraduates. This has gotten me excited to consider how to introduce the concept of flow chemistry in the organic instructional lab. A variety of instructional innovations were on display in student poster sessions, allowing me to see how other institutions have introduced new improvements to their Organic Chemistry Laboratory classes like ours here at Iowa.