

Overview of GC3 Project Group Activities

Advancing Green Chemistry Education



Rich Helling, The Dow Chemical Company
Joel Tickner, UMASS Lowell

GC3 Advancing Green Chemistry Education Group

Primary Focus of the Education Project Group

The GC3 Green Chemistry Education project group explores ways to embed green chemistry in university and professional education as well as in research, education, and development funding programs.

Project Objectives:

1. To develop a “policy statement” in support of green chemistry education at the university level: The statement can be widely supported by chemical companies, product manufacturers, and retailers supporting the need for:
 - ✓ The establishment of green chemistry programs at the university level, and
 - ✓ Graduates of institutions with green chemistry education programs being preferentially treated in the market place, all other aspects being equal.
2. Green Chemistry and Safer Alternatives Boot Camp: develop a 3-4 day “boot camp” for a broad technically savvy audience from materials designers and chemists to regulatory affairs experts.

Policy Statement on Green Chemistry Education

- Collaborative process with input from many of the GC3 companies and stakeholders
- Broadly supports sustainability in higher education, with a focus on green chemistry and green engineering principles
- The statement supports adoption of green chemistry and green engineering principles to be adopted in:
 - Science and engineering disciplines
 - Non-science disciplines
 - Continuing education and training within companies
- Statement puts forth a series of recommendations and commitments from the signing companies to academia

Policy Statement on Green Chemistry Education: Science and Engineering Disciplines

We encourage academic institutions to strengthen coursework, internships, and service learning opportunities so that **science and engineering students** are equipped with the following knowledge and skills:

- A working knowledge of the Twelve Principles of Green Chemistry.
- A working knowledge of the Principles of Green Engineering.
- A basic understanding of toxicology and public health, including addressing data gaps and tools for evaluation of toxicity, alternatives and trade-offs.
- The ability to recognize and assess the relative “greenness” (incorporating lifecycle impacts) of a chemical, product, material, or process. This includes familiarity with tools and strategies for evaluating alternative options.
- An understanding of how molecular and material design can affect the health, environmental, and performance attributes of a chemical or material.
- An awareness of environmental laws, policies, and market drivers that influence the use or generation of hazardous substances in industry.
- An appreciation of performance, economic, technical, and other considerations that are critical in moving from laboratory to commercial production of a new chemical, material, product, or process.

Policy Statement on Green Chemistry Education: Non-Science Disciplines

For students who are **not scientists or engineers**, we encourage academic institutions to strengthen courses in business, finance, policy, and relevant sciences as well as service learning opportunities and internships to equip these students with the following knowledge and skills:

- An understanding of the Twelve Principles of Green Chemistry.
- An understanding of the Principles of Green Engineering.
- An appreciation of the roles of science and engineering in society
- The ability to recognize ways in which technologies, processes, or products may harm the environment.
- An understanding of environmental laws, policies, and market drivers that influence the use or generation of hazardous substances in industry.

Policy Statement on Green Chemistry Education: Continuing Education and Training

It is crucial that **continuing education** programs ensure that both technical and non-technical employees acquire the following knowledge and skills:

- An understanding of the Twelve Principles of Green Chemistry.
- An understanding of the Principles of Green Engineering.
- An understanding of life cycle analysis and systems thinking in the design of products and processes.
- An understanding of environmental laws, policies, and market drivers that influence the use or generation of hazardous substances in industry.
- An appreciation of the performance, economic, technical, and other considerations that are critical in moving from laboratory to implementation of a new chemical, material, product or process in industry.
- An understanding of chemical hazards and hazard communication.
- An understanding of how to manage data gaps and tradeoffs
- An understanding of the roles of supply and value chains in advancing safer chemicals, materials, and products.

Policy Statement on Green Chemistry Education: Recommendations

Recommendations:

- ✓ Call on higher education institutions to adopt the knowledge and skills outlined in the position statement for science and engineering disciplines and non-science disciplines
- ✓ Call on manufacturing firms and suppliers to commit to ensuring employees receive continuing education on these topics

Policy Statement on Green Chemistry Education: Commitments

Commitments to Support Recommendations:

- ✓ Providing resources and support to work with academic institutions and suppliers in advancing recommendations
- ✓ Preferential hiring of people with demonstrated knowledge and ability of the recommendation
- ✓ Value and support research and innovation in universities where skills and knowledge are being adopted
- ✓ Value and support continuing education on these subjects for a range of staff
- ✓ Encourage supply chain companies to adopt similar practices and share commitment

* All other aspects being equal!

Signatories to date

Anvil Knitwear
Construction Specialties, Inc
EPEAT, Inc
Green Depot
Johnson & Johnson
Nike, Inc.
Seventh Generation
Staples
Steelcase
Sustainable Research Group
The Dow Chemical Company
The Wercs Ltd.

Potential next steps

- **Develop outreach strategy**
 - Link to Beyond Benign Green Chemistry Commitment
 - Outreach to university leadership
 - Outreach to NSF (re GC research grants)
 - Outreach on GC R&D bill
 - Connect to state green chemistry programs
- Press outreach
 - C&EN
 - Others

Objectives and Goals:

- To develop a boot camp for a broad, technically savvy audience
- Foster communication between job functions, sectors, and levels of supply chains on issues regarding safer alternatives and green chemistry
- Adult learning through “real-world” case studies
- Collaborate with other groups to design curriculum (i.e., Lowell Center for Sustainable Production, Beyond Benign, UC Berkeley, MA TURI, etc.)

Development Process:

- Identify audience
- Assess the need for such a training
 - Evaluation of corporate training programs
 - Evaluation of non-profit and academic training programs
- Gather existing curriculum and modules
- Identify gaps in curriculum for further development

GC3 Boot Camp Curriculum Framework DRAFT 1

Group	Bench Scientists	Process (Continuous) Manufacturing	Discrete Manufacturing / EHS / Quality	Customer & Consumer Functions	Procurement / Contracts / Legal	Post-sales Service & Support	Management & Administration
Typical Jobs / Functions	<ul style="list-style-type: none"> ➤ Chemists ➤ Materials Scientists ➤ Metallurgists 	<ul style="list-style-type: none"> ➤ Formulators ➤ Process Engineers ➤ Chemical Engineers ➤ EHS Staff 	<ul style="list-style-type: none"> ➤ Design Engineers ➤ Industrial Designers ➤ Mechanical Engineers ➤ Electronics Engineers ➤ Thermal Engineers ➤ Discrete Manufacturing Engineers ➤ EHS staff ➤ Quality Management 	<ul style="list-style-type: none"> ➤ Product Managers ➤ Marketing Staff ➤ Sales Staff ➤ Pre-sales Applications Specialists ➤ Product Packaging 	<ul style="list-style-type: none"> ➤ Buyers ➤ Contract specialists ➤ Corporate Attorneys ➤ Compliance Attorneys ➤ IP Attorneys 	<ul style="list-style-type: none"> ➤ Service & repair technicians ➤ Post-sales applications support ➤ Logistics ➤ Shipment Packaging 	<ul style="list-style-type: none"> ➤ Executive Level Officers ➤ HR staff ➤ Sustainability Officers ➤ Finance ➤ General Admin
Course Modules	<ul style="list-style-type: none"> • Advanced Intro to GC • Advanced GC levels • GC Metrics • Innovation • Hazard Communication • Toxicology 101 	<ul style="list-style-type: none"> • Intro to GC • Advanced GC levels • GC Metrics • Alternatives Assessment • P2 • Environmental Laws and Regulations • Innovation • Hazard Communication • Toxicology 101 	<ul style="list-style-type: none"> • Intro to GC • Alternatives Assessment • Design for Environment / Life Cycle Assessment • Environmental Laws and Regulations • Hazard Communication 	<ul style="list-style-type: none"> • Intro to GC • Alternatives Assessment • Compliance, standards, labeling • Environmental Laws and Regulations • Green Marketing • Business case studies and models 	<ul style="list-style-type: none"> • Intro to GC • Compliance, standards, labeling • Green Purchasing Programs • Environmental Laws and Regulations • Business case studies and models 	<ul style="list-style-type: none"> • Intro to GC • Alternatives Assessment • Environmental Laws and Regulations 	<ul style="list-style-type: none"> • Intro to GC • Compliance, standards, labeling • Business case studies and models • Green Marketing • Environmental Laws and Regulations

Another job function: Product Stewardship/Sustainability/Ingredient Policy

Status:

- Identify audience
- Assess the need for such a training
- **Gather existing curriculum and modules**
- **Identify gaps in curriculum for further development**

Target: Boot camp ready for launch in late fall 2012/Spring 2013
