

American Chemical Society



# Green Chemistry and Sustainability Education

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Green Chemistry in Higher Education

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# ACS Vision and Mission



## ❖ Vision

Improving people's lives through the transforming power of chemistry

## ❖ Mission

To advance the broader chemistry enterprise and its practitioners for the benefit of Earth and its people

# 2005-2014: UN Decade of Education for Sustainable Development



- ❖ **The United Nations Decade of Education for Sustainable Development (2005-2014)** seeks to integrate the principles, values, and practices of sustainable development into all aspects of education and learning, in order to address the social, economic, cultural and environmental problems we face in the 21st century.

# *Green at 15?*

- ❖ *How 15-year olds perform in Environmental Science and Geoscience in PISA*
- ❖ 2009 OECD report
  - ❖ U.S. below OECD countries
  - ❖ Understanding lags behind awareness

# Sustainability in the Chemical Industry



- ❖ National Research Council report
  - ❖ Based on outcomes of workshop held in February 2005
- ❖ Identifies eight grand challenges for sustainability in chemistry and chemical engineering
  - ❖ Highlights research needs

# Sustainability Education



## ❖ Challenge

- ❖ Improve sustainability science literacy at all levels

## ❖ Research

- ❖ Professional development opportunities
- ❖ Integrate sustainability concepts into assessments and accreditations
- ❖ Incorporate sustainability concepts into curricula

# Professional Development



- ❖ Green Chemistry in Education Workshop (University of Oregon)
- ❖ Targeted workshops (University of Scranton, Beyond Benign, ACS...)
- ❖ Symposia at professional meetings
- ❖ Summer Schools (ACS and EU)

# 2010 Summer School



- ❖ Green Chemistry and Sustainable Energy
- ❖ Colorado School of Mines
  - ❖ July 21-29
- ❖ Primary sponsorship by the ACS PRF
- ❖ 118 applications, 61 acceptances



# Integrating Sustainability Concepts



## ❖ Approval/Accreditation

- ❖ ACS: Students should conduct themselves responsibly and be aware of the role of chemistry in contemporary societal and global issues
- ❖ ABET: Students must attain “the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context”

# Integrating Sustainability Concepts



## ❖ Assessments

- ❖ ACS Exams Institute

- ❖ College Board

- ❖ National and state science standards

- ❖ NSES: Science in Personal and Social Perspectives (9-12)

- ❖ Environmental quality

- ❖ Natural and human-induced hazards

- ❖ Science and technology in local, national, and global challenges

# Incorporating Sustainability into Curricula



- ❖ Extends beyond the chemistry and chemical engineering major
  - ❖ Medicine, law, business, marketing
  - ❖ Green chemistry is chemistry's *unique* contribution to sustainability
- ❖ Includes research

# Green Chemistry Resources from ACS



- ❖ *Chemistry in the Community*
- ❖ *Chemistry in Context*
- ❖ *Introduction to Green Chemistry*
- ❖ *Real-World Cases in Green Chemistry*
- ❖ *Greener Approaches to Undergraduate Laboratory Experiments*
- ❖ *Journal of Chemical Education*

# International Year of Chemistry: IYC 2011



## ❖ Goals

- ❖ Increase public appreciation of chemistry in meeting world needs
- ❖ Increase interest of young people in chemistry
- ❖ Generate enthusiasm for the creative future of chemistry
- ❖ Celebrate 100<sup>th</sup> anniversary of the International Association of Chemical Societies and Marie Curie's Nobel Prize

# Opportunities and Challenges



- ❖ Pockets of excellence
  - ❖ Research, curriculum, outreach
- ❖ Additional resources needed
  - ❖ Textbooks, labs, professional development, exams
  - ❖ Move beyond organic
- ❖ Connect green chemistry with broader sustainability concepts

# Education for a Sustainable Future



- ❖ Develop well-informed global citizens
- ❖ Create a cadre of chemists who can design greener products and processes
- ❖ Create awareness of the role of science and technology in solving global challenges

