



# SENCER Showcase

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JULY 2, 2015

USING SOCIETAL ISSUES TO RECRUIT AND RETAIN STEM STUDENTS –  
INSPIRE PEDAGOGY WORKSHOP

# What is SENCER

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SENCER = Science Education for New Civic Engagements and Responsibilities

Mission: “SENCER courses and programs strengthen student learning and interest in the sciences, technology, engineering, and mathematics by connecting course topics to issues of critical local, national, and global importance.”

“Ideal 1: SENCER robustly connects science and civic engagement by teaching “through” complex, contested, capacious, current, and unresolved public issues “to” basic science.”

Origins: 2001 with funding from NSF CCLI

Affiliated with: National Center for Science and Civic Engagement (NCSCE)

Community of faculty interested in this approach to science education – annual conferences and regional meetings.

# SENCER Resources

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Website: <http://www.sencer.net/>

Model Courses & Projects: <http://www.sencer.net/Resources/models.cfm>

Topic Background: <http://www.sencer.net/Resources/backgrounders.cfm>

SENCER Symposia:

- Summer Institute: Worcester Polytechnic Institute, July 30-Aug 3, 2015
- DC Symposium: Sept. 27-29, 2015 at George Mason University & Capitol Hill
- SCI-Midwest: March 14, 2015 – “Teaching College Science and Math Through Food, Health, and Sustainability Themes”

Assessment: SALG – Student Assessment of Learning Gains ([www.salgsite.org/](http://www.salgsite.org/))

# Assessing Exposure to Toxic Chemicals: General Chemistry Applied to Human and Environmental Health

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[http://serc.carleton.edu/sencer/assessing\\_exposure\\_toxic/index.html](http://serc.carleton.edu/sencer/assessing_exposure_toxic/index.html)

Department of Chemistry, Hamilton College, Clinton, NY

Class: Advanced General Chemistry (Gen Chem option for advanced students)

Issue Focus: Exposure to toxic chemicals – BPA & flame retardants

Project Type: Laboratory & Seminar focus + 5 week independent research project

- Lectures – cover basic chemistry content
- Labs – prepare for analytical measurements in research project
- Textbook – Resource
- Readings – links to social issues: ie: Slow Death by Rubber Duck: The Secret Danger of Everyday Things, R. Smith, B. Lourie
- Speakers



# Assessing Exposure to Toxic Chemicals: General Chemistry Applied to Human and Environmental Health

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## Sample Lab Activities:

- Determining the amount of iron in iron supplements.
- Caffeine extraction as an example of the extraction of organic compounds from natural sources – teaches methods of extracting compounds from plastics and other materials.
- Determine the amount of cocaine on US currency – teaches extraction and GCMS methods.



## Sample Research Projects

- "Fire Retardants in Baby Products"
- "Effect of EtOH on Leaching of BPA"
- "The Effect of Phosphate, Amino Acids, and pH on the Leaching of BPA"
- "Assessing Exposure to BPA from Polycarbonate Cups"
- "Plastic Lining in Aluminum Cans Leach BPA"
- "Baby Bottles and BPA"



# Chance

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<http://serc.carleton.edu/sencer/chance/index.html>

Nagambal Shah, Professor of Mathematics, Spelman College, Atlanta, Georgia

Class: Quantitative Reasoning – Probability and Statistics for non-Scientists

Issue Focus: Current Issues and critical thinking using probability/statistics

Class Type: Lecture, Discussion, Case studies, Guest Speakers, Journal, Project

- Journal – students read and comment current news from the mathematical prospective
- Class Sessions – Discussion of one or two student journal entries
- Project – major research into the statistics of a general interest topic

Part of a larger Chance Initiative: <http://www.dartmouth.edu/~chance/>



# Chance

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## Sample Case Studies/News Articles:

- Breast Feeding raises IQ
- Mathematics of Love – TED Talk
- Benefits of Coffee
- Cancer and Luck – addressing the media’s misunderstanding of a scientific report
- Climate Change Reports – looking at incorrect explanations for p-values
- Deflate-gate statistics
- Game Theory analysis of football decisions (“Why Pete Carroll’s decision to pass was not as stupid as it looked”)

# Undergraduate Biochemistry Through Public Health Issues

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[http://serc.carleton.edu/sencer/biochem\\_public\\_health/index.html](http://serc.carleton.edu/sencer/biochem_public_health/index.html)

Matt Fisher, Associate Professor, Chemistry, St. Vincent College

Class: BioChem Sequence: Proteins & Metabolism and Nucleic Acids & Membranes (for majors)

Issue Focus: Health Issues (Alzheimer's Disease, HIV/AIDS, diabetes, influenza, multidrug-resistant tuberculosis, mental health, and cancer)

Project Type: Lecture, Readings, Final Project

- Topics – provide context for content in lecture
- Readings and respond – non-biochemical aspects of context topics
- Project – “Electronic Poster” on biochemical and non-biochemical aspects of an issue



# Undergraduate Biochemistry Through Public Health Issues

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## Sample topics:

- Alzheimer's disease – protein structure, stability, folding
- HIV/AIDS – enzyme kinetics and mechanisms
- Drug resistant TB – transport across membranes
- Mental Illness – signal transduction pathways

# Other Examples on a smaller scale

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## Extra Practice In Class Activities

- Replace textbook problems with real world problems – design a bridge, design a swing set, design a shaft for a given application – need to make assumptions, justify assumptions, and use technical info

## Example problems

- Replace textbook problem with problem linked to big problems
- Examples:
  - Water purification
  - Ethanol Production

## Homework activities

- Make a video explaining concept to high school students – partner with HS or Ed department to get feedback

# Summary

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***SENCER courses and programs connect science, technology, engineering, and mathematics content to critical local, national, and global challenges. Students and faculty report that the SENCER approach makes science more real, accessible, "useful," and civically important.***

This can be done on a number of scales, disciplines, class sizes, class foci, etc.