Environmental Science

SENCER TEAM

College of Arts and Sciences
Northeastern Illinois University

Summer 2009
Overview

SENCER

Organizational Models

Program Goals

Curriculum
Environmental science integrates a wide range of scientific disciplines necessary to understand the environment and the many interactions among its components. These interactions include both the impact of human activities on the environment and how the environment affects humans.
Rationale

- As a public institution, NEIU has an obligation to serve public and legislative concerns for environmental quality and its protection.

- NEIU has an environmental studies program focused on policy and management, but NEIU has no corresponding interdisciplinary, environmental science major.

- Careers: “The magnitude and complexity of environmental problems are creating a growing need for scientists with rigorous, interdisciplinary training in environmental science.”

  Employment opportunities in private, educational, corporate, and governmental sectors. *e.g.* Natural Resource Management, Environmental Protection and Monitoring, Global Climate Monitoring, Renewable Energy, Sustainability, Natural Habitat Restoration.
Northeastern Illinois University

SENCER SSI

- **SENCER** - Science Education for New Civic Engagements and Responsibility:
  http://www.sencer.net/

- **SSI** - SENCER Summer Institute 2008

SSI is an annual, intensive, residential, team-based learning opportunity for educators, academic leaders, and students. The SSI features a rich mix of plenaries, workshops, and concurrent sessions that focus on not only what students should learn, but how that learning might be accomplished.
SSI 2008: NEIU Participants

August 8-11, Santa Clara University (California).

- Abhijit Banerjee (geography & env. studies)
- David Rutschman (math)
- Greg Anderson (physics)
- John Kasmer (biology)
- John Al-Bazi (chemistry)
- Ken Voglesonger (earth science)
Post-Institute Implementation Award

- $3000 award for continued planning for an environmental science major.
- Assessment requirement: SENCER SALG

“Dear David,
Thank you for your application for a SENCER Post-Institute Implementation Award. The review panel recently convened to consider all requests and we are pleased to let you know that the panel recommended funding your proposal.”

Danielle Kraus
SENCER & NCSCE
10/01/08
Organizational Models
More Silos?

Model 1: A new, independent, vertical department.

Environmental Science is an interdisciplinary field. Shouldn’t it be connected to all of the STEM disciplines?
Tracks to Divide Us?

Model 2: Every department rolls their own.

Will this approach bring us together?
Model 3: A horizontal structure connecting disciplines, e.g. AFAM, LLAS, WSP.
NEIU’s environmental science program provides students with an interdisciplinary scientific framework for understanding the environment and making rational and informed decisions. Our program provides hands-on laboratory, field and analytical work that prepares students for careers in environmental science, and lives of informed civic engagement. Our program is designed to produce graduates who are qualified for employment with industry, governmental regulatory agencies, and environmental consulting firms as well as graduate study in environmental science or related fields.
Program Goals

Goal 1
Goal 1 cont.
Goal 2
Goal 2 cont.
Goal 3
Goal 3 cont.
Goal 4
Goal 4 cont.
Goals

1. **Scientific Knowledge and Understanding:** Students will gain the fundamental knowledge needed to investigate and understand environmental issues.

2. **Scientific Methods and Research Skills:** Students will gain a practical understanding of scientific research methods using hands-on laboratory, field, and analytical techniques and approaches.

3. **Communication:** Students will master effective oral and written communication skills that allow them to engage with diverse audiences on environmental subjects.

4. **Application of Knowledge and Skills:** Students will be able to work independently and in groups to apply the fundamentals of environmental science to important local, regional, national and global environmental problems.
Scientific Knowledge & Understanding

Students will gain the fundamental knowledge needed to investigate and understand environmental issues.

**Learning Outcomes.** Students should be able to:

1.1 Describe the interrelated contributions of different scientific disciplines to the study of the environment.

1.2 Describe and explain the connections and interdependence between humans and the environment.
Extended Learning Outcomes for Majors.  

SSBAT:

1.3 Demonstrate a solid understanding of the fundamentals of biology, chemistry, geology, mathematics, and physics.

1.4 Identify the causes of perturbations on the environment and describe the ways in which these disturbances propagate through, interact with, and affect the physical, biological and human components of a system.

1.5 Analyze scientific issues related to sustainability, energy, and our reliance on limited natural resources.

1.6 Integrate knowledge across the scientific disciplines that deal with the environment, and be able to demonstrate an in-depth understanding of environmental principles from a multidisciplinary, scientific perspective.
Scientific Methods & Research Skills

Students will gain a practical understanding of scientific research methods using hands-on laboratory, field, and analytical techniques and approaches.

**Learning Outcomes.** Students should be able to:

1. Understand the scientific method and how it is used to formulate and test hypotheses.

2. Demonstrate basic laboratory and field skills.
Extended Learning Outcomes for Majors.
Students should be able to:

2.3 Utilize scientific methods to formulate and test hypotheses.

2.4 Employ the range of technical, laboratory, and field skills necessary to study environmental systems.

2.5 Apply mathematical, statistical, and computational skills to analyze data and model environmental systems.

2.6 Identify and critically evaluate authoritative information on environmental issues (e.g., from peer reviewed scientific journal articles, and technical reports).
Communication

Students will master effective oral and written communication skills that allow them to engage with diverse audiences on environmental subjects.

Learning Outcomes. Students should be able to:

3.1 Communicate ideas effectively in writing.
3.2 Orally communicate ideas effectively.
Communication

Extended Learning Outcomes for Majors.
Students should be able to:

3.3 Demonstrate effective writing skills in various formats (e.g., essays, correspondence, technical papers, note taking), for different purposes (e.g., informing, defending, explaining, persuading, arguing, teaching), and for diverse audiences.

3.4 Demonstrate effective oral communication skills in various formats (e.g., group discussion, debate, lecture), for different purposes (e.g., informing, defending, explaining, persuading, arguing, teaching), and to diverse audiences.
Application of Knowledge and Skills

Students will be able to work independently and in groups to apply the fundamentals of environmental science to important local, regional, national and global environmental problems.

Learning Outcomes. Students should be able to:

4.1 Explain how environmental science can be used to address environmental issues in a wide range of settings, from the NEIU campuses to local neighborhoods to the Chicago metropolitan area and beyond.

4.2 Evaluate the impacts that life decisions have on the environment and apply this understanding to their personal choices.

4.3 Apply their knowledge through environmentally related civic engagements.
Application of Knowledge and Skills

Extended Learning Outcomes for Majors.
Students should be able to:

4.4 Work effectively in multidisciplinary teams to investigate environmental problems and identify solutions.

4.5 Apply their knowledge and scientific skills to towards the design of solutions to environmental problems.

4.6 Improve the quality of their environment by working toward sustainable development and environmental protection.
Curriculum
**Draft Curriculum**

**Area**

- **STEM Core**  45
- **STEM Electives**  14
- **ENVI courses**  10
- **Soc. Sci/Policy/Humanities**  9

**Major Total**  78

**Gen Eds + ENG-101**  33 → 24

**NEIU Degree Total**  111 → 102
Draft Curriculum

Area

STEM Core

STEM Electives

ENVI courses

Soc. Sci/Policy/Humanities

Major Total

Gen Eds + ENG-101

NEIU Degree Total

Credits

45

14

10

9

78

33 → 24

111 → 102
STEM Core: Life Science

Biology (10 credits)

- BIO-150: Essential Skills for Biologists (2 credits)
- BIO-201: General Biology (4 credits)
- BIO-202: General Biology II (4 credits)
STEM Core: Physical Science

Chemistry (9 credits)
- CHEM-211: General Chemistry I (5 credits)
- CHEM-211: General Chemistry II (4 credits)

Earth Science (8 credits)
- ESCI-207: The Atmosphere and Oceans (4 credits)
- ESCI-211: Physical Geology (4 credits)

Physics (8 credits)
- PHYS-206,201: Physics I (3 credits)
- PHYS-203: Physics I Lab (1 credits)
- PHYS-207,202: Physics II (3 credits)
- PHYS-204: Physics II Lab (1 credits)
STEM Core: Math (10 credits)

- MATH-177: Mathematical Modeling (3 credits)
- MATH-185: Pre-calculus Mathematics (4 credits)
- MATH-275: Statistics (3 credits)
STEM Core: Env. Sc. (10 credits)

- ENVI-1xx: (3 credits) Introduction to Environmental Science
- ENVI-3xx: Writing Intensive Seminar (3 credits)
- ENVI-3xy: (4 credits) Capstone
Other Considerations

- Required STEM Minor
- Emphases, Concentrations
- Certification Programs

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