

Environmental Studies: An Interdisciplinary Approach

**A Description of the Development and Design of
Illinois College's Environmental Studies Program**

**Berlin Conference on the Human Dimensions of Global
Environmental Change "Greening of Policies –
Interlinkages and Policy Integration"**

**3-4 December 2004
Berlin, Germany**

Kevin Klein – Professor of Economics

Contributing authors:

Kent Elwood – Professor of Psychology

Debra Beal – Professor of Environmental Studies

Winston Wells – Associate Professor of International Studies

Table of Contents

Introduction.....	1
Illinois College: A brief History.....	1
A Brief History of Environmental Studies at Illinois College.....	1
Staffing and Unique Features.....	2
The Environmental Studies Major: The Academic Program.....	4
Intentional and Unintentional Connections: The Interdisciplinary Connections.....	6
Summary.....	10

Introduction

In recent years, more students have chosen to channel their interest in the environment into an undergraduate major in environmental studies. Undergraduate programs in environmental studies have often had heavy emphasis in the studies of the natural and physical sciences. Although studying the natural and physical sciences as an undergraduate is necessary, the ability to develop solutions to environmental problems remains limited unless the student has a broader understanding of the social, economic, and political systems in which the environment exists. The Illinois College environmental studies program is an interdisciplinary program which, when designed, acknowledged that environmental issues are a result of complex human interactions. The program was thus designed to integrate several social science disciplines into a program of study that also has heavy emphasis in the study of natural and physical sciences. The program designers believe that only through such an interdisciplinary approach is it possible for students to develop solutions to important environmental problems. This paper will discuss the interdisciplinary program design of Illinois College's environmental studies program along with the rationale of the design.

Illinois College: A brief History

Illinois College was founded in 1829 by a band of Yale missionaries in what was then the new U.S. frontier state of Illinois. The Reverend John M. Ellis, a Presbyterian missionary in the U.S. West, saw the need for a "seminary of learning" in the new state of Illinois. True to its founding in 1829, Illinois College is a community committed to the highest standards of scholarship and integrity in the liberal arts. The College develops in its students qualities of mind and character needed for fulfilling lives of leadership, personal fulfillment, and service. Today, Illinois College remains a small liberal arts college with a student enrollment of approximately 1,000 students.

A Brief History of Environmental Studies at Illinois College.

Approximately five years ago, several faculty members saw a student need going unmet at Illinois College. Students who were deeply interested in pursuing a life dedicated toward environmental issues could only do so at Illinois College by majoring in the traditional sciences of biology and chemistry. While these disciplines of study are important to understanding environmental issues, the faculty involved with Illinois College's Environmental Studies program believed that environmental issues were much more complex than only biological and chemical issues. This perception existed primarily because of the recognition that the environment, while serving varied needs, also helps establish our identities. The list of human needs served by the environment is long, but includes:

- Natural resources such as fresh water, timber, and minerals.
- Crop and animal production.
- A recreation area.
- A disposal area for production and consumption residuals.

Human use of natural resources results in a wide array of environmental issues such as the non-sustainable harvest of natural resources, acid rain, global warming, decline in biodiversity, and changes in species. These issues are not only scientifically complex, but socially complex as well. Recognizing the complexity of these issues, the Illinois College faculty sought to develop an interdisciplinary environmental studies program that addressed the full range of environmental issues—scientific, political, social, and cultural. We sought for our students to develop not only an understanding of the science of environmental issues but the social aspects of environmental interaction as well.

To help address these issues in studying the environment, faculty interested in developing an environmental studies program began meeting to design an interdisciplinary/multidisciplinary program. As is true with most academic programs, the resulting program was designed by a committee. The program described below, which was developed over a one-year period, continues to evolve. Our approach is one that acknowledges that humans are part of the natural environment and that an individual as well as humanity is, in part, defined by our relationship to the environment. With this interdisciplinary understanding of the natural world, we believe that our students will begin to better understand how humans can develop workable solutions for sustainable interaction with the environment not only for the sake of humans but also on behalf the web of life.

Staffing and Unique Features

As with all small institutions, Illinois College found it difficult to fund an environmental studies program that was independent of other academic programs on campus. As a result, with the exception of the program director, staffing of the program occurs through adjunct appointments from other programs on campus.

At Illinois College, the environmental studies program is an interdisciplinary major that integrates courses in the natural sciences, physical sciences, and social sciences. Faculty from environmental science, chemistry, physics, economics, geography, international studies, ecological psychology and history participate in the program. Additional coursework is required in the fields of biology and mathematics.

Although many environmental studies programs are similar in design, we believe there are several features unique to our program that help our graduates gain an exceptional and distinctive understanding of both regional and international environmental issues.

These features include:

1. Location. We are:
 - a. Near important field research areas of regional, national, and international importance (Emiquon wetland restoration project¹).
 - b. Near important governmental offices involved in environmental issues.
 - c. Near diverse eco-systems, such as river, wetland, native grassland, woodland, and farmland, visited regularly in courses and fieldwork.
 - d. Are centrally located within the continental US to facilitate travel to all parts of the US.
2. History: Our faculty, students, and alumni have been and continue to be involved in key governmental agencies, advocacy groups, and private profit and non-profit corporations which work with environmental issues.
3. Field Courses which take students off campus. Field courses are required of all majors that investigate diverse eco-systems in the Midwest, as well as the Northern Woods, Florida and the Everglades, the Tropics, and the Southwest.
4. Required Internships: Through required internships and research opportunities a primary part of our mission is to provide students with on site learning and work experiences in many different areas of environmental studies. Past Interns have worked at The Illinois Department of Natural Resources (IDNR), The Nature Conservancy, The US Fish and Wildlife Service, IDNR Wildlife Rehabilitation Sites, Local Zoos, Local Landscape Nurseries, Public Gardens, and various parks.
5. Research Opportunities: Our students have the opportunity to participate in research, particularly in the fields of wetlands restoration ecology and the ecology of small mammals. Students have presented their findings at regional and national meetings. Students have particularly been involved with the Midwest Fish and Wildlife Society, The Animal Behavior Society, Regional Nature Conservancy Symposiums, The Illinois River Coordinating Council meetings and The Upper Mississippi River Research Consortium.
6. All students are taught the basic aspects of writing grant funding proposals as part of their Environmental Economics course. Upon completion of the grant writing training, students participate in grant writing for local environmental groups.

¹ Emiquon National Wildlife Refuge is an attempt to restore approximately 7,000 acres (2,800 hectares) of agricultural land to pre-European settlement flood plain wetland habit. For more information, log onto <http://nature.org/wherewework/northamerica/states/illinois/preserves/art1112.html>

The Environmental Studies Major: The Academic Program

As part of the 120 credit hours required for graduation, environmental studies majors are required to complete 44 credit hours of courses in the integrated disciplines. The course work required follows along with a course description, where appropriate.

Natural and Physical Sciences

- Two environmental studies interdisciplinary courses:
 - ENVS/BIOL 224 - Environmental Science. The study of the impact of human activities on the environment. Fundamental ecological concepts which indicate the balance of nature without humans are compared to current problems caused by human domination of the world. Topics include air, water and land pollution, energy and overpopulation.
 - One course chosen from:
 - ENVS 312 -- Illinois River Valley. Ecological, environmental, and economic factors are addressed with an emphasis on how humans have used and changed this ecosystem and how the ecosystem has determined local social and economic patterns throughout the past. Field trips and lab exercises taking students to important ecological and historical sites along the Illinois river are incorporated into the laboratory component.
 - ENVS 326 - Ecology of the Northern Woods. This course focuses on land use in the northern woods of Upper Michigan. Students investigate logging, fishing, and mining in the upper Great Lakes region. Ecological, environmental, and economic factors are addressed with an emphasis on how humans have used and changed this ecosystem and how the ecosystem has determined local social and economic patterns throughout the past 150 years. As part of the course, a mandatory one week long field trip to Northern Michigan is required.
- Students must complete an internship, independent study, or field school experience approved by the co-advisory committee.
- **Biology Courses**
 - Biology 324 – General Ecology. Principles of ecology illustrated by lecture and by the investigation of selected types of habitats.
 - And two courses from:
 - Biology 109 – Plants and Society. A presentation of the relationships between plants and people with strong emphasis on the economic aspects and implications of plants and fungi.
 - Biology 201 – Botany. A detailed study of the plant kingdom with an emphasis on diversity, identification of the local flora, and collecting/preparing herbarium specimens.

- **Biology 205 – General Zoology.** A detailed study of the animal kingdom with an emphasis on form and function, followed by a survey of the major phyla including protozoa.
- **Biology 245 – Microbiology.** The study of the central role that microorganisms play in the web of life, including the study of physiology, structure, metabolism, cultivation, diversity, and genetics of microorganisms.
- **Biology 301 – Vertebrate Biology.** A detailed study of the vertebrates (especially those in the Midwest) emphasizing the diversity, identification, comparative physiology and anatomy, ecology, and human impact on their populations.
- **Biology 325 – Tropical Ecology.** An introduction to the composition, structure, and function of tropical rainforests. Laboratory, held during spring break in Costa Rica, will emphasize biological diversity.
- **Biology 328 – Animal Behavior.** The behavior of animals as revealed by the ethological approach. Orientation, learning, social behavior, migration, and agonistic behavior. Laboratory held during spring break in Florida.
- **Biology 345 – Environmental Physiology.** Physiological adaptations of animals to survive in their environment with an emphasis on vertebrates.

➤ **Chemistry Courses**

- Chemistry 111 – General Chemistry I
- Chemistry 112 – General Chemistry II

➤ **Social Science Course**

- One course in Geography chosen from:
 - **Geography 102 -- Introduction to Physical Geography.** The study of the great natural regions of the world, earth-sun relationships, creation of landforms, and climates. Relationships between people and environment are stressed.
 - **Geography 203 – World Regional Geography.** A study of the natural, economic and cultural regions of the world, with emphasis on North America, Europe, and relationships between humankind and the natural environment.
- **Economics 372 – Environmental Economics.** A theoretical analysis of environmental pollution generation and suggestions for corrective policies. Emphasis is on resource allocation and the welfare and income distributional implications of public policy decisions. Students also learn the basics of environmental grant-writing.
- **International Studies 160 – Introduction to International Studies.** An interdisciplinary course that examines humanitarian, economic, political, social, cultural, and ecological issues from a global perspective. Highlights the contributions that history, geography, anthropology, political science,

economics, and other disciplines make to the field of International Studies.

➤ **Quantitative Reasoning**

- One course in quantitative reasoning chosen from:
 - Math 133 – Introduction to Functions. Introduction to Functions explores functions (linear, power, exponential, logarithmic, polynomial, and trigonometric), triangle trigonometry, and matrices through multiple representations of mathematical ideas -- words, numbers, graphs, and symbols. The concepts and skills associated with these topics are approached from the perspective of using them to create mathematical models to address questions about phenomena from the world around us.
 - Math 123 – Elementary Statistics. The study of basic descriptive and inferential statistical methods, with applications primarily to the biological, behavioral, and social sciences.

Intentional and Unintentional Connections: The Interdisciplinary Connections.

Recognizing that resolving any environmental issue is not only a scientific problem but, as importantly, a social problem, Illinois College's faculty intentionally designed the environmental studies program to include an emphasis on the social aspects of environmental change. A simple listing of these courses, however, does not reflect the deeper integration of the social sciences with the natural and physical sciences. Some examples of the deeper integration, provided by the teaching faculty, follow.

Environmental Sciences.

In the Illinois River valley and the Ecology of the Northern Woods courses, the professors engage the students in experiential learning from an ecological psychology perspective. This perspective holds that humans are part of the natural environment and that humanity and individuals is/are defined by their relationship to the environment. From this perspective, humans have neither an adversarial nor a caretaker relationship, but rather humanities' and individuals' identity and health depends on that of the environments.

In these courses, the professors start with studying and interacting with the physical environment and then proceed to the social environment (political, religious and economic institutions). Their study begins with the geologic history of the area, the dynamics of how the surface topography was formed and the structure of the bedrock. The students examine field evidence of how this geology has changed throughout recent geologic history. Special emphasis is given to the deposition or creation of natural resources (minerals, gravel, lime, clay) for mining, and the ground and surface water resources. In the west central Illinois region, aquifers are particularly important because they are easily

rechargeable given their geological formation through repeated glaciations. In these classes, the professors also study climates, the variables involved in climates and how climate change has affected the flora, fauna, and human occupation of the area. Techniques for studying climate change are emphasized including coring for pollen, looking at soil strata, and even analyzing levels of strontium in mussel shells found and dated at archeological digs by horizons and carbon 14 dating that reflect the current of the rivers from which they were harvested.

Meteorology is also studied to show how natural conditions occur such as the development of the prairie peninsula. Both climate and weather patterns are eventually tied to economic conditions such as housing, travel, agriculture, mining, fishing, logging, tourism, etc. Some of these economic activities are studied over the recent history of human occupation.

The professors also tie the economic and political institutions to issues such as the construction of internal improvements and the politicizing of land ownership and the development (or removal) of the "commons." Emphasis is made on the distinction between boundaries and edges as defined in natural geography versus political geography. For example, the development of paper mill towns coinciding with land speculation during the development of internal improvements such as the canals, railroads, highways, drainage districts, etc. This is studied along with the competition between river towns and upland or prairie towns. Discussion also occurs about the mistreatment of the river by towns and distant economic interests. Chicago's use of the Illinois river as a sewage canal is one example.

From the stage set by the discussion of the physical environment (geology, geography, topography, flora and fauna) to that of the social environment, continuities are made over several thousand years of human occupation of the areas. Populations are analyzed by county and by region with discussion of which cities are successful and which are not. For both courses there is also discussion about different people's views of the "commons", land ownership, values, and attitudes.

Both courses discussed above integrate experiential learning. For example, water erosion is a geologic process that can be immediate, and thus any type of erosion is perhaps better understood when water erosion is directly experienced. To better understand the temporal concepts of either a lasting environment or a changing environment and the human interaction with, and vulnerability to, the environment is best learned "in the environment". Thus, Kayaking trips on the Illinois river, Lake Erie and in the waters surrounding the Florida keys are regular components of these courses.

- **Environmental Economics** – In the environmental economics class, the professor integrates experiential learning to help discuss the flow of resources

between the environment and economy. Field trips to view nature areas are also a regular feature of this course. On these trips, emphasis is given to alternative uses of resources and the problems associated with commonly owned resources.

This course is also taught from the perspective that humans are an integral part of the environment. As a part of the environment, humans use resources from the environment. From an economic perspective, resources have both a use and an existence value. That is, resources not only have value because of how humans can use the resources to produce goods and services, but they also have value to humans simply because they exist. As such, economists explain resource flows in terms of the costs and benefits the resources impart to humans.

Human use of the environment also results in returning residuals (pollution) to the environment. This residual flow of resources can, in excess, result in environmental degradation to not only privately owned resources but to 'common' resources as well. In the environmental economics course, special emphasis is given to the degradation of the 'commons' such as air, water and fisheries with emphasis given to the inadequately defined property rights. The implications of inadequately defined property rights are discussed in terms of resource usage as well as national and international environmental policy design.

To economists, most human contributions to environmental degradation are a matter of costs and benefits. In terms of resource usage, individuals frame the question in terms of personal costs and benefits. If personal benefits exceed personal costs, then one chooses to use, and sometimes abuse, a resource. In terms of pollution the question is framed differently. What are the costs of not polluting versus the benefits of not polluting? Should costs exceed benefits, individuals will choose to pollute. This is especially a problem when it comes to 'common' resources. Individually, a person has little incentive to conserve a resource if others also use that resource. For example, a fisher is unlikely to limit her catch if others are likely to take what she does not. In a similar fashion, an individual has little incentive to not degrade the 'common' environment if others are doing so. To produce or consume using 'cleaner' methods would put that individual at an economic disadvantage compare to others.

Acknowledging these microeconomic incentives, students in environmental economics then study the transboundary nature of environmental degradation and the resulting implications for designing government regulations to help resolve the issues. To do so requires the intentional integration of the disciplines of economics, biology, chemistry, geography, geology, psychology, sociology, and political science throughout the course. Special emphasis is given to the topics of global warming and sustainable development including a study of renewable energies.

Current student centered research in the class includes a study of residential scale wind generated electricity. A grant-writing component in which students

learn how to write environmental grant proposals is also integrated into the course.

➤ **International Studies.**

Most significant forms of pollution are global or regional in nature. As a result, Illinois College's faculty believe it is important that students understand the international implications of environmental change. In the required international studies class, students examine the humanitarian, economic, political, social, cultural, and ecological issues from a global perspective.

INS 160, Intro to International Studies, focuses for part of the semester on such ecological problems as acid rain, deforestation, ozone depletion, and global warming. The professor emphasizes the transboundary nature of these problems to convince the students of just how essential, but difficult, it is to arrive at lasting political solutions. Much of the class time here is spent examining the international negotiations surrounding ozone depletion and global warming. Specifically, the discussion centers on the successful Montreal Protocol process on ozone depletion, and the far less successful Kyoto Protocol process on global warming. The professor addresses the same material in the Political Science 150, World Politics, course as well focusing more on the problems that state sovereignty creates in the negotiating process.

The professor also addresses international environmental issues in two upper-level courses as well. The International Studies 300 Readings course always involves at least one book on the global environment. In recent years, William Allen's "Green Phoenix" has been used to explore the successful case of reforestation in the tropical dry forest of the Guancaste region of Costa Rica. The professor also spends significant time in Political Science 386, International Relations, on the topic of global negotiations over global warming. In this discussion the class focuses not only on the Kyoto Protocol, but also on the larger issues of past and future responsibility and the division between developed and developing countries over bearing the costs of reducing greenhouse gas emissions.

Summary

The Environmental Studies program at Illinois College is intentionally designed to help students understand the interdisciplinary nature of environmental concerns. To do so, the professors within the program intentionally integrate the disciplines of economics, biology, chemistry, geography, geology, psychology, sociology, and political science throughout their courses. However intentional the design, a significant amount of unintentional integration also occurs. For example, several of the courses discuss the geology and meteorology of resource patterns. Other courses discuss the various international protocols designed to help resolve global pollution. Most courses have overlapping discussions on the economic and political reasons for environmental change. These overlaps in material are not specifically designed into the program but represent a portion of each discipline's contribution to a common problem. Students' casual comments with professors tell a part of the story. Students frequently observe that courses within the major are consistently reinforcing discussions held in other classes. These student comments suggest that the faculty within the program are reinforcing each other unintentionally. This unintentional dynamic has been important to Illinois College's Environmental Studies program. The cross-connections in the courses continue to demonstrate that resolving environmental issues is not only an international issue but an interdisciplinary issue as well.