



Formalizing Research within an Undergraduate Major at Bethune-Cookman University: Curriculum and Departmental Design

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Abstract

Based on the recommendations of the Environmental Systems and Sustainability Roundtable, the Department of Integrated Environmental Science (IES) at Bethune-Cookman University (BCU, a Methodist-related, diversity-serving university of approximately 3500 students) has institutionalized an undergraduate service-based research requirement using specific curriculum and departmental design attributes. The curriculum for the major includes required seminars every year that lead students step by step from the process of acclimatization and basic college level skills to career goals, literature review and proposal writing, conducting basic research and data analysis, and presentation in both written and oral form. This research activity is supported by the design of IES, which purposefully maintains an active research faculty with an interest in service learning, a Master of Science program, and links to local environmental agencies and organizations. Both formal (e.g. coursework, grant assistantships) and informal (e.g. honor society, social activities) interactions between graduate and undergraduate students are built into the curriculum and program to provide academic role models for undergraduate students, and graduate students can and do mentor undergraduate research with supervision. Students not linked into existing faculty grants or research projects (or who have different interests) can find alternative opportunities by extending one of their course research projects or working through the department's internship connections. All undergraduate projects are presented at the university's research day and (if determined to be acceptable) at professional meetings and conferences. In this way, the department assimilates undergraduate research into the fundamental structure of the department and major, allowing BCU IES students to learn about interdisciplinary environmental issues and the research process in a format that promotes collective hands-on experience useful to the local community.

1 Desired Program Attributes

- An integrated environmental science program that promotes research as part of its mission and design
- A focus on service learning across all levels of the program
- A curriculum that implicitly includes career development and research training to support our population of mostly first-generation college students
- Research and open-ended lab exercises typical in majors' coursework
- Interaction among students of all program levels (beginning majors through masters students)



2 Program Curriculum Design

- The Program Student Learning Outcomes (PSLOs) provide the interdisciplinary or higher order (ID+) framework for the program (Fig. 1), focusing on:
 1. Structure and Function of Ecological Systems
 2. Structure and Function of Geochemical Systems
 3. Structure and Function of Human Systems
 4. Role and Impact of Humans On/Within these Systems as Pertains to Environmental Concerns
 5. Ability with Regard to the Management and Control of Human Impacts from an Environmental Perspective
 - Methodology and tools were treated as an implicit PSLO built into the curriculum
- The courses, selected using an IRMA (Introduce, Reinforce, Master, Assess) chart in reverse, cover the PSLOs within the desired context for the program:
 - An ID+ B.S. in Integrated Environmental Science (IES)
 - A focus on coastal resource management and water use issues fitting the university's location
 - Integrated Environmental "Science" as used here is a convention due to the department's administrative home (the School of Science, Engineering, and Mathematics), the science core needed to function in this discipline, and the desired context for the program: this is a true ID+ department and major
- Other design notes
 - Restricted major: Must earn "C" or better in the Gateway course in Fall of Sophomore year
 - ≥ 2.0 gpa, "C" or better in all majors', Math, and English courses to earn degree
 - Required service-based research project

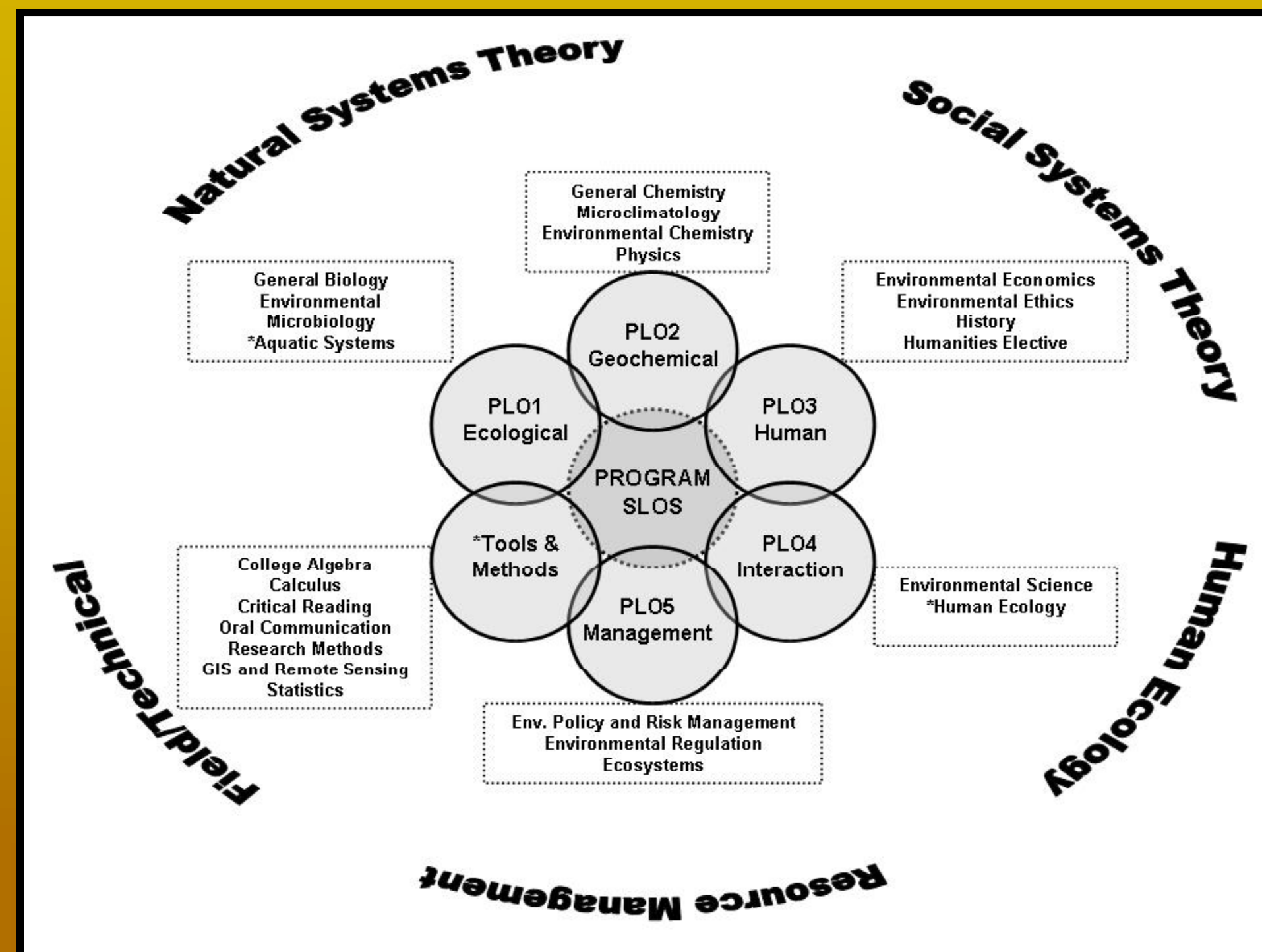


Figure 1. Links between Learning Objectives, Courses, and Approaches to Integrated Environmental Science inherent in the program's design.

3 Curriculum "Spine": The Seminar Series

To support our primarily first-generation college student population while also promoting research capacity, an IES seminar series (Figure 2) was built into the curriculum (2 semesters first and fourth year, 1 semester second and third year). These seminars are designed to help students, 1) adjust to college demands and learning styles while propping up writing and math capability, 2) learn to read journal articles while obtaining information about potential careers and graduate school options in order to develop a career plan, 3) learn to critically read and review relevant literature in order to formulate a question and develop a research proposal, and 4) carry out that proposal, analyze data, and present the results in written and oral form.

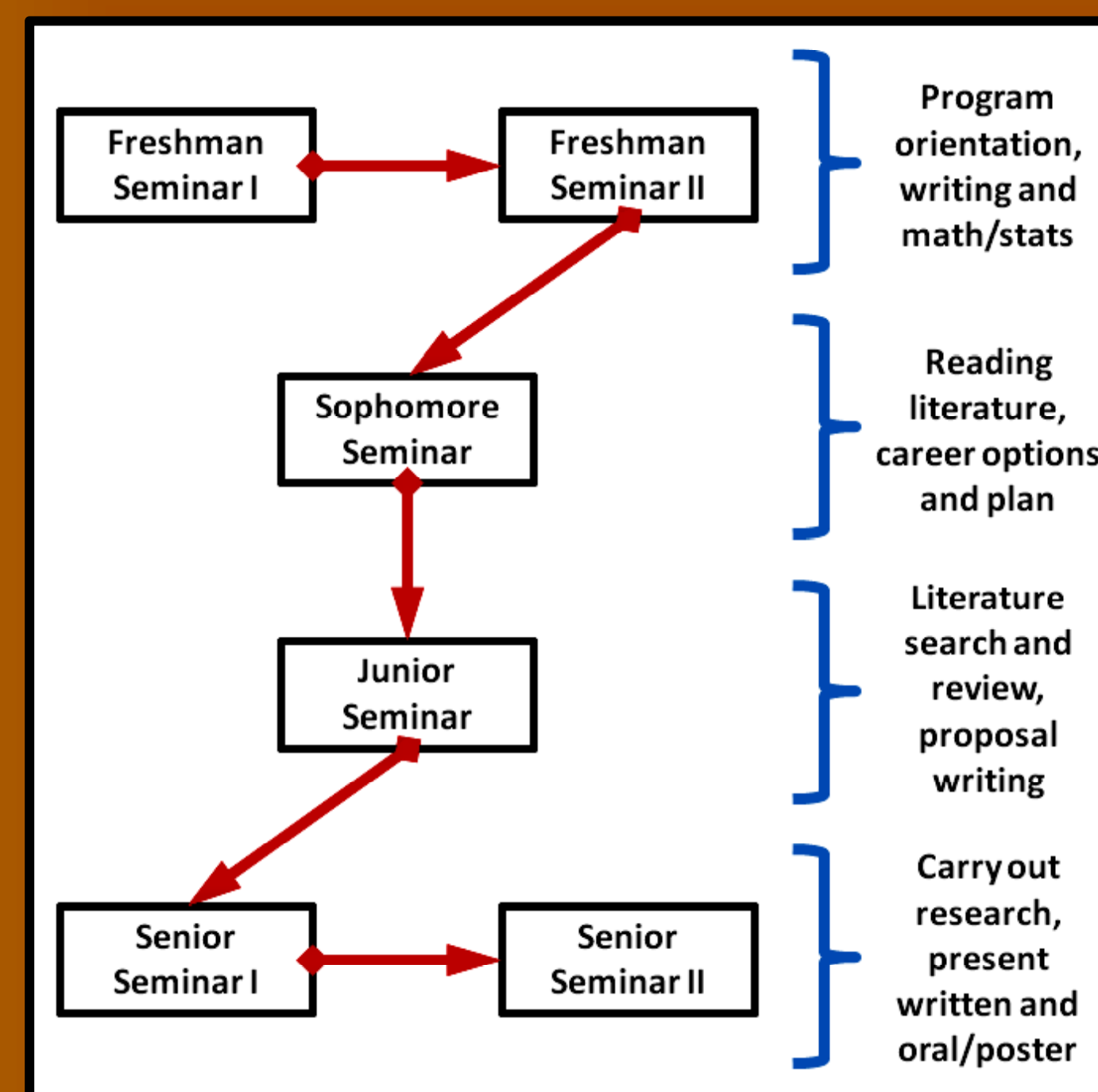


Figure 2. The BSIES seminar series, the "spine" of the curriculum, along with the associated curriculum goals.

4 Programmatic Research Support

- Beyond the curriculum, several approaches have been built into the overall program to support research by undergraduates (Figure 3):
- The department maintains direct connections (adjunct teaching faculty, internships, funding links) to several state and national environmental agencies (NOAA, USFS, NCCOS, SJRWMD, etc.)
 - Many majors' courses include short service research projects, often in conjunction with local resource managers who participate directly in the course
 - Departmental promotion and tenure requirements support grantsmanship and the inclusion of students in grant work
 - BSIES is a restricted major (in part because of the importance of the work we do for our stakeholders) which includes a research requirement for graduation
 - A chapter of the honor society KAO forms a student-run focal point for campus environmental initiatives
 - The program includes several formal and informal means by which undergraduate and graduate students can interact, including in research projects
 - The department encourages and provides funds for student presentations at conferences

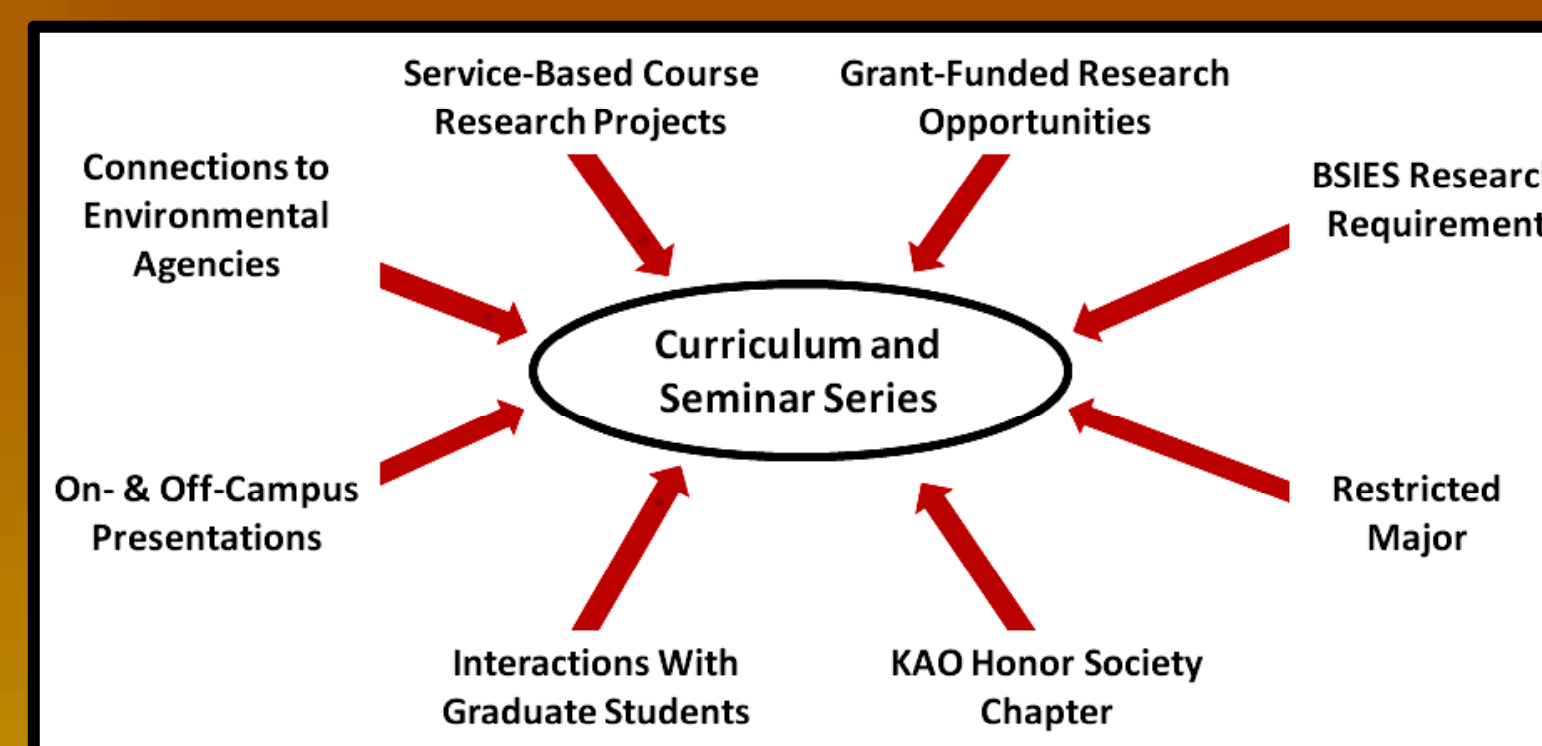
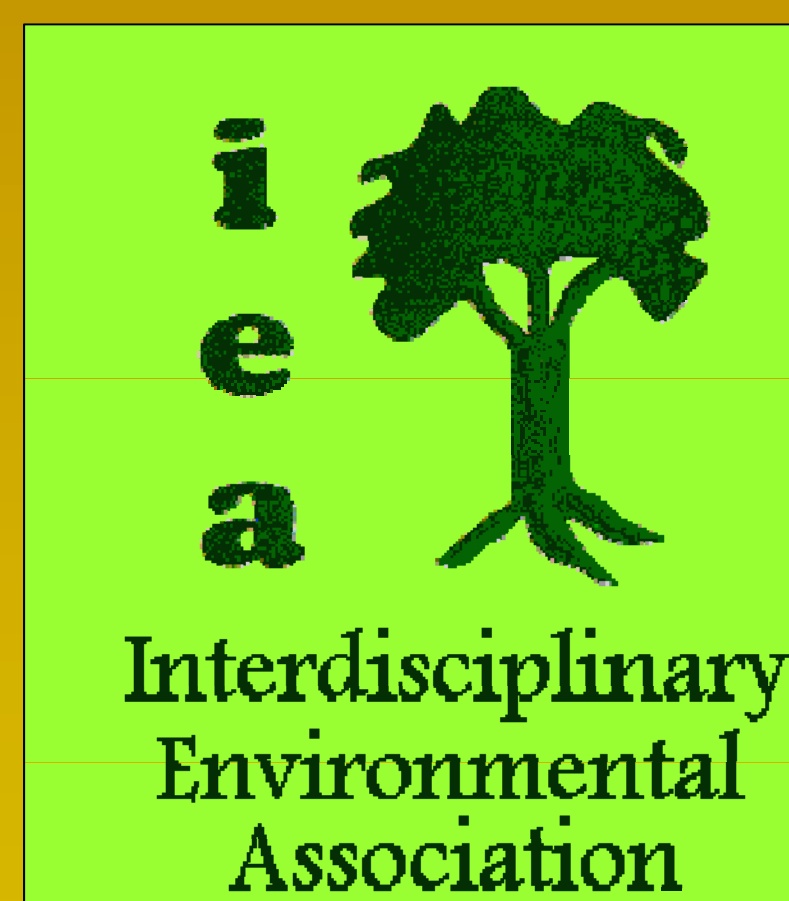


Figure 3. Program support mechanisms for undergraduate research.



The design of this department and curriculum were inspired by the proposals of the Roundtable on Environmental Systems and Sustainability organized by the Interdisciplinary Environmental Association (IEA), and partially supported by NOAA and the Andrew W. Mellon Foundation.

Founded in 1995, the mission of the IEA is to bring together all disciplines so that environmental knowledge is enhanced through interdisciplinary communication. The organization and its honor society, Kappa Alpha Omicron, form a strong support structure for interdisciplinary and higher-order teaching and research in environmental fields. For further information, visit <http://www.ieaonline.org/>.

Related Reference

Reiter, M. A., P. C. Coggins, and M. E. Howse. 2009. Designing an integrated interdisciplinary Environmental Science curriculum using an IRMA chart: An example from Bethune-Cookman University. In: Filho, W. L. ed., "Umweltbildung, Umweltkommunikation und Nachhaltigkeit" (Environmental Education, Communication and Sustainability) Vol. 31: Sustainability at Universities: Opportunities, Challenges and Trends. Peter Lang Scientific Publishers. Ch. 12, pp 153-162.

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