Assessment of Learning for Educational Improvement Grant Program:

Mentored Research Studies/Center for Coastal and Marine Studies

Dwight G. Smith
Vincent Breslin
Jim Tait

Learning Goals

The focus of our grant proposal is to develop assessment protocols that permit and promote extent of the education experience through faculty mentored research projects of our undergraduate students. The student research experience is a key component of the Connecticut Marine and Coastal Center recently established by the state and codirected by Drs. Vincent Breslin and Jim Tait of the Environmental Studies Department and Dr. Dwight Smith of the Biology Department. Specific learning goals of our mentored student research focused sharply on the undergraduate student research component of teaching and learning. This reflects a key component of teaching and learning methodologies that stresses applicability and critical importance of "student learning by student doing." As students become directly involved in the "doing" process they acquire scientific skills of maximum use in all of their future work as scientists, whether K-12 teachers, laboratory technicians or university professors.

The key component, and *reason d' entre* of the Connecticut Coastal and Marine Study Center is to promote faculty mentored student research that directly involves students in a variety of projects centered on the environment and ecology of Long Island Sound and its coastline. This urban sea is a living laboratory of critical importance to the environment and economy of three states---Connecticut, New York, and Rhode Island. Student oriented research on the environment/ecology state of Long Island Sound provides an

important, extensive, and varied range of research topics. The mentored student research spawns a networking approach that involves faculty, students, local communities, agencies, and the state.

Faculty mentored student research on ecological/environmental topics of concern immediately and directly immerses students into both theory and application of the science of the Sound.

The learning goals of mentored research directly satisfies one of the most important of all learning goals for educational improvement for our science students. Determining the effectiveness of our program of faculty sponsored student research is the issue that we address in this grant proposal.

Assessment Instruments and Methodologies

Assessment protocol for our mentored student research oriented program is critical as results shape all present and future research programs including resource allocations (what is the optimum number of students that each faculty member should sponsor during each research episode/session to maximally promote student learning of science), daily interactive learning events/episodes involving faculty and their students (how often should mentors meet with students to ensure that effective teaching and learning is ongoing), and how the research process should be promoted as a key learning experience for students (for example, writing and rewriting the research proposal, developing a suitable experimental design, gathering evidence/data). Directly related is our determination that ensures that students will learn key elements of science including the scientific method and how it relates to field experience.

Analysis Process

Our analytic process focuses on helping/guiding students in acquiring research skills that enable simultaneous or near-simultaneous learning of the application of science to "real life" events and concerns regarding local ecologies of Long Island Sound.

A priori we have two key concerns. First, we want the research experience to include and incorporate familiarity with theory and applicability of the scientific method. Second, the research experience in itself provides a capstone experience that solidifies student learning of both theory and practice of science. This leads to the concern that students demonstrate competency in all aspects of science research. These include It is anticipated that the final student report becomes an important part of the student's science education portfolio. Direct indications of learning that are part of the ongoing analytic process include: (a) ability to research background information about the research topic prior to initiating the field and/or laboratory study (b) demonstrated ability to select appropriate sampling methodologies for data collection (c) computer-aided analysis of data collected (d) generation of report (e) revisions (f) preparation of completed report for publication.

Areas of Proposed Improvements

Continued assessment of our mentored research is necessary to ensure the following components of teaching and learning:

(1) Ensure that research results consistently match learning outcomes in the sense that skills at every level are acquired. These skills include library research, development of methodologies specific to the research project, statistically centered data collection, analysis, and report.

(2) Ensure that learning goals have been successfully acquired by students participating in this program. These include the ability to set up a new research topic from start to finish with respect to the research skills mentioned above including protocol, data collection, analysis, and reporting of results.

(3) Collecting and gathering evidence that the mentored research is a success includes the following:

    (a) Evaluating student projects at the completion of the research experience cycle
    (b) Developing a questionnaire for students that evaluates how they feel about their research experience to include facets related to areas of improvement especially with reference to faculty/student interactions at every level of the research experience and research experiment
    (c) Direct inquiry regarding possible improvements to mentoring process as an ongoing event
    (d) Developing a process that promotes continued involvement of past students with present students in shaping and reshaping goals of the mentored research project.
    (e) Results will provide guidelines for changes in pedagogy associated with the overall mentored student research approach

Schedule for Implementation

Work will be completed by the end of summer and the final report for this project will be delivered prior to the end of September 2007

Projected Expenditure of Funds

Requested funds are for faculty stipends for each of three participating faculty plus travel funds. Travel funds are absolutely necessary for this project as rising fuel prices are rapidly constraining travel time and opportunities for us to mentor our students conducting on-site projects all along the length and breadth of Connecticut's coastal border with Long Island Sound