

**Progress Report for the College of Science's
2007-08 Inquiry/Research Based Education Project
and Request for Continued Funding**

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II. Summary of Activities

During 2007-08, the College of Science Quality Enhancement Plan Council (COSC-QEPC) decided that they needed to address inquiry/research-based experiences at the College level, rather than focusing on supporting the implementation by a few faculty. The COSC-QEPC accepted the following list of inquiry/research-based student learning outcomes as those desired for the College of Science: (a) formulating good questions; (b) examining, identifying, and gathering information; (c) analyzing, interpreting and presenting results; (d) formulating conclusions and/or selecting the best solution with appropriate justification; and (e) evaluating the worth and importance of the conclusions drawn. The COSC-QEPC then designed a plan to highlight and share among college faculty clarifying examples of teaching that are currently being implemented in the College of Science and that show evidence of achievement of at least one of these five outcomes.

Based on the results of the University council's recently conducted survey, in addition to other departmental and instructor information, the COSC-QEPC identified two examples of inquiry/research based experiences from each of the departments of Biology, Mathematics, Physics, and Statistics. Each of the faculty responsible for the identified experiences was interviewed by the chair of the committee with regard to how he or she felt that the inquiry experience addressed the five inquiry/research-based learning outcomes. From each of these interviews, the faculty member and COSC-QEPC chair identified an appropriate method of capturing important knowledge needed to support the implementation of the example of inquiry and evidence of student achievement related to one or more of the inquiry/research-based learning outcomes. These methods included retrieval of media from already established websites, collection and analysis of hard-copy artifacts, and video replication, among other means. (See Results section.)

The data mined from these specific examples are now being used to provide the contexts for designing on-line asynchronous engagement of faculty for building familiarity with and exploring approaches to achieving these inquiry/research based learning outcomes. The COSC-QEPC-supported faculty engagement activities being designed are focusing on (1) identifying commonalities in the cross-departmental examples that could be used as guidelines for designing inquiry/research-based experiences to support the student learning outcomes for inquiry/research-based experiences, (2) identifying and sharing strategies for efficient implementation of these experiences, and (3) designing and implementing effective tools and techniques for assessing student achievement of the learning outcomes.

III. College-Level Outcomes for the 2007-08 Inquiry/Research Based Education Project

According to the original proposal, the evaluation of the 2007-08 COSC QEP activities was to be based on evidence of progress toward the following outcomes:

- A baseline plan for providing additional faculty in the College of Science, including new hires, with orientation in Inquiry/Research-based Education in the College of Science in future years.
- A beginning structure for a College of Science web-based portal that can be used as an interactive resource to support faculty in the design and assessment of inquiry/research-based education.
- The development of the 2008-09 COSC proposal for increasing the quantity and quality of inquiry/research-based experiences in College of Science courses.

Assessment methods for determining the level of achievement of each outcome are described in the next section.

IV. Assessment Methods for Each Outcome

According to the original proposal, the evaluation of the 2007-08 COSC QEP activities was to be based on evidence of progress toward the deliverables listed in the previous section. These outcomes were assessed as follows:

- Intermediate goals were set for the development of a baseline plan for providing additional faculty in the College of Science, including new hires, with orientation in Inquiry/Research-based Education in the College of Science in future years. The intermediate goals included: (1) identify two faculty per department who were implementing inquiry/research based instruction, with an eye to diversity with regard to class size, lower/upper division courses, non-major/major enrollment, and component of inquiry being addressed; (2) interview each faculty member identified to ascertain the main component of inquiry their implementation addressed and the appropriate way to capture the essence of their implementation in order to display it within a web-based environment; (3) set up appointments with each faculty member to obtain these data; and (4) collect the data. Assessment of this outcome was conducted through evaluation of the achievement of these intermediate goals.
- Through meetings with the College of Science web-designer, groundwork was laid for the design for a beginning structure for a College of Science web-based portal that can be used as an interactive resource to support faculty in the design and assessment of inquiry/research-based education. Achievement of this outcome was assessed by the evaluation of the web-designer as to the efficacy of the desired use of the portal and the feasibility of the desired components.
- Assessment of the development of the 2008-09 COSC proposal for increasing the quantity and quality of inquiry/research-based experiences in College of Science courses was based on the level of detail that was able to be included in the proposal component of this report, with relation to the components needed from 2007-8 to continue the project.

V. Summary of Results

Based on the assessment methods outlined in the previous section, the following results were determined for each outcome as follows:

Development of a baseline plan for professional development on inquiry/research based education. The intermediate goals were accomplished as follows. (1) Two faculty were identified in each of the five departments in the College of Science who were implementing inquiry/research based instruction. (2) Seven of the ten faculty identified agreed to an interview with the committee chair to ascertain the main component of inquiry that their implementation addressed and the appropriate way to capture the essence of their implementation in order to display it within a web-based environment. The other three faculty, or replacements for them, will be interviewed in Fall 2008. (3) and (4) Data from 5 of the faculty interviewed were obtained during the Spring 2008 semester, with the data including a mixture of classroom video, staged video, already designed course web pages, and examples of written assignments. Collection of data from the other two faculty interviewed is planned for Fall 2008. The following table summarizes the data collected.

Data for Development of COSC PD for Inquiry/Research-based Education

Course Characteristics	Component of Inquiry Involved	Data Collected
(BIOL 214) Introductory biology for non-majors, large class	Formulating good questions	TBD, but plans for video of activity
(PHYS 221) Lower-division physics course for majors	Examining, identifying, and gathering information	Existing websites
(STEPS sequence) Physics for engineers	Examining, identifying, and gathering information	TBD, but plans for video
(BIOL 351) Microbiology for upper-division majors	Examining, identifying, and gathering information; Analyzing, interpreting and presenting results	Video of processes of obtaining cultures and still shots of resulting cultures
(MATH 442) Upper-division mathematical modeling course for majors and non-majors	Analyzing, interpreting and presenting results	Example of inquiry assignment handout; student work examples
(STAT 408) Upper-division statistics for majors and non-majors	Formulating conclusions and/or selecting the best solution with appropriate justification	Video of class presentations
(STAT 302) Introductory statistics for non-majors	Evaluating the worth and importance of conclusions drawn	Example of inquiry assignment handout

Design of a web-based portal for professional development on inquiry/research-based education. Through meetings with the College of Science web-designer and members of the Center for Technology Mediated Instruction, it was determined that a web-based portal to support professional development for faculty in this area was a feasible project. Types of data that could be used were identified, including a variety of media. Access to the portal was discussed with details for access and use still needing to be finalized.

Development of the 2008-09 COSC Inquiry/Research-based education proposal. The proposal for continuing the College of Science professional development activities relate to inquiry-research based education is included in the next section. Plans for 2008-9 are built around the results achieved in 2007-8 described previously in this section.

VI. Closing the Loop

The results from the 2007-8 College of Science Inquiry/Research-based Education activities will be used to complete the development of a web-based professional development portal for asynchronous engagement of faculty for building familiarity with and exploring approaches to achieving the inquiry/research based student learning outcomes. Two more faculty members (preferably from Chemistry) will be identified and data collection will be completed.

As the data collection is being completed, 4 or 5 faculty members will be identified to participate on an ad-hoc committee for designing the professional development experience. The goals of the committee will be to (1) identify commonalities in the cross-departmental examples that could be used as guidelines for designing inquiry/research-based experiences to support the student learning outcomes for inquiry/research-based experiences; (2) identify and share strategies for engaging faculty in reflecting on these commonalities and thinking about ways to incorporate them in their own content area and level of course; and (3) provide ideas for guiding faculty in the design and implementation of effective tools and techniques for assessing student achievement of the inquiry/research-based learning outcomes. The committee will also make suggestions as to methods of evaluating the impact of the professional development experience.

As faculty choose to engage in the professional development, they will be requested to contact the Associate Dean for Assessment with regard to processes for collecting data on the student learning objectives related to inquiry and research. The goal for this assessment effort will be to identify evidence of impact of the professional development on classroom instruction and the result in student learning.

Since the professional development portal will be designed around common aspects of inquiry- and research-based education and will not require updating for specific courses, access to the professional development should be totally sustainable with minimal upkeep. The major aspect of sustainability will be dissemination of information about the university's goals for inquiry/research-based education and the availability of this opportunity for professional development.

Although no new inquiry courses were developed as a result of this project, several courses in the College of Science were identified as inquiry-based that were not included in the previous university

inventory (see the table on p. 4). Another aspect of sustainability will be to continue to meet with the representatives from the departments to identify courses that are being taught with inquiry or research-based components, as possible additions to the professional development examples.

VII. Budget Request for 2008-9

Proposed activities for 2008-9 include (1) approximately 3 ad-hoc committee meetings to synthesize the data collected in 2007-8 and the additional data from the coming year and to provide suggestions for design of the professional development portal, (2) production of the website, and (3) pilot of the website. The pilot will include collection of data for evaluation and revision of the portal for continued implementation.

Support for Web designer	\$ 4,000
Support for College of Science Center for Technology Mediated Instruction (for pilot and data collection)	\$ 5,000
Refreshments for ad hoc committee meetings and assessment supplies	\$ 1,000
Total	\$10,000