

Report on the SENCER Project

Executive Summary

December 2006

The evaluation of the *Science Education for New Civic Engagements and Responsibilities* (SENCER) project is an NSF-sponsored, three-year effort to assess the impact of SENCER courses on participating students and faculty. Evaluators revised and validated the SENCER-SALG online survey, analyzed student data from the survey, collected course descriptions from SENCER faculty, and linked faculty course descriptions to student survey responses.

Evaluators found the following:

- Over 10,000 students answered questions from the SENCER-SALG online survey. When students across SENCER courses rated instructional and learning activities that “helped them learn,” the results painted a complex picture of reform efforts. High ratings for areas such as “addressing real world issues” and “the interplay between civic and scientific issues” suggest that instructors’ use of civic content to frame science is engaging students and is perceived as helpful for their learning. However, students also rated lecture and “learning science facts” highly, supporting a more traditional pedagogical approach.
- Students in SENCER classes rated their confidence in science skills, interest in science and civic behavior. Students gained the most from pre to post surveys in the areas of science literacy, followed by general course skills. This pattern of gains is in line with efforts by SENCER to encourage awareness of the link between civic issues and scientific content. When asked to rate their interest in pursuing “advanced” science activities such as joining science clubs or attending graduate school, 10% of students who had little or no interest on the pre in taking future science courses reported they were highly or extremely interested in taking courses on the post. While few students reported engaging in civic activities such as attending hearings or writing letters to the editor before courses, roughly a fifth of the students who had never engaged in civic activities said they were more likely to participate in these activities after course completion. This proportion was higher in courses with service learning components.
- When specific demographic groups were analyzed separately on their responses to the SENCER-SALG, women gained more than men, and non-science majors gained more than science majors on many of the items and composite variables. This is encouraging evidence given that females and non-science majors have traditionally been underserved or overlooked in many university science programs.
- The incorporation of innovative instructional methods predicted pre/post gains on the SENCER-SALG. The inclusion of projects, group work, presentations and field-work were associated with greater gains in confidence in both science literacy and general science skills.
- An important outcome of the SENCER project was the development and validation of the SENCER-SALG. Use of the survey has grown steadily from the

beginning of the project. Validity evidence for the survey includes factor analysis showing relatively independent factors corresponding to item blocks, and criterion matches with academic test scores. Perhaps most important to the continuation of the survey were findings from faculty that they used what they learned from the survey to make meaningful changes to their instruction.

- Faculty praised SENCER for providing the support they needed to implement their courses. Through workshops at the summer institute, publications, models and outreach, SENCER was identified by 63% of the instructors as actively helping their course implementation. Ninety-two percent of instructors believed their courses would be continued in the future, and 80% considered their course part of the permanent curriculum at their institution.
- Instructor recommendations for SENCER administrators included intensified outreach activities, both at a national level, and locally through direct contact with institutional representatives. Legitimizing reform efforts to peers and deans through outreach was also cited as an important activity that SENCER currently performs.
- Analysis of linked student and faculty data showed how content and methods interact with student confidence and interest in science. Case-based and survey-based courses were roughly equal in gain on science literacy items. For confidence in general science skills, students in survey-based courses gained more than case-based courses. This result may be due to greater emphasis placed on traditional academic content in these courses.
- SENCER instructors also wanted more opportunities to network with other instructors. Some wanted clusters to be more active in helping faculty interact with their peers throughout the school year, and felt that email was not enough to sustain this contact. Instructors new to SENCER especially wanted to interact with veteran SENCER faculty who could provide nuts-and-bolts advice on implementing and teaching a SENCER course.
- Instructors provided a detailed picture of their course content and practices. From these descriptions it was evident that SENCER's goal of encouraging faculty to teach courses with civic content and innovative pedagogy is a reality. How SENCER courses are implemented varied; almost half of faculty organized courses around specific case-based themes with a single topic used to frame science content, a model seen in many SENCER publications and SSI presentations. Other faculty had a broader approach; some courses focused explicitly on the link between science and society while others retained basic science courses but added a civic component in as a module or special topic.
- SENCER faculty embraced the use of innovative pedagogical methods such as field activities, group work, projects and presentations. While most instructors also practiced traditional methods like lecture, multiple choice tests and quizzes,

those using the case-based approach were more likely to incorporate projects, presentations and field activities into their courses. Service learning and community projects (used by 33% of the instructors) were also more likely to be incorporated into case-based courses. Those teaching courses with service learning also tended to practice innovative pedagogy and have learning goals that focused on societal and ethical issues.

- Faculty identified an array of personal and structural implementation barriers to course implementation, although a majority were able to implement and sustain courses. Barriers included insufficient time to plan and implement new courses, and active resistance to reform practices from colleagues, administrators and students. One area where SENCER has helped, and could help in the future, is by lending the weight of a national organization to efforts to convince reluctant colleagues that reform-based approaches are worthwhile and effective.
- Many of the facilitators and barriers mentioned by faculty are out of the control of an external organization like SENCER. However, any facilitation of extra time through money for course buyouts (i.e., through the NSF) addresses some of the more practical logistical concerns of instructors. An awareness of the obstacles facing instructors as they implement courses is also important; SSI workshops devoted to overcoming common implementation challenges faced during reform could educate faculty on this topic.