Partners in Pollution Prevention Internship Program: Success Stories and Lessons Learned

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An innovative internship program in pollution prevention (P2) has been developed at the University of Nebraska-Lincoln (UNL). This program contains educational, research and extension components and has been successful in the first year of its four-year project period. The Partners in Pollution Prevention program is funded by the US EPA, Region VII (Nebraska, Iowa, Kansas, and Missouri). Matching funds are provided by the University of Nebraska. Support for the program is provided by the Nebraska Department of Environmental Quality. The three main goals of this program are to provide: 1) an intensive educational experience in pollution prevention for engineering students, 2) technical assistance to small businesses and industries in Nebraska, and 3) research on complex pollution prevention problems.

The technical assistance is delivered each summer by 15 to 18 undergraduate engineering student interns and three graduate students. The undergraduate interns participate in two weeks of intensive formal training before spending nine weeks in an assigned (industrial, small business, or regulatory) location providing a specific type of technical assistance. For participating in this program, the undergraduates receive both a stipend and 3-credit hours of senior-level technical elective. The graduate research assistants focus on providing P2 assistance for the most complex research-oriented problems. Students from eight Region VII universities and three majors (civil engineering, biological systems engineering, and chemical engineering) participated in the program during the first two summers.

Approach

A series of tasks are required to develop a successful internship program. These tasks include student recruiting, training curriculum development, organizing the mechanics of student-provided technical assistance, integrating the graduate students into the project, and ensuring an appropriate stipend for the students. Each of the tasks required to achieve the program goals and the lessons learned during the first year of the program are discussed below.

Student Recruitment

Students were recruited for this program from the four-state area of US EPA Region VII . To be eligible for the program, a student must be enrolled in an accredited undergraduate engineering program, be a resident of or attending a university in one of the four states covered by US EPA Region VII, and must have completed a course in environmental engineering. Students have participated in this program from eight universities (representing all four states) and three majors. Over the first two summers, 14 of the interns were Biological Systems Engineering majors, 13 were Civil Engineering majors, and five were Chemical Engineering majors.

To attract the best students, a strong emphasis has been placed on recruiting. Seven

different forms of recruiting have been utilized, with the last four methods involving an on-campus visit by a UNL faculty member.

(1) Posters with tear-off postage paid cards were mailed to engineering departments and to internship offices at universities in the four-state region. The posters were credited with only one applicant each of the two years.
(2) In three cases, publicity materials and overheads were sent to faculty members (who were colleagues of the project faculty) at universities not visited in person by the project faculty. These faculty members made announcements in classes. No applications were received through this method.
(3) A World Wide Web site was created for the internship program. No applicants learned about the program from the site, although many applicants used to site to obtain a file copy of the applicant and to learn more about the program.
(4) Presentations were made to environmental engineering courses by UNL faculty members. An average of 6.5 classes were visited each year.
(5) Presentations were made to seminars and student group meetings (ASCE, ASAE, etc.) by UNL faculty members. Presentations were made at an average of 1.5 seminars and two student group meetings each year.
(6) When the UNL faculty were unable to visit a class or student group at another campus, "office hours" were arranged on that campus so interested students could visit with a UNL faculty member in person. The office hours were announced in classes and posted on flyers. An average of two such visits occurred each year.
(7) Word of mouth was also an effective recruitment tool. Classmates of interns from the previous year learned about the program through word of mouth. During each campus visit, the UNL faculty discussed the internship program with the environmental engineering faculty members. These faculty members often shared the internship information with students who were unable to attend a class, seminar, or other office hours. Also, UNL faculty members spoke individually to students they knew were interested in Environmental Engineering to tell them about the program.

During the first two summers, nearly all of the applicants learned about the internship program from one of the last four methods. An on-site visit was found to be essential for intern recruitment. The posters were not effective in attracting applicants; the posters were effective at providing a presence in campus locations the project team was unable to visit.

The deadline for applications is in mid-February. The largest number of applications have been received following presentations given one to four weeks before the deadline. Relatively few applications were received after presentations made more than a month before the deadline.

Training Curriculum

The students participate in two weeks of intensive formal training at the start of the program. The training consists of a combination of the following: (1) lectures on the basic concepts of pollution prevention and environmental regulations, (2) discussion sessions concerning the ethic of pollution prevention, the application of pollution prevention to real businesses, how to communicate with businesses, and different personality types, (3) a small group project where the students apply P2 concepts to a real technical assistance case study (e.g.,

University's Auto Pool repair shop), (4) presentations to the students by the project's "partners" (Nebraska Waste Exchange, Cooperative Extension, Nebraska Energy Office, Nebraska Chamber of Commerce, etc.), and (5) small group meetings that prepare the students for the unique challenges of their individual technical assistance assignment.

Technical Assistance

After completing the training, the students spend nine weeks in an assigned location providing a specific type of technical assistance (small business, industrial, or regulatory). Each summer, approximately nine students are assigned to work with small businesses to provide assistance to six to ten clients. These students contact each business, perform a waste assessment on the business' operations, identify the latest technological innovations that the business may want to implement (to minimize waste production), perform an economic analysis of the possible pollution prevention opportunities, and present this information to the client in a brief report. The students are supported in their technical assistance efforts by University of Nebraska faculty, staff, extension educators, and graduate students, and the Non-Compliance Section of the Nebraska Department of Environmental Quality. Examples of small businesses assisted include dry cleaners, auto repair shops, farm cooperatives, and print shops. The small business students are involved in community education activities, such as manning booths at county fairs, participating in community affairs programs on local radio stations, and speaking to civic organizations.

In addition, each summer about three students are assigned to provide technical assistance to industries in Nebraska and three other students work with local regulatory agencies. The industrial students typically work with two industries on technical assistance projects that are larger and more complex than the small business students' assignments. The industrial projects are identified by the faculty before the summer begins. The industry-based interns perform the same general steps in their technical assistance as the small business interns. The industry-based interns are supported directly by graduate research assistants, in addition to the rest of the project staff. Another three students are assigned each summer to work with the Nebraska Department of Environmental Quality staff and other local regulatory agencies on on-going P2 projects.

At the end of the summer, each intern prepared a final report that summarized all of their client reports and detailed the educational, financial, and waste minimization impact that they had on the state of Nebraska. On the last day of the internship, the interns gathered in Lincoln and each student gave a 20-minute presentation highlighting their most interesting technical assistance tasks. The program ended with a recognition banquet for the students.

Graduate Student Participation

A total of four graduate students where supported for their thesis research on this project. Although the graduate students assisted in the training program, they primarily focused on providing technical assistance to complex industrial problems. Components of their the industrial technical assistance research were spun off as summer projects for the "industrial" interns. The graduate students provided supervision for the "industrial" interns. The graduate students' theses topics related to the development of new modeling tools for life cycle analysis and imprecision as applied to pollution prevention. The graduate students used the industrial

technical assistance projects as case studies for their theses.

Student Stipend

The students were provided with a basic stipend of $2,100 in 1997 and $2,400 in 1998. The program paid for tuition of the three-hour course, and covered meals and housing during the two-week training period. Additional funds were provided to the students located in high cost-of-living locations. The stipend was found to be lower than many other summer work opportunities that are available to these students. The participants in the internship were willing to accept less reimbursement since they saw this program as being superior to other summer work opportunities in helping them develop marketable skills.

Outcomes

The most dramatic impact of this internship program was the changes in the interns themselves. By undergoing a hands-on experience in pollution prevention, the student interns not only learned the basic terms and concepts of P2 but were required to use analysis and synthesis skills to apply these concepts to each of their technical assistance projects. Each technical assistance project was a unique, open-ended assignment. The students improved their skills at a tremendous rate, in part because they were provided with more detailed feedback on their writing and analysis (technical reports) than typically occurs in a traditional lecture-based class. The students recognized that they learned a great deal from experience, as illustrated in the survey results listed in Table 1.

Table 1. Results of Student Interns' Evaluation of the Program.

Rank: excellent = 1, good = 2, moderate = 3, little = 4, and none = 5. Sample Size of 17.

	Understanding of P2 Methods	Ability to Communicate (both verbal and written) with Business People about P2
Before internship	4.1	3.6
After two-week training	2.3	2.6
After internship	1.5	1.7

In addition to having a major impact on the student participants, this program has had a significant impact on the state of Nebraska. During the first summer (1997), the program has positively impacted the state by providing technical assistance reports to 67 small businesses and seven industries, providing an intensive educational experience in pollution prevention to 20 engineering students, and developing awareness of pollution prevention throughout the state of Nebraska (and beyond). The nine interns who worked with small businesses identified over $62,500 of potential savings. The three graduate students and four interns who worked with industries identified over $150,000 of potential annual savings.

Summary

In summary, a new model for providing hands-on education to engineering undergraduates is being developed. This new model combines engineering education with technical assistance tasks that are funded by an external-funding source. The preliminary results of this model have been very encouraging.