THE HISTORY OF WOMEN IN ENGINEERING AND SCIENCE - DEVELOPMENT OF A COURSE

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In the Fall of 1994 the Women in Engineering, Science and Technology (WEST) Program at Texas A&M University, in conjunction with Women's Studies, the Department of Management, and the Department of History, received an award from the National Science Foundation (NSF) for the Model Projects for Girls and Women. There were several components proposed. This paper will cover the first component, a course on the History of Women in Science and Engineering. This paper will include the structure of the course, comments about team teaching, syllabus, laboratories presented, grading format, results of evaluations conducted, and obstacles encountered.

Introduction

The goals of the project developed by the WEST Program at Texas A&M University are to enhance the retention of women in science, engineering and mathematics (SEM), at every degree level in the University, and to provide information to students in these fields which will amplify their success and satisfaction in their professional careers. Studies have repeatedly shown that not only do we have fewer women than men entering SEM fields at the College entry level, but that they also continue to leave these fields at a higher rate than do their male counterparts at every level of scholastic and professional development [Northrup 88]¹. Some reasons women discontinue as SEM majors have been cited as: 1) feelings of isolation and alienation; 2) difficulty in relating highly theoretical courses to interests; 3) lack of adequate advising and mentoring; and 4) lack of women role models [Baum 90 & Palmgren etal 93]². These four reasons coincide with research findings designed to measure success in women's studies courses. Enrollment in women's studies has been shown to provide women students with the tools for surviving in what is still a predominantly masculine world [McTighe Musil 92]³.

There are four reasons why we proposed a freshman women's studies course which counts for curriculum credit. They are: 1) minority women in SEM often have to choose whether to spend some of their extra curricular time in minority or women's programs; 2)
many young women do not know why they are feeling uncomfortable in SEM until it becomes overwhelming, and they do not want to believe that gender issues are involved; 3) male students in SEM do not recognize that in addition to the pressure they feel in the fields, women may have some different and additional pressures, and therefore they are not sensitive to how their normal behavior among peers may be extra deterrents for some women; and 4) many women, not in male dominated fields, contribute to the isolation women in these fields feel by not demonstrating an interest in what women in these fields do. Therefore, our course, while targeted to women in SEM, was open to all University students, fits into the core curriculum at the undergraduate level, and counts as a three hour humanities course.

Introduction of Women's Studies: Special Section on Women in Science, Engineering and Mathematics

The specific topic of the course is the History of Women in Science and Engineering, with emphasis on women in the past who have made significant contributions to their fields and women in the present who continue to do so. By juxtaposing the histories and biographies of past women with women currently active in the same or similar fields, we hope to provide the opportunity to think about the relationship of past to present regarding gender and scientific practice.

Course Structure

First, the course briefly introduced the theoretical framework for understanding the relationship of gender to science and technology. Included in this introduction were presentations on historical research, the philosophy of science and engineering, gender and science, issues in the study of women and their contributions, and team building skills. Beginning in the fourth week of class, a student team presented the introductory background information on the specific field to be studied for that week. This material included biographies and contributions of women in SEM from 3000 BC to the present, with attention to the ways in which race and class have also contributed to the devaluation of their work. In addition, each week a female faculty member, in the field being studied, was a guest speaker, providing insights to the struggles and triumphs of contemporary women active in that field. The week ended with a laboratory or design experience.

Team Teaching

The team of professors and graduate assistants not only present material throughout the semester, they attended class, sat together, and participated in all class activities as a team. This "instructional" team provided a model for the student teams and formed a network of mentors to help guide all the participants through the course. In addition, the student teams participated in team teaching the overview material each week.

Syllabus

The syllabus provided the course description and objectives, the required text and additional reading materials, and a detailed description of the course requirements.

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Engaging Feminism: Students Speak Up and Out, O'Barr and Wyer, eds. provided a model for the students' journals, a record of thought and reactions to the course. Additional readings were required to provide background material on gender and science, classroom climate, non-sexist writing, and teaming skills. Included in the course requirements were attendance in the regular class and in labs, team oral presentations, journals, and a research paper.

Laboratories

The laboratory experience was designed to deepen the understanding of the contribution of one or more of the women studied. The laboratory experience was also meant to enhance the freshman student's experience and knowledge of laboratory procedure, and to provide the hands-on knowledge that has shown to be crucial to women's learning. The exercises focused on the joy, fun, and exploratory nature of historical SEM studies as well as exploring a modern communications media, the computer and the Internet.

* For the math lab the teams were asked to create a map of the grounds surrounding the classroom building using a protractor and compass. They were to figure the height of any building they could see within their designated area and then produce a scale drawing.
* Physical properties of some common substances was the topic of the chemistry lab. The teams used their senses to describe the substances - the taste and smell, the texture and consistency, the color and appearance - then they read the ingredients from the labels and looked up the chemicals in handouts from The Merek Index. The substances used in the discovery exercise were various baby foods, sodas, chips, and filled cupcakes.
* For veterinary medicine, we had a site visit to a research laboratory at the Veterinary School hosted by the speaker that week. She researchs possible cures for multiple sclerosis.
* The electrical engineering/computer lab was a hands-on introduction to the Internet using email, telnet, and Netscape.
* A multimedia presentation on drilling procedures was provided for the chemical/petroleum engineering lab.
* A scavenger hunt on the Internet was the lab for oceanography.
* For environmental engineering an oil spill was simulated using gravel, sand, dirt, and motor oil. Then the students simulated a clean up with different solutions.

Grading Format

The grades for the students were calculated on the following basis: team presentation, 15%; laboratory, 15%; journal, 30%; and research project, 30% written and 10% oral presentation. The grade distribution for the class was: 15 A's, 15 B's, 4 C's, no D's or F's, and 4 incompletes.

Team Presentations. Each team member was required to give a portion of the material and all members receive the same grade. Full credit was given for responsible presentations. The only problem presentation was an early presentation which required extra
time. That team was counseled about the team process and was required to write in their journals about how the team process could have been better to perfect the presentation and to prevent the time over run.

Laboratory exercises. Attendance and active participation in the weekly laboratories was the only requirement for full credit.

Journals. The students were required to keep an academic journal of their thoughts and reactions to the course. The requirement was that entries be made twice a week, that team meeting records are included, and that the readings and speakers were included in the writings. The journals were read three times during the semester and comments were made in the journals by the different professors.

Research project. A 10-12 page, double spaced paper and a ten minute oral presentation were required. The subject matter was women in science and/or engineering. Suggested approaches were contrasting two historical periods, contrasting individuals within the historical period or in the same fields, or focusing on a field.

Results of Evaluations

A detailed questionnaire was used to evaluate the student perceptions of the course. Among the questions were self-evaluation of changes in self-esteem, in commitment to science/engineering, in self-confidence, in writing and research skills, in presentation and teamwork skills. Although no one guest speaker was the favorite, the stories by the speakers, the "How I dealt with the challenges in my field," instead of details of research interests, were the favorite part of the class. Everyone wanted more time for discussions. The student teams were perceived as a positive experience. The teams did not disband after the required presentation, but worked and played together in the laboratories and the research project. The networking and mentoring were very positive.

From the faculty perspective, we feel that we successfully blurred the student/professor boundaries in class. After the first week of class, the students were not focussed on grades but on the course content. Consciousness raising did work. At the beginning of the semester, the students insisted they were not feminists yet by the end of the semester they were saying "I am a feminist" in their journals. For our experience in the course, as the faculty team, we enjoyed the networking, the laughter, and the collaborative effort put into the course which made it invigorating and fulfilling for all of us.

Obstacles Encountered

The only problem from the student evaluations was not enough time for class discussion. The biggest problem from our perspective was eight days of ten minute presentations, five to a class. The momentum of the class was lost. There was the additional problem of many students not doing the required readings and therefore missing material that should have been included in their research.

Conclusion

This class will again be offered in the fall. We plan to retain the general structure of

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the course except we will include time for discussion and eliminate the individual presentations. Part of the discussion will be students sharing research progress, road blocks, breakthrough, and interesting discoveries and trivia. We want to include more writing skills practice, more active use of the computer and more student to student mentoring. We believe that we can accommodate these new goals and retain the non-threatening, open learning environment we all enjoyed during this first attempt at a course on women in SEM.

References


