

## **IDAHO JEMS: A PRE-COLLEGE ENGINEERING EXPERIENCE FOR HIGH SCHOOL STUDENTS**

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### **INTRODUCTION**

The University of Idaho College of Engineering has offered a summer experience for high school students for twenty-eight years called Idaho JEMS (Junior Engineering, Math and Science -- previously Idaho JETS). While the program has helped to identify students interested in engineering, it has not been as successful in attracting young women into the summer workshop or into engineering at the college level. There continues to be a problem with the way young women perceive their abilities in math, science and engineering.

To change the perception that young women have about themselves and the fields of engineering, we offered a two-week summer engineering experience for young women and men. The workshop incorporated strategies to improve the instructional climate provided by the faculty; the understanding of gender and cultural diversity issues by students, faculty, and counselors; and the self-esteem of the young women.

The project offered, for most of the students, the first opportunity for a university experience. Students registered for a two credit pre-engineering course, lived on the University of Idaho campus, attended courses and laboratories in university buildings, and used other university facilities. The college atmosphere provided a transitional experience for the students that will be valuable when they attend college for the first time.

### **PROGRAM CONTENT**

One problem with learning environments has been that engineering tends to be a male dominated field. As women enter college to study engineering, they often have their first experience in taking a class that is predominately male. Often they feel uncomfortable or inhibited and may have a sense of not belonging in the class. The male students frequently ignore the few female students who are in the class and tend to gravitate to other male students when forming study groups or when working on group projects. The attitude of the male students can sometimes affect the way the female students perceive their role in engineering and their sense of belonging.



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While it has been shown that female students are often less inhibited in classes/summer workshops that are all or predominately female, this approach ignores the problems they will face once they enter a college of engineering or another math or science field. If the culture of the college and the student population is not changed to become more inviting for female students, the graduation rate of female students in engineering may not improve significantly. This project tried to improve the climate of the workshop to make it more welcoming for female students and to influence the attitude of the male students and the faculty through workshops on gender and cultural diversity.

Most students have their first university experience by enrolling in the two credit summer workshop. By creating a situation similar to what they will encounter when they enroll in college, the project helps ease the transition from high school to a college or university. The students become familiar with dormitory living, library facilities, classrooms and laboratories, and faculty and staff in a college. Upon completion of the workshop, the students receive a letter grade and graduate from the program. They receive a certificate of completion along with a group picture of the workshop participants. Students select from among themselves four students to speak at the ceremony and to reflect upon the experience/knowledge they gained while participating in the workshop.

In order to make the content relevant and interesting to all students, the workshop focused on a human factors engineering problem involving the design of small home appliances such as entertainment centers. During the workshop, student teams were responsible for a group project. The project incorporated concepts learned in all courses to reinforce the information gained. On the final day of the workshops, the teams presented the results of their project to their families and other visitors. The presentation included a description of the design process, rationale for the particular design selected, and final results of the research project. Students used computer-aided-design tools to assist with the design of their project and to prepare posters and visual aids for the presentation.

Instruction for the design process included sessions on human factors engineering. Frequently, the human/machine interface part of the design process is neglected by engineers. Students attended a one and one-half hour per day course which provided information about the impact of a design upon the people who will use the product. The teams used the principles they learned about human factors to complete their design project and described the principles used in their design during their group presentation. In addition to the human factors course, students also attended courses in computer-aided-design and usability testing.

It is important that students realize the need for critical learning skills and the understanding of group dynamics. During the workshop, students were assigned different roles within a group. Over the two-week period each student had the opportunity to assume the responsibilities for each role in the group. The students also attended leadership training courses to help them understand the roles within a group,



why the different roles are important, and how motivational concepts work. Part of the leadership series included presentations on gender and cultural diversity.

The workshop included adequate leisure time for students to become acquainted with one another and to learn about the area, the university, and the college. The students participated in dances, picnics and other forms of entertainment to make their experience more enjoyable. To enforce the ideas they learned in the leadership course, the students participated in an adventure bound field trip. In this setting, students were encouraged to help each other complete physical tasks, such as rope climbing and rock climbing. The activity helped to reinforce the team concepts.

### SUMMARY

Partial funding for Idaho JEMS was provided by a grant from the National Science Foundation. Funding for the grant provided scholarship waivers for all participants of the workshop. As a result, a sufficient number of applications were received to increase the number of female participants to 50 percent of the total attendees. Participation by female students in previous years has been only 20 percent.

The NSF funding provided an opportunity for significant change in the content of the Idaho JEMS program. As a result, the program is now a model for future workshops which should enable the college to reach its goal of encouraging more women to enter engineering and computer science fields.

### PARTIAL LIST OF REFERENCES

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