

THE ENGINEERING SCIENCE PREPARATION AND INTRODUCTORY TRAINING (ESPRIT) PROGRAM

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Abstract — The ESPRIT program provides selected undergraduate students with an opportunity to gain hands-on experience with, and exposure to, a variety of technical skills early in their education. ESPRIT students are provided with free access to a well-equipped laboratory staffed by an experienced instrument designer. The students are encouraged to develop their technical skills independently or in small groups by working through structured training modules. The program provides the students with the tools and information they need to build complete, electromechanical systems. The program is intended to develop a cohort of independently motivated, skilled, and competent undergraduate researchers. The experience is expected to provide a variety of benefits to the students' academic performance and to enhance their career success.

Index Terms — group learning, active learning, self-paced instruction, design experience.

THE ESPRIT PROGRAM

A not-for-credit, 4-year training experience, the ESPRIT program teaches students to be productive undergraduate researchers and successful participants in cooperative education programs at research laboratories across the nation. Self-paced, active learning and small-group cooperative learning modules introduce technical skills such as computer maintenance and construction, circuit construction, microprocessors, mechanical design, and the history of scientific research. Students receive modest cash incentives for completing educational modules, mentoring other students, developing new educational modules, writing scholarship and grant applications, and writing technical papers. The most powerful participation incentive, however, is that students gain round-the-clock access to a complete lab (the ESPRIT lab) equipped with approximately \$10,000 worth of computer hardware, electronics, machine tools, and welding equipment. They are encouraged to use the lab to complete the educational modules and to design and complete their own projects. The students track their progress in a notebook and meet weekly with faculty and staff to discuss the students' experiences. After two years of intense training in the ESPRIT lab, we will aid the students in securing external research opportunities.

Thirteen students applied to the ESPRIT program in the fall of 2001, the program's first year. A committee chose ten students to participate; seven remain (4 male and 3 female). The students work between 0 and 29 per week with an average of 7.4 hours per week. We expect these students will enjoy several benefits when compared with similar students not in the program. These benefits include: higher academic achievement, greater persistence through graduation in engineering, better high-level reasoning and critical thinking skills, superior transfer of training, lower levels of anxiety and stress, greater intrinsic motivation to learn and achieve, greater interpersonal skills, and higher self-esteem.

After the first year, there is considerable subjective evidence that the program promotes independence and cooperation among the students. Students who are performing poorly in their classes seem to find inspiration and enthusiasm for engineering in the applied projects they conduct in the lab. Students who are performing well in their courses regularly share their skills with their peers and use the laboratory to extend these skills. All the students are now competent when working with computer hardware and simple circuitry and seem proud of these skills. On the other hand, the extra time demands on the students may have detrimental effects on their grade point average and reduce the time available for other extra curricular activities.

Next year a new group of students will join the lab, providing opportunities for the current students to mentor and assist the newer students, an important aspect of the ESPRIT concept. Currently all the students who finished the program last year plan to return next year and their decision to continue to devote their time to this extra-curricular activity is an important indication of its value. We are also developing a new set of training modules in the areas of scholarships application authoring, java programming, motor control and advanced micro controller programming.

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