

F. CASE STUDY: California Polytechnic State University at San Luis Obispo

The Setting:

A comprehensive, four-year public university with 18,000 students whose philosophy is “learn by doing.” Rated as the best public, largely undergraduate university in the West for the last nine years. One of three founding programs, the engineering program, has more than 4,500 majors.

The Physics Department of the College of Science and Mathematics has 30 faculty members, three technical staff members and two administrative staff. The department offers courses in astronomy, geology, geophysics, and oceanography as well as physics and offers B.A. and B.S. degrees in physics and the B.S. in physical science. The department graduates 15 majors per year of whom 25–35% go on to graduate school.

What Has Been Done:

1. The department has a tradition of being friendly and open with a broad, hands-on and can-do approach to physics.
 - The physics program is designed to be flexible, preparing students for graduate study in physics or related fields, a teacher-credentialing program, or work in industry. Students have the opportunity to participate in a wide variety of research programs.
 - Once students identify themselves as physics majors, they receive phone calls from a faculty member welcoming them into the department community and offering information and advice. The office staff actively helps physics majors in matters of enrollment and other academic details. The chair and most of the faculty are aware of the student community and actively foster it.
2. The department requires completion of a senior research project for all degrees.
 - A faculty member is assigned to help students formulate a project in one of the areas where the department has strength. The projects must involve creative and original efforts by the student and include traditional research projects as well as other types of projects.
3. The department has invested in a studio-style teaching laboratory which is not yet used for the upper-level majors’ courses but has had an impact on faculty and student T.A.s who are involved in the course and the pedagogy is “leaking” into other physics courses.
4. The department has created a student-operated and controlled lounge area known as the h-bar (\hbar) which they describe as the “beating heart” of the physics program.
 - The h-bar is centrally located in the department, near faculty offices and space used by seniors for their research projects and is large enough to accommodate a large group or several small ones. Seniors feel responsibility to help younger majors, and the majors develop an unusually high degree of cohesiveness and have formed a genuine learning community. The h-bar is a home away from home for students but remains strongly focused on the work of the discipline.
5. The department has fostered the active and direct involvement of the technical staff in the educational experience of the students.
 - Many students interact directly with the technical staff, particularly during their senior projects, and staff see helping students as a part of their jobs. Students are required to complete five quarters of lab experience which include projects that are

student-initiated but completed under the guidance of an experienced technician. The friendly and respectful relationship between students and technical staff is a unique attribute of this program.

6. The requirements for retention, promotion and tenure are clearly and explicitly defined by the college in which the department resides. Younger faculty express appreciation of very clear guidelines, and this, in turn, provides an unusually stable environment for the department so that all faculty feel free to focus on the quality of instruction.

Indicators of Success:

1. The department graduates an average of 15 majors per year, a number that has recently been increasing.
2. Students perceive the faculty and staff of the department as friendlier and more open than other departments on campus.
3. There are a number of women active in the department and occupying leadership positions.
4. The selectivity of the department (and the university) and the quality of physics undergraduates has been increasing.
5. Graduates succeed in selective graduate schools and other careers.

Keys to Making the Changes:

1. Large enrollments in engineering offer a fertile recruiting ground for physics majors and the university has a tradition of strength in science and technology. The physics program has benefited as the university, helped by its high ratings in *U.S. News and World Report*, has attracted better prepared students.
2. There is an uncommon level of respect among all elements of the department: faculty, lecturers, administrative and technical staff and students.
3. Careful sequencing of classes fosters the development of student networking as does the provision of a student-controlled space in the department.
4. The pre-identification of majors encourages many physics majors to enter Cal Poly, and the fact that it is easy to identify majors in their first year allows mentoring of beginners by the department and fellow students.
5. The department and the administration encourage innovation in teaching from both the faculty and lecturers and the technical staff.

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