

Teachers should go back to school

Talking About Leaving: Why Undergraduates Leave the Sciences

by Elaine Seymour and Nancy M. Hewitt
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Elaine Seymour and Nancy Hewitt seek to understand why US undergraduate students leave science and engineering majors, and to identify areas where intervention could have a positive effect. The motivation for their study was derived from the widely publicized belief that the fundamental approach to science and mathematics education was flawed, leading to a waste of talent.

The impetus for US science education reform is rooted in several reports issued in the late 1980s and early 1990s that sound the alarm by predicting a shortage of scientists and engineers in the next century. Recruitment and retention of women and minorities to the sciences was generally offered as part of the solution to the under-supply problem. Although recent under-employment of scientists, due to changes in

the political and economic landscape, demonstrates that a shortage is not imminent, improving science teaching remains the focus of many organizations and scientists. Educational reform in the sciences and mathematics is currently motivated by a perceived need for science literacy and for increased diversity in technical disciplines.

The first chapter of *Talking about Leaving* provides a thorough outline of the recent history leading up to the authors' study, making this an excellent reference source for those interested in issues of science and education reform.

Seymour and Hewitt's conclusions are thought-provoking and somewhat surprising, and will cause science and mathematics educators to re-examine their assumptions about why students do and don't become scientists. The authors conclude that switching out of a science and engineering major is not due to students discovering that they erred in selecting their major, nor is it directly related to large class size. Furthermore, the grades earned by "switchers" and "non-switchers", using the parlance of the book, are not substantially different.

Various factors — such as lack of interest in science, interest in other disciplines, poor teaching, the workload and pace of science courses, financial factors, the level of high-

school preparation, advising, and conceptual difficulties — are discussed in detail and their relative importance weighed, on the basis of the responses of undergraduate students at several different types of institutions.

The quality of teaching is identified as a key factor in the loss of talent, across gender and ethnic lines. The debilitating effect of the old-style "weed-out" system, whereby introductory courses are made into a test of fire, is correctly identified as antithetical to the learning process and a source of talent "wastage". If nothing else, the old-style pedagogy, which requires students to devote themselves to science and places undue emphasis on exams, serves as a barrier to developing science literacy in students who ultimately choose another career path. That is a particular problem when one considers the importance of science literacy for law-makers, business people and citizens in our increasingly technological society. The "weed-out" system is particularly damaging in terms of gender and ethnic diversity, because it eliminates individuals who may have had less rigorous training in science and mathematics in high school.

Issues of special importance in the retention of women and underrepresented minorities are also thoughtfully considered. There is clear evidence that female students and those from minorities will benefit from improvements in science teaching. Indeed, peer attitudes and teaching are identified as central factors in retaining female students. The strong point of the chapter on race and ethnicity is the recognition that a diverse range of ethnicity and culture is often treated as the same, even though different groups might have a specific need or barrier to a career in science or engineering.

Although overall the methodology of Seymour and Hewitt is sound, I found the assertions of an inherent conflict between teaching and research activities to be oversimplified and not well documented. Seymour and Hewitt tacitly accepted students' perceptions that the research activities of a faculty member drive a disinterest in teaching, without examining the facts or providing corroborating evidence through interviews with the faculty members who were teaching the students.

I suspect that the perceptions of students were coloured by their expectations of what constitutes good science teaching based on their experiences in secondary school, where emphasis is placed on rote rather than conceptual learning. Indeed, there is a contradiction in their thesis since students expressed a desire to have current and relevant information included in course material. Who best to incorporate the latest results if not someone actively engaged in research? It is often the case that



Film star walks on water

The world of the insect was the subject of the Miramax film *Microcosmos*, an official selection at the 1996 Cannes Film Festival. To accompany the film, Claude Nauridsany and Marie

Pérennou have brought the stars (in this case, just to be contrary, a pirate spider) sharply into focus in *Microcosmos: The Invisible World of Insects* (Stewart, Tabin & Chang, \$35, £23).