

Portraying the Academic Experiences of Students in Engineering: Students' Perceptions of Their Educational Experiences and Career Aspirations in Engineering

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Source: 2007 American Society for Engineering Education Conference

Understanding better the experiences of students pursuing an engineering degree is an important issue for the pedagogy of engineering programs. This study sought to identify students' perceptions of their educational experiences and their motivations for and dreams of a career in engineering.

Implications of Findings

This paper argues that the learning environment of the engineering program includes structural, cultural, and processual factors that may undermine student learning. The findings of this study indicate that the system through which students acquire their education affects not only what and how they learn, but also informs students' as they develop a set of values and beliefs about the profession of engineering. An educational system that promotes competition, individual effort, and test results with limited attention to the learning process, including opportunities for practical and hands-on experiences, seems to create unnecessary difficulties for students.

Conceptually, there is merit in students' decisions to leave engineering programs if they conclude there is not a good fit with their interests, aspirations, and goals. However, in some cases, fully capable and eager students are leaving, not because the discipline is a poor fit, but because the educational experience is a poor fit. Regarding the concern of attrition and the goal of increasing the number of women and minorities in engineering programs, it seems counter-productive to drive away talented and capable students with pedagogical practices that create unnecessary difficulties.

(Please see the full-text paper at the link below to read a discussion of the "Seven Principles of Good Practice in Undergraduate Education" (Tinto, V., 1993) as they relate to the findings of this study.)

Method and Background

This study was an extension of the Academic Pathways Study (APS) developed by the Center for the Advancement of Engineering Education (CAEE). It attempted to understand the perceptions of engineering students' educational experiences and knowledge of engineering in the Institute of Technology (IT) at the University of Minnesota (UMN). This study was cross-sectional and gathered a wealth of

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information about students' motivations and perceptions of engineering, as well as the educational experiences of students.

The UMN online survey cross-sectionally targeted 160 students across the four undergraduate classes. The survey was administered in the fall of 2005 and again in the spring of 2006. The spring administration also included an additional sample of transfer students. As a supplement to the quantitative data, a series of six focus groups were conducted—two each for non-transfer women, non-transfer men, and mixed gender transfer students. Each group lasted from 1.5 to 2 hours and included students from each of the four academic years. Questions covered the same topics covered in the survey and were designed to elaborate on the survey information.

What We Found

The survey asked students about four different sources of motivation to study engineering: financial, family, social good, and mentor influence. Survey findings reported that social good was rated the highest, followed by financial motivation. There were no significant differences between men and women or upper and lower division students regarding motivations to study engineering, however, non-transfer students were more highly motivated by financial reasons to study engineering than transfer students.

Many students in the focus groups also described a strong preference for engineering because they perceived it was more objective, logical, and concrete. Students also preferred the practical or applied nature of engineering. They held little interest and found little value in debate, subjectivity, and opinion, which they claimed were the attributes of liberal arts classes.

Overall, students reported moderate levels of confidence in their engineering and non-engineering skills and rated math and science skills as more important than professional and interpersonal skills for engineering success. However, students rated their level of knowledge of engineering relatively low. The most debilitating experiences related to course load and pedagogy.

Women reported significantly more difficulty coping with the pace and load demands of engineering-related courses and higher levels of involvement in extra-curricular activities. And compared to transfer students, non-transfer students reported higher levels of academic disengagement for liberal arts classes and lower levels of overall satisfaction with their collegiate experience.

Students also described their frustrations with the grading procedures (the curve) and problems with their TAs. These problems were most acute for lower division students. Upper division students also experienced, what to them, were more reasonable grading procedures in their major classes. They also had TAs that were involved more in their major topics.

It is important to recognize that what students learn about engineering may be at odds with our best intentions, the needs of the students, and the future of the profession. Furthermore, it may confound our best efforts to recruit and retain students who are not only fully capable of contributing to this profession, but may be our best resource for creativity and innovation in the future.