

Research Brief

Center for the Advancement of
Engineering Education
NSF Grant ESI-0227558



Outside the Classroom: Gender Differences in Extracurricular Activities in Engineering Students

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Source: Proceedings of the 39th Frontiers in Education Conference 2009

Student engagement in extracurricular activities, and the integration of these activities with academics, can be critical factors influencing student persistence. There is also evidence linking extracurricular and social involvement to career choices, goals and plans, as well as success in future employment and earnings. This paper explores the relationship of students to these extra- and co-curricular activities.

Implications of Findings

Extracurricular activities can play an important role in exposing undergraduate engineering students to broader challenges that enable them to utilize and/or complement their disciplinary knowledge. Fostering integrative

learning “across courses, over time, and between campus and community life” has been highlighted as an important goal of undergraduate education. In particular, as we prepare students to address global engineering challenges, they may benefit from experiences that occur outside the classroom, as well as those that occur within it. Extracurricular activities allow students to develop leadership, teamwork, and communication skills, which are all important for engineering practice.

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Methods and Background

The researchers explored the relationship of students to these extracurricular activities, using data from the Academic Pathways Study (APS), which is part of the NSF-funded Center for the Advancement of Engineering Education (CAEE). The APS is a multi-university, longitudinal study that focuses on the experiences of students as they move into, through, and out of engineering education. Researchers used a variety of methods, including ethnography, surveys, interviews, and design tasks. There are several models of mixed-methods research and the one used here has been termed a “concurrent triangulation” design, where the integration of the results from the various methods occurs during the interpretation phase, enabling researchers to address a broad range of research questions directed toward discerning complex phenomena like student learning and development.

Data presented here are from three sources. In addition to ethnographic interviews conducted with individual students, we present results from two survey instruments which represent the collective work of the APS research—the Persistence in Engineering (PIE) survey and the Academic Pathways of People Learning Engineering (APPLES) survey. At their core, the PIE and APPLES instruments share a common set of variables or constructs that relate to the factors that influence undergraduate persistence in the engineering major.

PIE data were longitudinal and covered the period from first year through senior year. Participants in the PIE survey entered the study in their first year and persisted in engineering until graduation. The APPLES data set was considerably larger than the PIE survey, and APPLES data were cross-sectional and sampled from students in all academic years (first year through senior).

What We Found

Results are reported for each of the three data collection methods mentioned above (see the full paper at the link below for details of the analysis and for related references).

PIE Survey

Responses to two related PIE survey constructs, both consisting of a single item (construct) are presented here. One relates to the importance of extracurricular activities and the other to the frequency of involvement in extracurricular activities.

When the entire time range was considered, females rated the importance of extracurricular activities significantly higher than their male counterparts, although the responses from males and females were only statistically significant at the start of the second (sophomore) year. Unsurprisingly, given the greater importance women place on non-engineering activities, they report engaging in these activities at higher frequencies than men. This difference was observed over all time points, although no significant differences were observed at any individual time point.

There does appear to be some temporal variation in the responses that do not appear to be gender-specific. For women only, the importance of extracurricular activities is higher at 2.5 and 3 years than at 1.5 and 2 years; as well, the value at 2.5 years is higher than at 4 years. Similarly, for men, the values at 2.5 and 3 years are higher than at 1 or at 4 years. This suggests that the importance of extracurricular activity for both men and women peaks during the junior year. In addition, there is some evidence that the frequency of engaging in such activities decreases at this time.

APPLES Survey

The results from the PIE survey were complemented by the Academic Pathways of People Learning Engineering Survey (APPLES), a cross-sectional study (first-years through seniors) that shared a number of constructs with the PIE study. The data and findings explored in this paper are based on a national administration of the APPLES instrument in early 2008 to a carefully selected, stratified sample of 21 institutions in the United States. Of the 4,266 valid responses, 3,911 students indicated they were engineering majors. We focused on the responses of these students since this group was most comparable to the PIE participants.

Respondents to the APPLE Survey were asked the same two questions as shown above under the PIE Survey relating to the importance of, and frequency of, involvement in extracurricular activities. In addition to those two constructs, another item on the APPLE Survey focused specifically on students' involvement in engineering-related extracurricular activities: What is your level of involvement in student engineering activities such as engineering clubs or societies?

Results from the analysis showed that for women, the importance of extracurricular activities and level of involvement in student engineering activities were statistically significant. Significant differences between female first-year students and sophomores, and first-years and juniors for the importance of extracurricular activities were found. The importance of extracurricular activities for first-year students was lower than for either sophomores or juniors. For the level of involvement in student engineering activities, there were significant differences between female first-year students and juniors, first-years and seniors, sophomores and juniors, and sophomores and seniors. First-year and sophomore students were less involved than either juniors or seniors. See the full paper for figures and additional statistical information.

For men, no effect of time was observed for the importance or frequency of involvement in extracurricular activities. However, for the level of involvement in student engineering activities there was a significant difference between the less involved male first-year students and sophomores, juniors, and seniors. Sophomores also differed significantly from the more involved seniors.

Results also showed that women reported significantly greater importance of extracurricular activities and frequency of participating in extracurricular activities than men. Women also report significantly higher levels of involvement in student engineering activities. For both genders, participation in the two types of activities is correlated, suggesting that many students participate to a similar degree in both. Involvement in engineering-related extracurricular activities is correlated with exposure to team-based projects for men, but not for women. For both genders, participation in these types of activities is correlated to increased interaction with faculty; however, increased interaction correlates with increased satisfaction with faculty for men, but not women.

Interview Responses

In their senior year, 15 of the APs students (5 women and 10 men) participated in an in-depth, semi-structured qualitative interview at Large Public University (a pseudonym). These interview data complemented the surveys with a rich picture of student participation in extracurricular activities, as students described their experiences to researchers. Data are drawn from two questions asked of students: “Are you a member of any other student organizations on campus?” and “Are you a member of any other student organizations on campus besides engineering-related organizations?” Among this small sample of students there appeared areas of commonality as well as suggestive differences between men’s and women’s involvement in these extracurricular organizations.

Students of both genders were likely to join a professional organization related to their engineering major, and many were also members of one or more honor societies. Membership in an honor society was a “resume booster,” according to several of the students.

Twelve of the 15 respondents reported membership in a professional organization related to their engineering major. Participation in engineering-related organizations appeared to be minimal or very active, with little middle ground. Students reported being engaged in a wide range of non-engineering extracurricular activities: intramural sports, community service organizations, Greek organizations, and religious student organizations.

Despite the small number of participants, some interesting gender differences emerged. Women were more likely to take on administrative leadership positions, while men's involvement in engineering-related extracurricular activity tended to be engineering-related hands-on design and prototyping. Data also suggest that women's involvement often is spread across more than one activity, where men's involvement tends to be focused on one intense activity.

Understanding the role of extracurricular activities in the development of undergraduate engineering students, as well as understanding differences in how male and female students perceive and engage in these activities, is important in supporting student growth and development.

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October 2009