

Arizona State University's Bioengineering First-Year Student Workshop

**Jessica Mitchell, M.Ed., Kristine R. Csavina, B.M.E.E., James D. Sweeney, Ph.D.
Department of Bioengineering, Arizona State University, Tempe, AZ 85287-9709**

Abstract

The foundation of Arizona State University's Bioengineering First-Year Student Workshop Series is to enhance the first-year experience by 1) fostering a community of peers and a connection with faculty; and 2) providing an overview of and initial connection to the bioengineering field. The workshop series aims to provide students with early involvement in bioengineering and to encourage an investment in their education. Additionally, workshops are an effort to help students relate first-year coursework to a broader overall goal of future courses and potential career paths. Themes of workshop modules, scheduled to meet every other week, include 1) a first overview of bioengineering at ASU including hands-on labs and faculty lab tours, 2) an exploration of education and career paths for bioengineers, 3) and an overview of various opportunities available to them within the Department of Bioengineering. Topics may be modified according to findings from surveys administered in the semester prior to the workshop series. Assessments will be conducted both pre and post workshop to determine whether the learning objectives were met. This series is designed to compliment existing departmental and college efforts in recruitment, retention and academic as well as career advising including an annual BME Day (Biomedical Engineering Day) open house, Summer Bridge Programs, freshman Orientation and mandatory advising, the Women in Science and Engineering program, the Minority Engineering Program, and BME 201 (Introduction to Bioengineering).

Introduction

This workshop originated from consideration of existing and potential programs that promote the retention and development of students in their early years of undergraduate studies in engineering. Research indicates that the two primary factors that promote undergraduate student success are student-faculty interactions and student-peer interactions (Astin, 1993 as cited in Felder, 1993). At Arizona State University, as with many universities and colleges of engineering where freshmen enter with class schedules dominated by coursework in introductory engineering, calculus, chemistry, physics and English composition, Bioengineering students often do not have the desired level of opportunity to interact with bioengineering faculty or their bioengineering peers until they progress perhaps one year into their major. In the sophomore year at ASU, Bioengineering students typically enter their first major prefix course, BME 201 Introduction to Bioengineering. In this highly regarded course, students who have committed to the Bioengineering major are exposed to a full semester presentation of career paths and options in the discipline, as well as a survey of sub-specializations in the field including both hands-on labs and in-class exercises. A goal of the Bioengineering First-Year Workshop Series is then to provide a first year or entry year experience for students who have declared in the Bioengineering major or might be considering the major that bridges the time between entry into the university and arrival in the major coursework

The Workshop

The foundation of Arizona State University's Bioengineering First-year Student Workshop Series is to enhance the first-year experience by 1) fostering a community of peers and a connection with faculty; and 2) providing an overview of the bioengineering field. This foundation developed under the auspice that not only do the entering bioengineering students not meet most of their cohorts in the same major their first year, but also the only bioengineering faculty contact they might receive is through faculty advising primarily focused upon course and curricular decisions. By bringing students and faculty together, the department can help foster a sense of community and belonging early in their program when concerns abound on every front for students. The need to provide an earlier understanding of the field of bioengineering originates not only from ASU student feedback, but also from more general reports generated on S.M.E.T. (Science, Mathematics, Engineering, and Technology) education. In Elaine Seymour's article, "Revisiting the "Problem Iceberg": Science, Mathematics, and Engineering Students Still Chilled Out" she details findings on why equally capable students (mathematic S.A.T. scores of 650 minimum) switched to non-S.M.E. majors. At the top of the list is "a lack, or loss, or interest in science," with an overall conclusion that students switch majors based on "career-related concerns." In better introducing first year students to bioengineering at ASU and in the local community, we hope to enhance and support their interest in this highly interdisciplinary field of engineering and provide them lasting insights into their potential future career potentials.

The workshop series aims to provide students with early involvement in bioengineering and to encourage an investment in their education. Additionally, workshops provide an out-of-the-classroom opportunity to help first year students better relate work in their general engineering, math and sciences courses to their intended major and career paths. The workshop is developed in a series of modules to help address these goals. Themes of workshop modules, scheduled to meet every other week, include 1) an overview of bioengineering at ASU including hands-on labs and faculty lab tours, 2) an exploration of education and career paths for bioengineers, 3) and an overview of future programs and how they can participate in the department. Workshop participation is voluntary and students do not receive academic credit.

Module 1: Research Overview at ASU

Introductory Session: Workshop Overview & Hands-on Lab Demo

Lab Tour 1: Biomechanics, Motor Control, & Neuroscience

Lab Tour 2: Biomaterials & Tissue Engineering

The first module directly addresses the goal of cultivating interest in bioengineering while subtly providing linkage to their current course work. This module includes three workshops: the first session introduces the workshop series to the students and ends with an instructional lab (where they will spend much time in future courses) for exciting, hands-on experiences meant to stimulate their curiosity and give them a taste of future courses, while the next two sessions incorporate lab tours. These lab tours provide the first meeting between the first year students and faculty in the department. The professors provide a brief overview of their research and sub-disciplines and provide a link between the students' course work and application in their research field.

Module 2: The Student Experience in Bioengineering

Session 1: Undergraduate Student Panel

Session 2: Graduate Student & Alumni Panel

The second module concentrates on the underlying theme that the unknowns of possible career paths can be of concern early on in student academic preparation. Here we will provide two workshops focusing on careers, one from the point of view of upperclassman and the other from program alumni. With the panel of upperclassman, we want to introduce the entering students to possible paths they might take during their education. Topics might include industrial or clinical internship experiences, working in the research facilities on campus, and discussion of choosing a major area of concentration. With the career panel, we would like the first year students to hear about the successes and struggles that new graduates face in the workforce. The panel is intended to be a diverse representation of career paths taken upon graduation including graduate school, medical school, and industry. The panels not only serve to highlight career opportunities, but also serve as reflection for the students that their current challenges and concerns are likely shared by upperclassman and by graduates currently working in the field.

Module 3: Department of Bioengineering at ASU

Session 1: Preparing for an Active Undergraduate Experience

Session 2: BME Day

The final module serves to pull the other five sessions together and to make students aware of the resources available in the department and college. The first session will introduce the internship program, the BMES student society, and other opportunities for student involvement. The final session culminates on the department's annual BME Day event which highlights the program at ASU to the community including ASU students, industrial guests, and high school students, their parents and teachers. The first year students will be encouraged to participate in the various events throughout the day.

In addition, we propose a mentor for all those who participate in the workshop; the mentors are volunteers from ASU's active student chapter of the Biomedical Engineering Society (BMES). Mentoring provides the early contact, helps establish a sense of bioengineering community for the freshman, and provides a point of view from students who are "learning the ropes" as they are. Another general finding from Seymour's report was the importance of learning environments; most switchers lacked this encouragement to complete their S.M.E. major though they showed signs of a successful student. Through systematic peer mentoring, we hope to instill the importance of forming partnerships/study groups with their cohorts rather than adhering to a competitive learning environment often present in S.M.E. academics. These peer mentors can speak to the value of the study groups they formed early on in their academics.

As a means to evaluate the extent to which the workshop series has influenced and affected their education, the participants' homework will be a journal response to each individual session. The importance of this is two-fold. First, it allows the student to reflect on what they learned that afternoon, to comment on ideas or questions that were raised, and to critique the session for

successes and improvements. Second, the administrators will read each journal and comment as needed. This allows for feedback to the students and for means of assessing the program for student usefulness and improvements to future workshops. Assessment will also be carried out by a survey given both pre- and post-workshop series. Questions will include assessment of the student's knowledge of bioengineering careers, how they would rate themselves as a student, their sense of community within the department, college, and university, and their self-esteem/confidence in their chosen Bioengineering major.

Conclusion

Through this workshop series, we hope to tackle some of the concerns that freshman bioengineering students typically have and to provide a framework to help them succeed within their chosen major. This is a win-win workshop series: students find a support network within their cohorts, mentors, and department, while the bioengineering department discovers how it might better service and support their student constituents. Should this initial series prove successful, an expanded series will be proposed for Fall 2002. These sessions will incorporate modifications based on the student's journals and the faculty response, and will include students enrolled as "undeclared engineering students."

References:

- A.W. Astin, *What Matters in College: Four Critical Years Revisited*. San Francisco, Jossey-Bass, 1993.
- E. Seymour, *Revisiting the "Problem Iceberg": Science, Mathematics, and Engineering Students Still Chilled Out*. JCST, May 1995.

BIOGRAPHICAL INFORMATION

KRISTINE CSAVINA is a doctoral student and IGERT Associate in Bioengineering at ASU. She received her bachelor degree in Mechanical Engineering from the University of Dayton in 1992. She was a participant in ASU's Preparing Future Faculty program and remained with PFF serving as Program Coordinator in 2000-01. Her interest in engineering education has her participating in CRESMET and undergraduate education activities.

JESSICA MITCHELL is the Internship Coordinator and Career Services Specialist for Arizona State University's Department of Bioengineering. She received a Master of Education degree from Western Washington University in Student Personnel Administration.

JAMES SWEENEY is an Associate Professor of Bioengineering at Arizona State University, and serves also as Associate Chair for Academic Affairs and Strategic Initiatives within the Department of Bioengineering. He received his Ph.D. and M.S. degrees in Biomedical Engineering from Case Western Reserve University in 1988 and 1983, respectively, and his Sc.B. Engineering degree (Biomedical Engineering) from Brown University in 1979. He regularly co-instructs the ASU course BME201 Introduction to Bioengineering.