

# Factors That Influence Engineering Freshmen in Choosing Their Major

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## Abstract

Over at least the past quarter century, engineering educators and even the national press have viewed with concern the declining interest of US students in the STEM disciplines relative to other choices available to students. Within engineering and computer science, educators are coping with large increases in undergraduate enrollment in some disciplines (for example, mechanical engineering) and large declines in enrollment in others (for example electrical engineering and computer science after the “dot com” collapse). Over a period of four academic years, the Watson School of Engineering and Applied Science at Binghamton University has done a student survey designed to rank the factors which influence choice of major. This work examines the results of these surveys, as collected from a pool of approximately 300 first-year engineering-intended students each year. Three factors were rated by students as most important in their major selection process:

- (1) Personal Academic Interests;
- (2) Potential for Societal Contributions; and
- (3) Perceived Job Prospects.

Students also had a high degree of support for “Decision Before Freshmen Program.”

## Background

The Watson School has a common first year for engineering majors. Students enter the Watson School as “undeclared” and are formally in the Engineering Design Division. First-year students take a 2-credit “Exploring Engineering” course in each of the fall and spring semesters (WTSN111/112), consisting of two lectures and one lab each week. They also take a 2-credit “Engineering Communications” course in each of the fall and spring semesters (WTSN103/104), which consists of a discussion session each week. In April of their first year they declare their major.

## Objective

The objective of this study was to rank the factors that influence the choice of major of Watson School first-year engineering students.

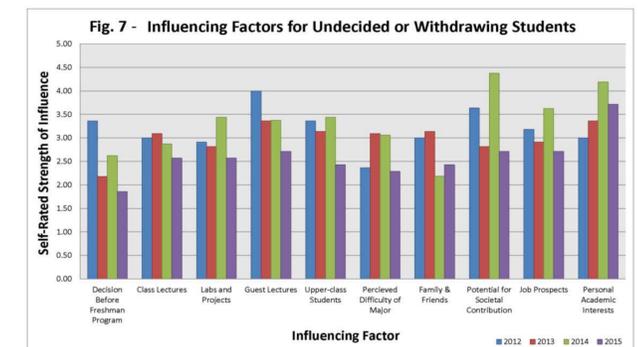
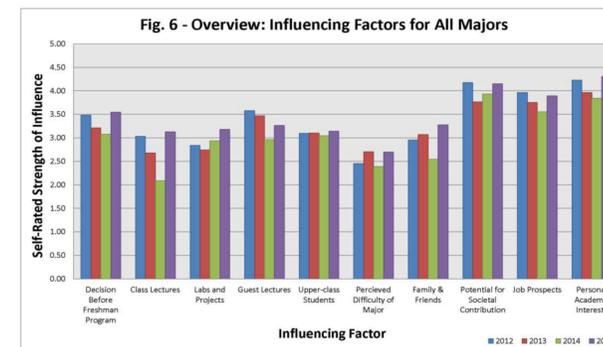
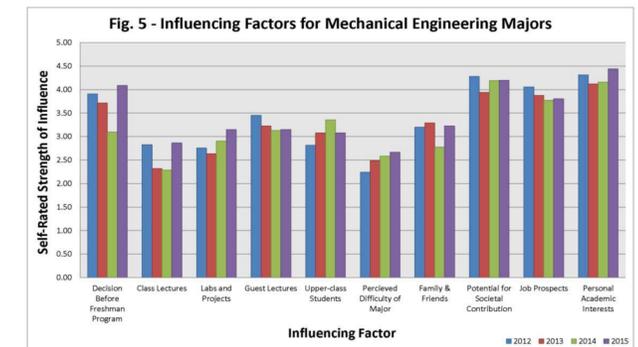
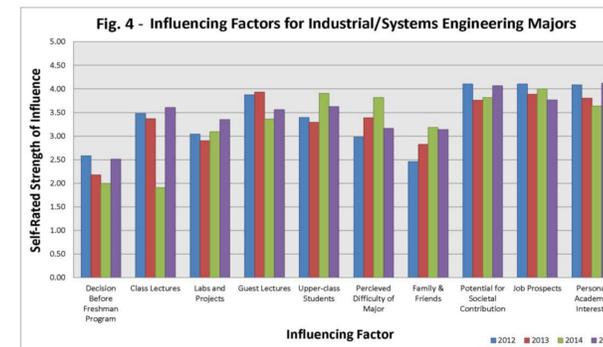
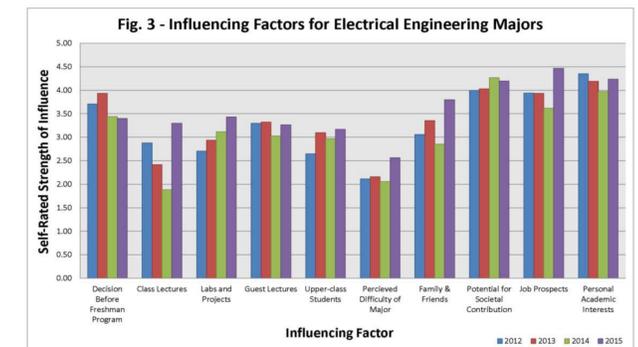
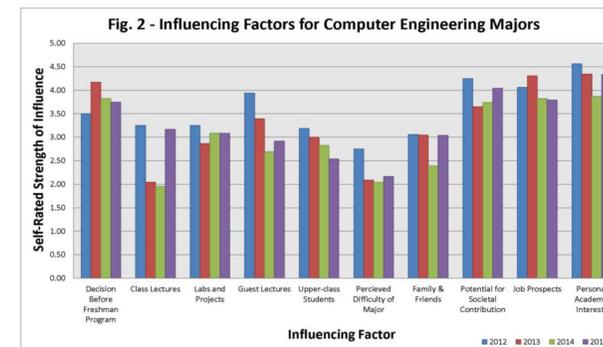
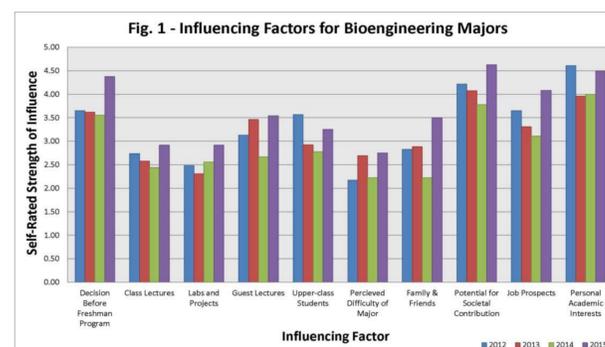
## Study Description and Results

A 10 question survey, as shown in Table 1, was given to students in April of their first year around the time they formally declared their majors. In the first 3 years the survey was administered during a lecture using an *iClicker*<sup>TM</sup>. In the fourth year the survey was administered as a survey on *Blackboard*<sup>TM</sup>. Participation rates each year varied from about 53% to 92%. The results are shown in Figs. 1 - 7.

Table 1 - **A** = Strongly Agree **B** = Agree **C** = Neutral **D** = Disagree **E** = Strongly Disagree

1) I was already pretty sure which engineering program I wanted before coming to Binghamton University and I did not change my mind.
2) The WTSN 111/112 lectures helped me to decide my major.
3) The labs and project in WTSN 111/112 helped me decide my major.
4) The faculty members from the academic departments who gave guest lectures helped me decide my major.
5) Input from upper class students helped me decide.
6) The levels of difficulty of the various majors helped me decide the major.
7) My family and/or friends helped me to decide my major.
8) I believe the major I chose will best allow me to contribute to society.
9) I believe the job prospects will be the best in the major I chose.
10) My personal academic interests best match the major I chose.
11) Which major did you choose? Please pick from the following choices and record your answer. Please leave blank if you have not yet decided on an engineering major or have a major other than the ones listed.

**A** = BioE **B** = CoE **C** = EE **D** = ISE **E** = ME



## Conclusions

- 1) Factors influencing first-year engineering students in choosing their major that can be directly controlled in a first-year engineering class -- such as “Class Lectures” and “Labs and Projects” are less significant than factors that extend beyond the freshman engineering lab and classroom -- such as “Personal Academic Interests,” “Potential for Societal Contribution,” and “Perceived Job Prospects.”
- 2) Actions to influence students in choosing their majors should be taken before they enter college. Most first-year engineering students have a general idea of what career paths are important for society and have good job prospects, long before entering college.
- 3) It is believed that a common first-year experience for engineering students, allowing students to choose a specific engineering major near the end of that first year, is a sound academic practice. The main goal in presentations to first-year engineering students about each major is not to sway undecided students toward any particular major, but rather to present them with information to make an informed decision.

## Reference

Noonan, Jeremy S., Oakes, William C., and Imbrie, P. K., “First-Year Engineering Students’ Choice of a Major: When It Is Made and What Influences It,” in American Society for Engineering Education Conference, March 31 – April 1, 2006.