Measuring the Pro-Social Value System of Electrical Engineering Students

MONTANA STATE UNIVERSITY
Engineering Education Research Center

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Abstract

This poster presents the results of a study conducted at Montana State University (MSU) to measure the prosocial affordance beliefs about the electrical engineering (EE) profession in addition to prosocial trait endorsements of students in freshman and senior level EE classes. Goal-Congruity Theory states that students are more motivated to pursue a career when they believe the profession affords the values that they personally endorse. Goal-Congruity further categorizes value into two forms, agency (wealth, prestige, power), and prosocial (working with and helping others, benefitting society). Prior work has shown that all students possess prosocial trait endorsements, but that some students don't perceive EE as being a profession that affords prosocial value. This incongruence can lead to diminished motivation to pursue, and persist in, EE. We hypothesize that simple classroom interventions to highlight the prosocial impact of the EE profession will go a long way toward increasing interest and motivation to persist in EE. This research initiation project builds the groundwork for a future intervention by first measuring student attitudes and personal trait endorsements of EE students at MSU.

Motivation

Forming an engineering workforce that keeps the societal impact of technology at the forefront of engineering decisions is critical to the prosperity of our communities. The ubiquitous nature of technology in the modern world means that siloed engineering decisions can have a devastating impact on society. Embedding the consideration of societal impact in the engineering decision making process can have a significant impact on items such as sustainability and creating technology that serve all constituents of our society. Additionally, it has been shown that all students, both men and women, want careers that afford benefits society and helps others, so framing curriculums in a way that highlights the prosocial value of engineering may propel student learning and increase retention into the workforce.

Our study is additionally motivated by the fact that past research has shown that prosocial trait endorsement diminishes over time while in college (Cech, 2014). This means that there is an unknown mechanism in our engineering curriculums that is reinforcing the students' mindset that the impact of engineering decisions on society are secondary to other considerations.

Theoretical Framework

Goal-Congruity Theory states people are more likely to pursue a career that affords the values they endorse (Diekman, 2010). From the perspective of a student, there are two places that values are important:

1) what values does a student personally hold dear?
2) what opportunities does a student believe a given job provides for?

Theoretical Framework Cont...

When these two types of values are congruent, motivation improves. Goal congruity research has further found that there are generally two categories of values: agency (self-oriented, wealth, prestige) and prosocial (other-oriented, working with and helping others, benefitting society). While it is certainly possible to view a profession as affording both agency and prosocial value, research on goal congruity finds that most people desire professions that allow them to work with and help others and that the positive influence of prosocial values accounts for motivation above and beyond that of agency values.

The concern for the formation of the EE profession is that it is often misperceived as not affording prosocial value. Indeed, engineering embodies the stereotype of individuals working in isolation with a singular focus on technology (Cheryan, 2015). While there are certainly parts of engineering that involve working alone, 21st century engineering problems are predominantly solved by teams working collaboratively to create solutions that benefit others. Thus, the perception that engineering does not afford prosocial value (i.e., working with & helping others) is mostly inaccurate. This inaccuracy can contribute to students not choosing EE as a degree, or for those that do earn a BSEE, deciding not to enter the workforce.

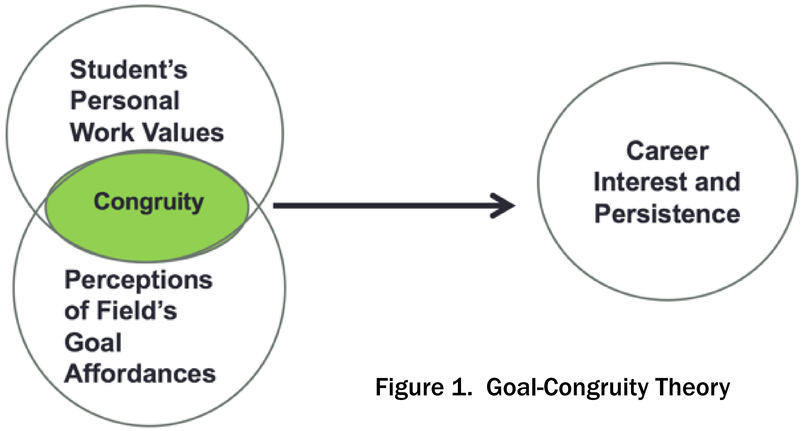
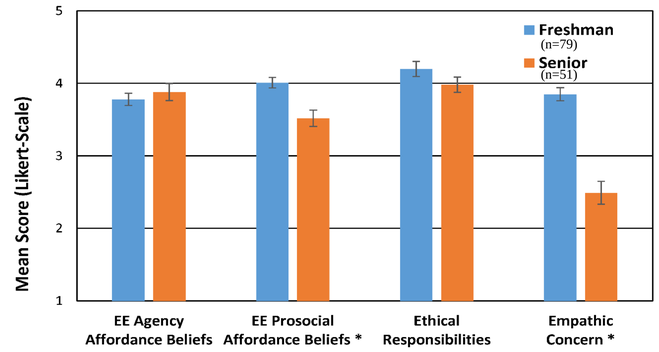


Figure 1. Goal-Congruity Theory

Method

An online survey was designed and administered to students enrolled in required freshman-level and senior-level EE course during the same academic year at MSU. Instruments from other studies that had been tested for reliability and validity were used to measure affordance beliefs about the EE profession (both prosocial and agentic), prosocial trait endorsement, and specific measures on the important of technical vs. professional skills in having a successful career in electrical engineering. Participation was voluntary & participants received a $10 Amazon card.

Analysis & Results



Note 1: Error bars are +/- 1x Standard Error.
Note 2: * Indicates statistically significant difference between groups (p<0.05)
Note 3: All measures are on 5-point Likert scale except Empathic Concern, which is on a 6-point scale.

Figure 2. Comparison of Affordance Beliefs and Prosocial Trait Endorsements across Freshman and Senior EE Students.

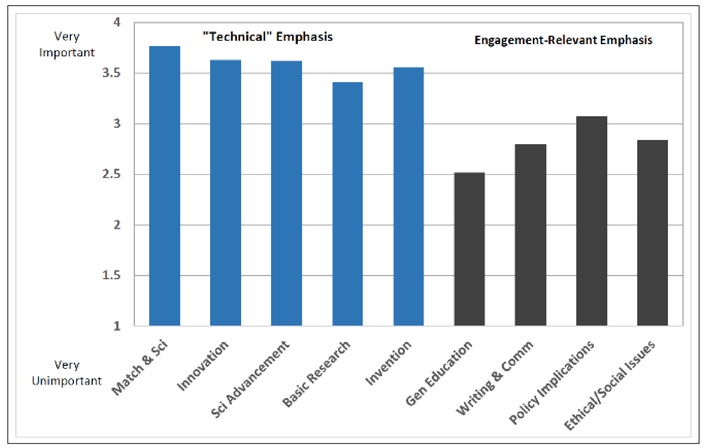


Figure 3. Student Perceptions of the Relative Value of Technical vs. Engagement-Related Skills.

Discussion

These results reveal a disturbing trend in the value systems of EE students. Freshman students show higher prosocial affordance beliefs about EE and higher levels of empathetic concern compared to seniors. The question emerging that **warrants a longitudinal study** is whether students with these high levels as freshman leave the program or if our curriculums are somehow diminishing these beliefs/traits. In both groups technical skills are valued more than non-technical. Both of these findings are of concern to the professional formation of engineers in which society impact needs to be at the forefront of engineering decisions.

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