A Longitudinal Study of the Ethical Development of Engineering and Non-engineering Students at a National Research University

Cynthia J. Finelli, Janel A. Sutkus, Donald D. Carpenter, and Trevor S. Harding

Context

Recent national reports (National Academy of Engineering, 2003; National Academy of Engineering, 2004; National Academy of Engineering, 2005) highlight the importance of promoting the development of ethical behavior among undergraduates. Academic dishonesty (i.e., cheating) provides one measure of ethical behavior, and it is particularly problematic on college campuses, with upwards of 80% of undergraduates reporting that they have cheated at least once during college (Bowers, 1964; Brown & Emmett, 2001; McCabe & Drinan, 1999; McCabe & Trevino, 1997; Spiller & Crown, 1995). It has been well documented that the rate of undergraduate cheating differs by college major, and findings in this regard consistently reflect those reported by McCabe (1997) – the percentage of undergraduates who report engaging in any type of cheating is highest for those students enrolled in "vocationally-oriented majors such as business and engineering": business (91%), engineering (82%), social sciences (73%), and natural sciences (71%).

Theoretical Framework

To better understand college cheating behavior and to investigate student differences, the E^3 Team* has developed and tested a *theoretical model* of the decision-making process that students use when deciding whether to engage in unethical behavior. The model is a modified version of Ajzen's Theory of Planned Behavior (Ajzen, 2002; Ajzen, 1991) that includes the variables of Ajzen's original model (attitude toward behavior, subjective norm, perceived behavioral control, and intention) as well as measures of past behavior, demographics, moral obligation, and moral reasoning. Although cheating is admittedly a single form of unethical behavior, the E^3 Team has used it as a *proxy* measure for behavior in the model because it is a familiar and "authentic" behavior for undergraduates and it represents a situation in which knowledge of ethics is no guarantee that an individual will engage in ethical behavior. Figure 1 illustrates the model.

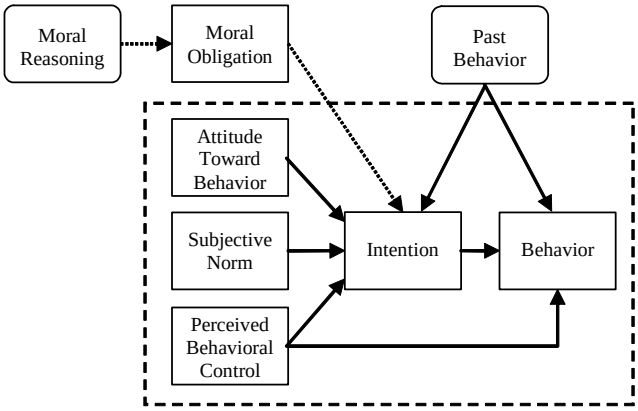

Figure 1. A theoretical model of the ethical decision-making process

* The E^3 Team consists of engineering educators and educational researchers who have worked collaboratively since 2000 to explore ethical decision making in engineering. The team includes this abstract's authors. More information about the team can be found at its website: http://www.engin.umich.edu/research/e3/index.html.

Previous research by the authors (Finelli et. al., 2005; Harding et. al., 2006; Harding et. al., 2007) comparing aspects of the theoretical model for engineering and humanities students confirms that the model is appropriate for understanding why students cheat – it accurately predicted both intention and actual behavior for students in both majors. In addition, the authors' work not only corroborates reported differences in college cheating rates between students in these majors, but it also shows that these differences are independent of the number of opportunities an individual student has to cheat. Further, the research indicates that these differences exist only in college, not in high school – both groups of students reported cheating in high school at statistically identical rates. Taken together, these findings imply that the historically higher rates of cheating reported by engineering students could be the result of the engineering curricula or academic environment, rather than any inherent difference between engineering and non-engineering students.

Research Question

This longitudinal study was designed to explore this hypothesis by addressing the question: "*What are the commonalities and differences in the way in which engineering and non-engineering students develop the skills of ethical-decision making*?" In particular, the authors studied approximately 100 engineering and non-engineering students at both their freshman year (when the authors' previous research indicates there is little difference in the ethical decision-making model for these groups of students) and senior year (when the differences are expected to be more pronounced).

Methodology

To perform this analysis, the authors utilized a two-part survey instrument. The first part, the *PACES-2 Survey*, was created by the authors, and it measures demographics, frequency of cheating (in college and high school), as well as five constructs of the model (moral obligation, attitude toward behavior, subjective norm, perceived behavioral control, and intention). The survey also includes Paulhus's *Balanced Inventory of Desirable Responding*, a reliable instrument used to determine which students are responding honestly and which are deliberately presenting themselves in a positive manner (Paulhus, 1991). The second part of the survey, the *Defining Issues Test 2* (or *DIT-2*), is a nationally normed test that provides a measure of moral reasoning. Originally developed by Rest (Rest & Narvaez, 1994; Rest, et. al., 1999), the test is based on Kohlberg's Theory of Moral Development (Kohlberg, 1981), and it has been shown to have good internal and test-retest reliability and has shown discriminate validity. The two-part instrument was pilot-tested to develop reliable, internally-consistent scales from the PACES-2 Survey and to identify how the scales relate to scores generated by the DIT-2.

The authors administered the instrument at a national research university twice during the undergraduate career of engineering and non-engineering students who enrolled as freshmen in fall 2004. First, 118 students (58 engineering majors and 60 humanities majors) completed the instrument during the second semester of their freshman year. Three years later, 87 of those students (38 engineering majors and 49 non-engineers) returned to complete the identical instrument during the second semester of their senior year.

Findings and Conclusions

Data analysis has not yet begun (the second administration of the instrument was mid-February 2008), but the authors intend to conduct an in-depth study of this longitudinal data to answer the research question stated previously. Specifically, they will perform unpaired t-tests to assess group differences on measures of the model constructs at both the freshman and senior year, as well as across their four years of college. Factor analysis on several items from the PACES-2 survey will provide measures of five model constructs (moral obligation, attitude toward behavior, subjective norm, perceived behavioral control, and intention), frequency of high school cheating will be used to measure past behavior, and frequency of college cheating will be used as the measure of behavior. Finally, ordinary least-squares regression analyses on the four DIT-2 scores (P, N2, Personal interest, and maintaining norm) will be used to assess students' moral reasoning at both the freshman and senior year.

The authors will compare the constructs for engineering and non-engineering students to identify which aspects of the model result in the greatest ethical development for both groups of students. Combined with knowledge of the curriculum and teaching techniques in engineering, these comparisons will allow the authors to reflect on the ways in which curricular approaches used in engineering (e.g., ways in which ethics is included in the curriculum, ways in which instructors are trained to teach ethics, etc.) may be modified to enhance the *development* of students' ethical decision-making skills from freshman to senior year. In addition, the authors will be able to provide insight into the *types of students* (focusing on gender, race, academic profile, and college major) that are most likely to be influenced by these curricular approaches. In the long term, these results are likely to affect curriculum changes nationwide.

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