

article:1258**The Use of Discriminant Analysis to Investigate the Influence of Non-Cognitive Factors on Engineering School Persistence**

Cross-institutional studies [1-3] indicate that the strongest predictors of engineering student success are high school grades and SAT scores. However, regression analyses show that differences in high school grade point averages and SAT scores account for a small percentage of the variability in the data describing student persistence toward an undergraduate degree [1]. Identification of other relevant factors is needed in order to fully understand student persistence patterns [4-6]. This article describes research designed to identify post-enrollment attitudes and perceptions that influence students' decisions to remain in an engineering curriculum over the long term as well as the short term.

The research reported in this article was based on data from two sources. The primary source was the Pittsburgh Freshman Engineering Attitudes Survey (PFEAS) that was administered to engineering students enrolled in a required engineering course during the second semester of their freshman year. The PFEAS has been widely used to measure attitudes of engineering students [5]. The second source was a database consisting of demographic and achievement variables that is updated annually by the University's Office of Institutional Research. The author obtained permission from the University's Institutional Review Board to combine data from these two sources into a single database and use this data to conduct a retrospective study of engineering student persistence.

The participants in this study were 115 students who were enrolled in the School of Engineering at the end of their freshman year of college who took the PFEAS (post-version) during spring 2001, and who could be linked to the associate dean's database by code name. For the first analysis, the participants were divided into three mutually exclusive groups (Stayer1YR, Switcher1YR, and Leaver1YR) based on their persistence in the engineering curriculum as well as their persistence at the University at the beginning of the second year of college. The majority (84.4%) of the participants were still enrolled in the school of engineering at the beginning of the second year of college (Stayer1YR). A minority (10.4%) were still enrolled at the University, but not in the school of engineering (Switcher1YR). The remaining 5.2% (Leaver1YR) were no longer enrolled at Mercer University. For the second analysis, three mutually exclusive groups (Stayer3YR, Switcher3YR, and Leaver3YR) were developed based on persistence at the beginning of the fourth year of college.

SPSS for Windows 11.5 was used to develop discriminant analysis functions that would distinguish among the mutually exclusive groups. The PFEAS, which was designed by

Besterfield-Sacre to elicit students' self-reported attitudes and beliefs about certain variables which have been associated with persistence, yields scores on 13 factors (ENGINEERING CAREER, OBTAIN JOBS, PERCEPTION, SOCIAL INFLUENCES, MATH-SCIENCE, EXACT SCIENCE, FAMILY INFLUENCES, BASIC SKILLS, COMMUNICATION, ENGINEERING ATTRIBUTES, GROUPS, STUDY HABITS, PROBLEM-SOLVING ABILITY). The discriminant functions used four of the sixteen PFEAS factors (JOBS, ENGINE , COMM, BASIC) as independent variables to predict membership into three groups (Stayer, Switcher, Leaver) based on the dependent variable 'persistence in engineering'. Study 1 results used registration status one year after entering college to determine group membership; study 2 used registration status three years after entering college. For short-term persistence (study 1), we determined that 15.6% of the variability in the discriminant function scores was accounted for by differences among the three student groups. For long-term persistence, 20.6% of the variability in the discriminant function scores was accounted for by differences among the three student groups. Using the leave-one-out method, we were able to predict short-term and long-term student persistence status with at least 75% accuracy based solely on non-cognitive factors.

The results of this research suggest that lack of confidence in math and science ability, combined with motivation for studying engineering, are associated with attrition from the School of Engineering. For those whose interest in engineering is genuine, efforts to increase their math/science confidence could result in reduced attrition. For those Switchers who lack confidence in their math/science skills, and whose main attraction to engineering was the expectation of high pay and good job opportunities, the decision to leave may have been the best for them. The long-term persistence results suggest that impressions students hold with respect to their math and science abilities during the freshman year are reflected in their decision to leave engineering as much as two years later.

This research does not negate the important influence of other cognitive variables, especially science and math grades earned in college [4]. Instead, this research confirms that non-cognitive factors such as attitudes and beliefs formed during the freshman year in college should be considered by investigators when they develop persistence models for their institutions. To benefit the pursuit of longitudinal studies, it is recommended that institutions routinely include reliable and valid instruments that measure engineering students' self-reported attitudes and confidence as part of a comprehensive freshman testing program.

References

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