

# Work in Progress: Is Engineering For Me? A Qualitative Case Study of First-Year Students

Tori L. Bailey<sup>1</sup> and Sheri D. Sheppard<sup>2</sup>

**Abstract** – This work in progress describes the experiences of two first-year students from a cohort of eight prospective engineering students at a private university in the western United States. The work presented is part of an ongoing qualitative case study of the cohort of students as they navigate through their undergraduate career. Our preliminary findings provide some initial insights into the intensely personal and largely unshared complex academic major decision process. Over the course of the first year, one student discovered an aptitude for studies outside of engineering, while the other, in pursuit of a more well-rounded education, began to consider alternate pathways towards an engineering career. These narratives illustrate two exits out of undergraduate engineering; both related to the tensions between the students' interest in engineering and other areas of study. The data referenced are based on semi-structured ethnographic interviews with the students at the conclusion of their freshman year.

*Index Terms* – First-year engineering, Persistence, Liberal Education, Qualitative Methods

## BACKGROUND

In their seminal work on persistence in science and engineering, Seymour and Hewitt interviewed undergraduates about their decision to “switch” from or stay in science, math and engineering programs [1]. The authors found that both groups, students who remained and those who switched, raised the same concerns about their experiences in science and engineering programs. Seymour and Hewitt's work enumerates a variety of insights into the major and career decision processes of engineering students. A possible extension of their work would be to consider the migration of students within science and engineering majors.

Adelman's *Women and Men of the Engineering Path* identified 16 different “destinations” of engineering students who had reached some “curricular threshold” of engineering studies [2]. The author collapsed these destinations into four groups, two of which are particularly relevant for beginning engineering students, “thresholders” and “migrants.” “Thresholder” students did not pursue engineering beyond the initial science and engineering fundamental courses; whereas “migrants” moved beyond these courses into engineering majors, but then either switched majors or left college. Adelman's work, though quite comprehensive, does not

consider more affective measures and non-curricular factors, such as the motivation and commitment to pursuing an engineering degree, participation in extracurricular activities, and intellectual engagement in the engineering program.

## INTRODUCTION

The University of Coleman<sup>3</sup> is a medium, private university in the western United States [3]. Coleman strongly encourages undergraduates to explore their academic interests before formally choosing a major [4], [5]. In order to complete the major within four years, prospective engineering students are advised to fulfill a combination of math, science, and introductory engineering requirements during the first two years, in addition to their humanities requirements [5]. The University's commitment to academic exploration precludes its enforcement of a regimented pre-engineering curriculum. Thus, potential engineering students must develop their own pre-engineering programs, engaging in an intense process of self-directed exploration as they decide on their major.

## CURRENT INVESTIGATION

For the past three years, we have observed eight prospective engineering students at Coleman. Each student initially reported an interest in pursuing an engineering major; currently, five of the eight students are pursuing engineering-related disciplines. The other three have chosen disciplines outside of engineering. The data referenced in this work are from semi-structured ethnographic interviews with Octavia<sup>3</sup> and Walker<sup>3</sup>; two of the participants who left engineering for other majors. The interviews were conducted at the end of the students' freshman year in May 2004. We discuss how each student recognized a desire to pursue academic interests beyond engineering. We then highlight the tensions between their engineering and non-engineering interests. These cases raise several issues that warrant further analysis of our first two years of data from the entire cohort. This analysis will be completed by the time of the conference.

## EMERGING RESULTS

Octavia and Walker possess similar pre-college academic backgrounds, both earning top tier scores on their SATs and AP credit in science and/or math courses. During their first year, both students also performed well in their fundamental math and science requirements. Both students were

<sup>1</sup> Tori L. Bailey, M.S., Department of Mechanical Engineering, Stanford University, tlbailey@stanford.edu

<sup>2</sup> Sheri D. Sheppard, Ph.D., Professor, Department of Mechanical Engineering, Stanford University, sheppard@cdr.stanford.edu

<sup>3</sup> Pseudonyms

influenced to pursue majors in engineering based on participating in engineering-related activities during their youth. Octavia was interested in electrical engineering, while Walker possessed more general interests in design, perhaps focusing in mechanical or civil engineering.

Octavia began participating in public health extracurricular activities soon after she arrived at Coleman. Though she had always had an interest in public health, she had never “fostered” that interest. As her extracurricular involvement increased, she began to acknowledge her “passionate interest” in public health. She believed she could “do engineering” and resolved that “maybe if I want to do public health I can like do that later on in life.” By the Winter, Octavia began to seriously deliberate whether to pursue engineering or public health. She considered multiple factors such as her passion for public health issues coupled with a lack of the same passion for engineering, the inability to simultaneously explore both majors, the perception of the different majors as “good” or “bad” depending on its technical rigor, and her perception of each field’s career options.

Octavia believed she felt more “passionate” about public health because it had a direct impact on society as opposed to the more “abstract” impact of engineering. Also, Octavia realized that a course in public health was her “favorite part of the day.” Simultaneously, she had to remind herself that her introductory science courses were just the “basics” and that she would “get to the fun [engineering] stuff later.” However, by the Spring, she reflected that she was enrolling in the math and science courses because that is what she had “to get through” to be an engineer, while she was “interested” in the content of her public health courses. One factor keeping her in engineering was her familiarity with its career options and unfamiliarity with careers in public health. Octavia also reflected on how vested she was in majoring in engineering. She had focused on engineering for so long, she had not thought about majors outside of engineering or the sciences. Faced with a multitude of issues, she finally had to confront her question “what if [public health] is what I really want to do?” By the end of the year, Octavia decided to major in public health.

Walker also had interests outside of engineering; however, his decision to major in engineering was tempered by his desire to explore not one, but several interests. One of the reasons he applied to Coleman is the school’s commitment to a liberal arts education which paralleled his desire to be “well-rounded.” Once he enrolled at Coleman, this desire began to abate his interest in majoring in engineering. Throughout his interview, Walker alluded to his varied interests, ranging from the physical and natural sciences, to more humanistic studies. When probed about how his academic goals had changed since high school, Walker responded that he needed to adopt a “broader perspective” on his studies. Throughout the year, he had attempted to focus solely on his technical courses, but found he was “distracted” by his desire to indulge in humanistic academic work. By the Spring, Walker had begun to consider a minor in the humanities because of his inability to “ignore” these interests.

He believed his major trajectory should be influenced by all of his interests, and furthermore, he should be able to pursue his studies “based on interests” rather than what might “get [him] a good job.”

Though by the beginning of his sophomore year, Walker decided to major in the physical sciences, he has not given up the possibility of pursuing engineering in graduate school or a career in engineering. For Walker, majoring in the physical sciences provides a compromise that enables him to explore a variety of his interests, as well as an opportunity to continue to engage in technical work. His case illustrates an alternate pathway into engineering, based on a desire to be not just an engineer, but a well-rounded engineer.

### SIGNIFICANCE TO ENGINEERING EDUCATION

Our purpose in presenting the preceding preliminary analysis of these two cases is two-fold. First we want to illustrate what *leaving engineering* looks like, specifically when students discover that their academic interests differ from their initial academic major choice. Also, we gained this insight from students in the midst of making their decision whether or not to switch. Second, we want to raise a point of departure from the previous literature, an alternative pathway to an engineering career: migrating from engineering to other STEM majors with the intent to pursue engineering in graduate school and/or as a professional career. We do not claim that either Octavia or Walker is an exemplar representing a more general population of students who leave engineering. We do believe aspects of their narratives resonate with findings from previous studies, and may have implications for how engineering students should be advised and guided, especially during their first years of study.

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