



Student Career Decision Making Approaches and Development of Professional Engineering Trajectories

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Introduction

In becoming engineers, students must assume new roles and acquire new skills, as well as adapt to social norms regarding how they should conduct themselves. Acting the part has important consequences for students' longer term career trajectories and ability to pursue the engineering profession through economic shifts. Understanding the decision-making process by which engineering students determine whether to pursue undergraduate work experiences, or cooperative education (co-op) programs, is critical in identifying how students envision, develop, and form their professional engineering selves. This article is a qualitative study of engineering sophomore undergraduates—both co-op participants and non-participants—reflecting on why they decided to pursue co-op experiences and their experiences as they made this decision. It is, in many ways, an early look at how engineering students begin to form their professional identities as engineers. “A basic assumption is that professional identity forms over time with varied experiences and meaningful feedback that allow people to gain insight about their central and enduring preferences, talents, and values; therefore, professional identity is more adaptable and mutable early in one's career” [1], [2]. Thus, this represents an early stage of this process when professional identity is shifting. Consequently, participation in co-ops has a critical role in shaping professional engineering identities. Ibarra proposed that individuals utilize “provisional selves” as “temporary solutions to bridge the gap between their current capacities and self-conceptions and the representations they hold about what attitudes and behaviors are expected in the new role” [2]. Co-ops, arguably, provide an environment for testing these provisional selves, although internships provide that opportunity in a more temporary way. Thus, this study advances the literature on socialization, the decision-making process, and professional engineering identity.

Methods

We used a grounded theory approach [3], [4] to examine engineering students' decisions to participate in cooperative education programs. Our aim in using this approach was to develop a theory and hypotheses about the process of decision-making regarding co-op participation based on the qualitative data. Therefore, our study design was open-ended to allow for emergent themes. With approval from the Institutional Review Board to conduct this research, we recruited 44 students from a large, Midwestern research-intensive institution to participate in individual interviews. At this institution, co-op participation is voluntary, and students can choose between 3-semester or 5-semester programs. To participate in the 5-semester program, students must apply and engage in the recruitment process during their first year of study. To participate in the 3-semester program, students can apply in their second year of study. Placement in a co-op program is overseen by a student services office with professional staff dedicated to supporting both students and employers. Additionally, each of the engineering disciplines has at least one professional staff or faculty member who helps manage the matching process between students and employers. More than 500 potential employers participate in recruiting co-op students, although not all companies recruit each year. The companies are local,

national, and international in scope and represent a wide range of engineering industries and career trajectories. Once students are hired as co-ops, they are expected to work with the same company across the 3-semester or 5-semester rotation, which alternates between academic study on campus and full-time employment off campus. Tuition is not charged during employment, although there may be a relatively small fee to maintain student status.

The 44 individual student interviews were conducted in Spring 2015, and the interviews ranged from 30 to 60 minutes in length. Students who participated in the interviews were in their second year of engineering study. We selected this group because they would have recently experienced the first-year co-op recruitment process. Importantly, in addition to experiencing the first-year co-op recruitment process, they would still be eligible to participate in the 3-semester co-op program the following year. Thus, we were able to obtain a range of perspectives from: (1) students who are currently co-op students; (2) students who were interested and/or applied for co-op, but did not participate; (3) students who are still considering participating in co-op; and (4) students who do not have any interest in participating in co-op at any time. This cross-section of students provides us with multiple perspectives and experiences regarding the decision-making process for participation in co-ops.

Table 1 describes the demographic characteristics of our sample, which comprises 39% women, 11% international students, and 77% White students. Several engineering disciplines are represented; however, the majority of the students in the sample are majoring in mechanical or chemical engineering. Approximately 40% of the students are currently participating in co-ops.

Table 1. Sample Descriptive Statistics.

Demographic Characteristic	n	%
Sex		
Male	27	61.4
Female	17	38.6
Citizenship		
U.S. Citizen	39	88.6
Non-U.S. Citizen	5	11.4
Race/Ethnicity		
White	35	79.5
Asian	5	11.4
Hispanic	1	2.3
PFTA	1	2.3
Other	2	4.5
Engineering Major		
Aeronautical & Astronautical Engineering	3	6.8
Agricultural & Biological Engineering	3	6.8
Biomedical Engineering	2	4.5
Chemical Engineering	8	18.2
Civil Engineering	5	11.4
Electrical & Computer Engineering	5	11.4
Industrial Engineering	3	6.8
Materials Science Engineering	3	6.8

Mechanical Engineering	11	25.0
Other	1	2.3
Co-op Participation		
Participant	18	40.9
Applied, Non-Participant	8	18.2
Did Not Apply	18	40.9
<hr/>		
Total Number of Interview Participants	44	

Results

We identified two emergent themes: (1) logistics of work opportunities, and (2) social influence of family and friends in decision-making. From these themes, we developed a theoretical model to help explain the decision-making approach of engineering students concerning co-op participation (Fig. 1). Our conceptual model proposes that there are four broad approaches that are significant in the decision to participate in co-ops: (1) Explorer, (2) Reinforcer, (3) Explorer/Reinforcer Hybrid, and (4) Undecided. We tested and verified our theoretical model using the student interview cases.

Logistics of Work Opportunities

This theme consists primarily of the student's relative importance of location and issues associated with school-work transition. Our interviewees discussed the relative importance of the actual geographical location of co-op opportunities, as well as potential post-graduation employment sites. For some students (15), location of employment was very important. For those who did not consider location heavily, it was because they found that doing so was too constraining or location was just not that important. Those who indicated that location was important were more likely to be Explorers, or students who seek breadth of experiences and flexibility. Some students also expressed concern regarding logistics of transitioning between work and school terms, including housing and academic considerations. Not all students process these factors the same way; thus, it was important to explore the various ways students perceived logistics of work opportunities.

Social Influence of Family and Friends in Decision-Making

Both family and friends influenced our students' decision-making. While some students indicated that their families and friends encouraged and supported them in pursuing co-op opportunities, others indicated that families or friends discouraged participation. Similar to the previous theme, it was important to take into account the multitude of ways students perceived and reacted to social influences when deciding whether to participate in co-op.

Conceptual Model of Decision-Making Personas

Our model proposes four approaches of decision-making: (1) Explorer, (2) Reinforcer, (3) Explorer/Reinforcer Hybrid, and (4) Undecided. These personas represent different modes of decision-making in terms of co-op participation. Each approach represents unique attributes that illustrate ways of interacting with the work environment. Below we describe the unique features of each approach. While most of our interviewees identified with the Explorer or Reinforcer approaches, there is a small number of interviewees who were Hybrids or Undecided. These

students represent a group who did not want to consider any type of work experience during their engineering study. Since our focus is on career decision-making approaches, we focus on the two different approaches to career preparation: Explorer and Reinforcer.

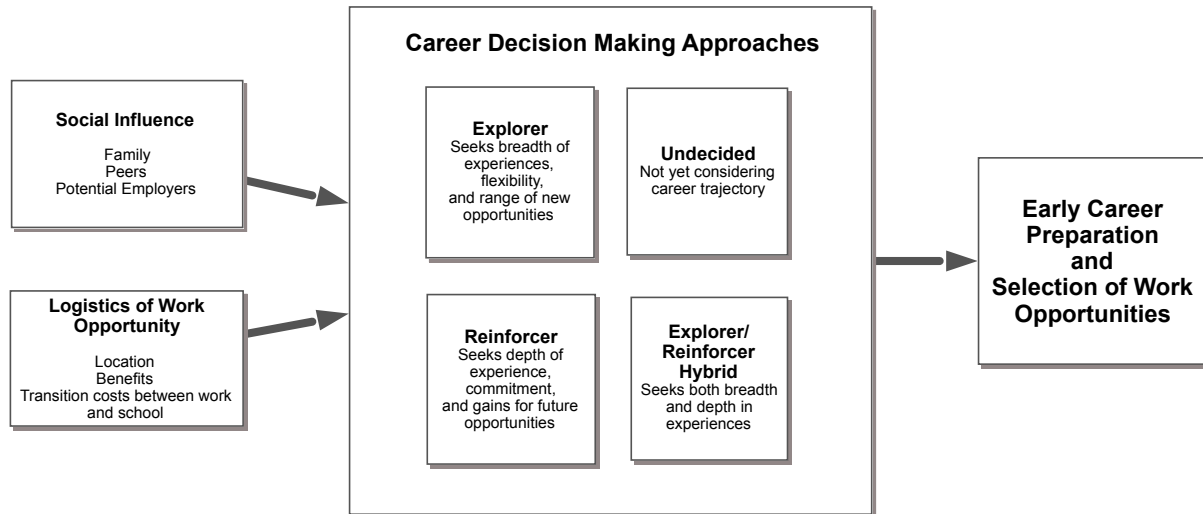


Fig. 1. Theoretical Model of Career Decision Making Approaches

Approach 1: The Explorer

Seeking a variety of shorter term exploratory work and extracurricular activities during his or her undergraduate years, the “Explorer” is more interested in getting a breadth of professional engineering experiences. In relation to career planning and preparation, the Explorer’s main attributes are exploration, flexibility, and mobility. While Explorers understand the importance of gaining professional engineering experience through co-op participation, they value flexibility in their career planning and preparation. Many prefer internships, defined here as a summer-long or semester-long work assignment with a single employer. Explorers prefer internships because they can pursue multiple internships during their undergraduate years with different employers and therefore gain a breadth of experiences, or they can mix internship experiences with study abroad. They generally regard co-ops as rigid in terms of the academic and employment rotation schedule and the length of commitment.

Approach 2: The Reinforcer

Reinforcers are more likely to engage in longer term commitments because they value the gains associated with commitment. They view co-ops as both accessible and attainable, which make co-op participation a valid and feasible route toward professional development and engineering experience. They value the opportunity to engage with one employer for multiple rotations to better learn about the company and to have increasing responsibilities and depth in their work experiences. They see the time commitment associated with co-op participation as a positive step toward the development of their longer-term career trajectory and professional development.

Discussion/Conclusion

We identified four different approaches that undergraduate engineering students engage in as preparation for their early career work experiences. Noting the differences in students' approaches to early career preparation, work-integrated learning experiences may be a better fit for students with certain approaches toward their professional development. Co-op employers and administrators can potentially apply these findings to develop strategies to more efficiently and effectively recruit students and encourage greater participation. They can reach out to students who have Reinforcer or Explorer/Reinforcer hybrid approaches, as these students are more likely to value the commitment and the depth of experiences that co-op offers. Meanwhile, for Explorers, co-op employers and administrators may choose to recruit students by emphasizing co-op opportunities that may offer a breadth of experiences within one co-op employer—for example, the opportunity to work in multiple divisions/areas within one company or the possibility of going to different locations with each co-op rotation with the same company. Since the Undecideds have a different approach to their early career preparation, they will require alternative strategies for participation in work-integrated learning. It may be that these work opportunities are not in alignment with their current professional trajectory, and they may or may not benefit from more exploration of potential employment positions. Internships, study abroad, and other co-curricular work experiences appear to be in alignment with students whose approach falls in line with Explorers. These opportunities are shorter term, and therefore have lower transaction costs, but they provide Explorers with the breadth of experiences that they crave in terms of career exploration. Our theoretical model proposes the different approaches that students may have in terms of early career preparation, and it can be useful toward designing strategies and programs that address the various needs and outlooks of engineering students for a more diverse and strong engineering workforce.

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