

Understanding the Socializer Influence on Engineering Students' Career Planning

Abstract

This research paper describes how engineering juniors and seniors perceive the influence of socializers on their post-graduation career planning. Grounded in Expectancy x Value Theory (EVT), this qualitative investigation is part of a sequential mixed-methods study that included two survey phases and an interview phase. An exploratory analysis of 72 interview excerpts revealed four dominant socializer groups, namely, family, peers, university related individuals, and work related individuals, as well as three distinct areas of socializer influence: thinking about specific jobs, job exploration in general, and choosing whether to pursue further education. A closer look showed that while parents, peers, professors, and supervisors were all important to students' career plans, the type of influence each had tended to differ. In-depth examples of socializer influence and their impact on students' job related decisions are shared in this paper. The results are insightful for researchers, university and industry stakeholders, and students.

Introduction

To support and strengthen a healthy engineering workforce, researchers have worked towards gaining a holistic understanding of the factors influencing the entry and exit of engineers from engineering majors and fields. In examining career choice processes both in general and in specific disciplines, research has tended to focus on how the attributes and characteristics of individuals differentiate their choices.¹⁻⁴ Outcomes from this research show that multiple factors such as socializers, knowledge, skills, and abilities influence students' transition in to the workforce. Lacking from current literature is a nuanced understanding of *how* these factors impact career choices.

To begin closing this gap, our analysis takes an in-depth look at the junior and senior engineering students and the socializers that influence their career planning. We define a socializer as anyone who provides a student with information about their career options and, as a result, influences the student's thinking about their post-graduation plans. Specifically, this research paper addresses the following questions:

- RQ1. Whom do junior and senior engineering students perceive as socializers influencing their post-graduation career plans?
- RQ2. What areas of thinking related to junior and senior engineering students' career plans are influenced by socializers?
- RQ3. What areas of thinking related to junior and senior engineering students' career plans are influenced by *specific* socializers?

To answer these questions, we examined interviews with 62 engineering juniors and seniors from six different universities in the U.S. To frame our study, we used Eccles et al.'s Expectancy x Value Theory of Achievement Motivation as this framework provides concrete examples of ways that socializers influence student outcomes.⁵⁻⁷

Background Literature and Theoretical Frameworks

Although research shows that socializers influence all aspects of pathways into and through engineering careers,¹¹⁻¹⁴ literature on the role of socializers in students' choices about their first positions after they graduate is fragmented. For example, previous work shows that positive undergraduate research experiences lead engineering students toward graduate school⁸⁻¹⁰ and that positive internship experiences lead them toward the workforce¹⁵⁻¹⁸ after graduation from college. Previous work also shows that interactions with professors and graduate students form a major part of the undergraduate research experience,⁸ and that interactions with supervisors, co-workers, and mentors are a significant portion of students' social interactions during internships.¹⁵ Parents influence undergraduate engineering students' career and persistence choices as well. For example, Martin, Simmons and Yu (2014) identified six different roles that parents fill and identified patterns based on parental educational attainment level.¹⁹ Building on the idea of parent support, Simmons and Martin (2014) found that a variety of people can serve as what they call fictive kin, or "like family," to support first-generation college students' persistence in engineering.²⁰ Family (i.e., family of origin and current partner/spouse) has also been determined to impact the choices of early career engineering graduates.²¹ While such findings help researchers and practitioners understand the strong forces pushing students toward and away from pursuing (and persisting in) engineering careers, we do not know the full list of who all these socializers are nor do we know details of what those influences are. Using a large data set, our analysis helps by expanding current knowledge of "who's" and "what's".

Our analysis is situated within a larger, mixed-methods and longitudinal study which seeks to understand connections between socializers and specific actions of engineering undergraduate students as they navigate toward their first position after graduation. This study uses the Professional Pathways model which combines two frameworks, Sampson et al.'s model of Cognitive Information Processing²²⁻²³ and Eccles et al.'s Expectancy x Value Theory of Achievement Motivation (EVT),⁵⁻⁷ to comprehensively examine career choice processes. Specific to our research questions, we used Eccles' EVT as a framework. EVT posits that socializers' beliefs influence their behaviors, which in turn influence students' outcomes. The beliefs, behaviors, and outcomes considered for our study are those relevant to students' career choice processes. For example, socializer beliefs include general perceptions such as those regarding the work environments associated with a specific career or student-specific perceptions related to students' abilities, skills, and interests. Socializer behaviors are how the socializers act or what the socializers do and may include offering career guidance or encouragement of career related activities. Finally, student outcomes include the choices students make, but also changes in students' self-concepts of ability, perceived costs of obtaining a career, interest in a specific career, etc.⁷ Although EVT theorizes such relationships, little research to date has actually explored these relationships in terms of how different socializers may impact aspects of a student's career choice process or outcomes. In conjunction with EVT, qualitative research is particularly useful to unpack the nuances of *who* different socializers are and *what* part of the process they influence from the student's perspective.

Research Methods

To address our research questions, we examined the interview responses of sixty-two juniors and seniors from six engineering schools across the country. Semi-structured interviews were conducted to allow students to provide insight into their personal experiences, in their own

words.^{24,25} These interviews probed students’ beliefs and perceptions pertaining to their preparedness to approach, enter, and traverse the job market. Specifically, questions asked about factors influencing their confidence and knowledge related to job exploration, job acquisition, and job performance. Two sets of categories emerged from coding the data to answer our research questions RQ1 and RQ2: the socializers whom students reported as having influenced their post-graduation career planning and the types of influence socializers had on their plans. We also examined the relationships between these sets of categories to identify the underlying patterns of influence of specific socializer groups on particular areas of career related panning (RQ3).

Research Sites/Participants

The study deployed nationally included a Western private university (WPRI), a Western public university (WPUB), a Midwestern private university (MPRI), a Midwestern public university (MPUB), and two Eastern public universities, one of which is a residential school (ERES), and the other a commuter school (ECOM). The school sampling was purposeful for their geographic, institutional, and student body diversity, to allow for the examination of both personal and contextual (e.g., regional, institutional, disciplinary, etc.) factors that affect engineering students’ career choices. The six universities have purposeful variation with respect to Carnegie classification for size, engineering enrollment, and public/private classifications.²⁶

The participants were a subset of 1,916 engineering students surveyed for the larger, longitudinal, mixed-method study funded by the National Science Foundation (NSF) and titled Professional Engineering Pathways Study (PEPS).²⁶⁻²⁷ Among the 1,916 students, 939 agreed to participate in a follow-up interview, and 76 were invited to be interviewed resulting in a total of 62 interviews. The interview sampling included purposeful sampling of mechanical engineers across all universities, and chemical engineers from two universities, to reduce potential variation in the data due to differences in discipline. Our initial interview plan was to represent the student demographics within each department; however, several universities did not have a sufficient sampling pool or did not have sufficient student response to match said demographics. Table 1 includes participant’s self-reported demographics from the initial survey.

Table 1. Interview Participant Demographics

School	Gender [1]			Year [2]		Major [3]		Ethnicity [4]		Total
	M	F	O	JR	SR	ME	CHE	Non-URM	URM	
ECOM	5	5	0	4	6	7	3	6	4	10
ERES	10	4	0	6	8	12	2	13	1	14
MPRI	6	0	0	1	5	6	0	6	0	6
MPUB	6	5	0	3	8	11	0	9	2	11
WPRI	4	7	1	6	6	12	0	10	2	12
WPUB	7	2	0	2	7	9	0	7	2	9
TOTAL	38	23	1	22	40	57	5	51	11	62

[1] M=Male, F=Female, O=Other; [2] JR=Junior, SR=Senior; [3] ME=Mechanical Engineering, CHEM E=Chemical Engineering; [4] URM=Underrepresented racial/ethnic minority, based on student survey response – students selecting at least one of the following in a “mark all that apply” question about their racial or ethnic identity were classified as URM: American Indian or Alaska Native, Black or African American, Hispanic or Latino/a, or Native Hawaiian or Other Pacific Islander.

Data Collection

The semi-structured interview protocols²⁴ were collaboratively developed by the qualitative research team through a series of expert reviews, pilot interviews, and weekly check-ins by the interview team during the interview process to ensure that thick, rich data were being gained. Two versions of the protocol, a “Senior” version and a “Junior” version, were developed with the actual protocol used based on the participant’s opening statements. Students actively seeking a first position for after graduation were interviewed based on the Senior protocol, while all other students were interviewed using the Junior protocol. The protocol was divided into two main sections with a pre-amble introducing the interview’s purpose and a post-amble allowing for any added comments to be captured. The first section contained five questions asking students about their career plans post-graduation. The second section contained four questions related to the “nuts and bolts” of finding, applying for, and obtaining a job post-graduation. Within each of these areas we explored the influence of people (socializers) on the students’ career related plans, confidence, and preparedness. The interview team consisted of nine researchers each trained by the leads of the interview team. The interviews occurred between November 2016 and February 2017. The interviews were approximately 45 minutes long, conducted via phone, audio recorded, transcribed verbatim, and cleaned to protect the identities of participants prior to analysis.

Data Analysis

The analysis process began by coding the interview transcripts. Each interview transcript was analyzed in its entirety to capture all instances of socializer influences; however, two sequential questions, “How have people influenced your career plans?” and “Can you provide an example that particularly stands out for you?”, were especially rich with information about socializers. The qualitative research team conferred on a regular basis to validate the codes and the coding process. Dedoose and Excel were used to code and analyze the interviews.

Our coding process was guided by EVT in that we were interested in exploring the socializers that influence students’ career planning, as well as the ways that socializers influence their plans. We used an iterative coding process, which moved from *a priori* codes to emergent sub-codes (inductive coding) with iterations by the qualitative research team to challenge code definitions and thoroughness of interview transcript coding.^{28,29} The *a priori* codes were chosen based on the research questions, while the inductive codes helped populate the finer details. The coding of each transcript began by examining the transcript and coding for mentions of “socializers” (Who, related to RQ1) and “socializer influence” (What, related to RQ2). Next, the excerpts within each major category (Who, and What) were coded inductively to allow for specific instances of socializers and socializer influence to emerge. We define a “specific (or individual) instance” as a student reporting a specific socializer influencing the students’ career planning in a specific way; multiple mentions of the same socializer influencing the student in the same way were coded as a single instance. Intercoder reliability was conducted by having an analyst familiar with the data set, but not responsible for socializer coding, review a subset of coded excerpts.³⁰ The analysts compared codes and refined code definitions until agreement was reached.

Our coding of the interview transcripts yielded a list of socializers (our “Who’s”) and the types of influence socializers had on students’ post-graduation plans (our “What’s”). Once these codes were finalized, we quantitized the qualitative data using tables and counts of codes to facilitate theme identification and pattern investigation. According to Tashakkori and Teddlie (1998),

quantitized data makes sense in cases where there is a lot of qualitative data of which to make meaning.³¹ We then analyzed the intersections of socializer (Who) and influence (What) codes, the result of which was a nesting of socializers patterned with the types of influences they have on students. This nesting allowed us to analyze our data with respect to our third research question focused on understanding the influence of *specific* socializers on students. For the purposes of this analysis, how we scoped our “What’s” (the influence socializers had on students) intentionally did not include socializers’ influence on the mechanics of job acquisition, which we define as the process of applying for, interviewing, and negotiating a job. Analysis of socializers’ influences on the mechanics of obtaining a first job after graduation will be the focus of a different research manuscript.

Findings

Perceived Socializers in Students’ Career Planning

Our analysis yielded 70 individual instances of socializers influencing students’ post-graduation plans. Together, they show that undergraduate engineering students come in contact with a myriad of socializers that touch their lives and change the trajectory of their professional paths by directly or indirectly influencing their career planning. Four categories of socializers emerged from our inductive coding of socializers. First among them were *family members*, which include parents, grandparents, aunts and uncles, close family friends, and community acquaintances known via the family structure. The next group of socializers that emerged from the student interviews was *peers*, i.e., those closer to the student’s age group, including siblings, friends, or friends of friends, recent alumni, and other college students. Students also mentioned *university-related socializers* including professors, academic advisors, club advisors, and research supervisors. Students interacted with some of these socializers in the context of the classroom (e.g., professors teaching their courses). Other socializers in this category served as parent-like figures, lending their guidance and advice to the student. Student’s career planning was also influenced by *work-related socializers* comprised of work supervisors, coworkers, and company leadership. This category also includes other professionals with whom students came into contact, such as guest speakers, job recruiters, and people met at conferences. Lastly, although not a dominant group, there were also some examples of unique socializers (i.e., influencers specific only to one student). For example, citing his involvement with the local Christian community, a student said that, “the Christian community I was involved in [at school] helped me redefine my image of what a workplace should look like” (Student 6434).

Socializer Influence on Students’ Career Planning

Our findings also reveal that socializers influence students’ thinking related to their post-graduation plans in three different areas: thinking about specific jobs, job exploration in general, and choosing whether to pursue further education (Table 2).

Table 2. Definitions of Influence Sub-Codes

Sub-code	Definition of Sub-code
Thinking about specific jobs	Participant describes socializer influence on his/her thinking about pursuing (or not to pursuing) a specific type of job after graduation (e.g., management, teaching, research, medical devices, automotive industry, etc.)
Job exploration in general	Participant describes socializer influence on learning about job options generally from talking with, listening to, or observing other people, either

	one-on-one (e.g., with a parent, a friend, an advisor) or in a larger group (e.g., among peers, coworkers, etc.)
Choice to pursue further education	Participant describes socializer influence on his/her decision to pursue (or not to pursue) graduate or professional school in lieu of a job after graduation

It is important to clarify that a socializer’s influence on a student’s thinking could be an influence either towards or away from a specific option. For example, a student described the positive impact of a research supervisor on his career thinking, saying, “If I do end up going into a biomedical field, which I’m considering, I think it would be mostly because of him because I’m doing the research with him. Before it wasn’t really a field [I was] super interested in, but now I feel like [I am]” (Student ID 6249). Another student recalled being steered away from medical school while working in a hospital over the summer.

What I did in the hospital over the summer ... influenced me not to go to med school. I met up with a lot of doctors, and they just, they did not recommend it. All of them were saying that the cons outweigh the pros in their experience. It can be disheartening to be in healthcare, because they see a lot of patients with the same issues [and] the politics of healthcare can be very frustrating when they limit something that they feel like they could do for the greater good and the politics stop that. (Student ID 1527)

Influences by Specific Socializers

Table 3 demonstrates the relationships seen between socializers and socializer influence in our data. We note that the table contains quantitized data (i.e., number of individual instances seen for each socializer x socializer influence combination) not to make absolute claims about these relationships, but to support pattern making and provide insight into the types of influence that each major socializer group has on students’ career planning. Findings related to each socializer group follow.

Table 3. Socializers x Socializer Influence on Post-Graduation Career Planning

Socializer Category	Number of Individual Instances			
	Thinking About Specific Jobs	Job Exploration in General	Choice to Pursue Further Education	<i>Total Number of Instances</i>
Family Front (includes extended family, family friends, and community acquaintances, but excluding siblings)	14	3	2	19
Peer Pack (includes friends, siblings, recent alumni, and other college students)	4	12	4	20
University Universe (includes professors, academic advisors, club advisors, and research supervisors)	8	5	4	17
Work World	7	4	5	16

(includes work supervisors, coworkers, company leadership, and other professionals such as guest speakers and job recruiters)				
<i>Total Number of Instances</i>	33	24	15	72

Influence of the Family Front

The family front is comprised of parents, grandparents, aunts and uncles, family friends, and community acquaintances that the student encountered as being part of a family and extends back to the student’s childhood. The group’s influence on students’ post-graduation career planning despite their expanded social circle over the college years indicates the importance of the family environment. Our findings suggest that family influence predominantly affects a student’s thinking about a specific job more than their general job exploration or decision-making about pursuing advanced education. In particular, families being in a certain business can influence students to aspire to working in a related field. As one student expressed, “My dad's an auto mechanic, so the automotive industry is something that I've always been interested in” (Student ID 6639). Another student interested in alternative energy mentioned that, “Pretty much my entire life, I've been surrounded by a family who's been in the [lighting] industry. Not necessarily in generating power, per se, but in the sense of trying to limit your usage, and reduce your usage” (Student ID 6568). The same student, while explaining how he gravitated towards jobs in the nuclear energy field, went to say, “Once I figured out that I wanted to be an engineer, my grandmother sat down and talked with me, kind of went over how that would be a possibility, and I took to it ever since then.” At the same time, family socializers could discourage a student from pursuing certain options, as demonstrated in the following excerpt.

We have a lot of family friends. Some are in contracting, some work directly for the government ... We talk about their job, and it just sounds like a situation that I don't want to be in. Too bureaucratic, from what I understand, even though I know that private business is the same way, but at least there's more money involved. (Student ID 6100)

Influence of the Peer Pack

Socializers who are closer to the student’s age constitute the peer pack. They are friends, or friends of friends, siblings, recent alumni, and other undergraduate or graduate students. The fact that students are at the same life and career stages as their peers and going through the same experiences of finishing school and trying to find a job may explain why peers emerge as a major influence. Our analysis shows that peers influence students’ job exploration related thinking more than their thinking about specific jobs or about enrolling in advanced degree programs. As illustrated from the quote below, gathering large amounts of firsthand information from friends and alumni who have had internships or jobs is the preferred way of learning about potential jobs and internships for some students.

One more thing that comes to mind is just talking to my friends, and also alumni that I was friends with before I graduated and then they got their jobs at X or Z or wherever they worked. Keeping communication lines open with people that are my friends or alumni ... really kind of helps me figure out what the companies are doing, and how the industries are going. You can get a feel for maybe where the next best place to work would be, or things like that. (Student ID 2017)

Our data showed several instances of students broadening and narrowing down their job search based on conversations with friends. It seemed that friends more so than family provided students with intimate details about their jobs and the work they do on a day-to-day basis. Students used these details to make decisions about whether they would like to take up similar jobs. While explaining how she became interested in her technical sales internship, a student recounted, “This one girl was a junior and she said that she had done a technical sales internship, that's how I learned about that” (Student ID 1355). Another student remarked about wanting to forge his own career path, “When I hear about what my friends are working on, it doesn't sound interesting” (Student ID 1527).

Influence from the University Universe

While enrolled in college, professors, academic advisors, club advisors, research supervisors, and other university related socializers all become part of the students' universe. Our analysis shows that this category of socializers influences students' thinking about specific jobs, general job exploration, and decision-making about pursuing graduate or professional school uniformly. In some cases, university socializers, and particularly professors, influenced students' career plans by motivating them to get interested in a specific subject. One student mentioned, “I had ... a very good teacher and he somehow ... inspired me to go more into the fields. He seems like he really loves his job and stuff he'd done before he started teaching, and he seemed very passionate about it” (Student ID 5164).

In other cases, university socializers played the role of a parent-like figure, offering the student advice and guidance. The influence of a faculty academic advisor is evident in the following excerpt where the participant mentions the advisor as the driving factor for the participant to introspect and decide what he wants to do for a career.

He's [academic advisor] a lecturer basically, but he really cares about his students, and so I've had a few meetings with him where I sort of discuss where I am in my strengths and my weaknesses. I don't know. There's something about the way he explained how to look for a job, what to look for in a job. He explained the things he looks for, and that made me really think about what I wanted, and what I was good at. (Student ID 4018)

Whether in the classroom or in their office, professors and advisors seemed to inculcate career confidence in students by sharing information about their own life trajectories. They helped put students' fears and anxieties to rest by making things that lie ahead seem doable. Talking about his decision to postpone graduate school until after spending some time in industry, a student identified a professor who “made industry [sound] like it would be a really easy step to take in the future, as opposed to now” (Student ID 1314).

Influence from the Work World

Students enter the work world as they take up co-ops, internships, and full-time or part-time jobs. As with university related socializers, work related socializers (including work supervisors, coworkers, company leadership, and other professionals) seem to influence thinking about specific jobs, exploring jobs in general, and deciding whether to pursue additional education equally. Students talked about work socializers steering them toward or away from specific jobs.

According to one student, “I originally thought I wanted to be in research and development, but after talking to some people here [at work] I thought that may not be quite what I want.” (Student ID 3017). Students also gave examples of work socializers encouraging them toward higher education such that they would be more marketable in their job search.

My boss persuaded me to pursue a Master's [degree]. He went to a school in Alabama, got his bachelor's, he didn't get his Master's. He said it was a lot more stressful finding work after graduating with a bachelor's as opposed to a Master's. He said if I'm in a position where I can ... financially afford it right out of college, he recommended that I do that, so that's definitely a priority to me. (Student ID 3338)

Socializers from the work world are experienced and, thus, able to offer real life, real time advice to students. Students seem to find this advice from work socializers valuable and take the advice seriously, as mentioned by the following participant.

I think going to see the SWE Conference in Philadelphia, not only attending the career fair there, but also some of the sessions and just talking to other women in engineering. I think there were ... 15,000 women in engineering at that conference. Just learning what they do, what they like about their jobs, what they hate about their job, where their career paths have been, that's been really, really helpful and meaningful in helping me to decide what I want to do. (Student ID 5172)

Study Limitations

Our study has three limitations taken into consideration during analysis and meaning making. They involve data collection consistency, participant sample demographics, and interview timing within the academic year. First, nine researchers assisted with the interviews which resulted in some variation in how questions and follow-up to answers were asked. This limitation was mitigated in three ways: 1) we conducted two interviewer training sessions which provided interviewees with information on the purpose of the research project and desired project outcomes, and with practice interviewing using the protocols, 2) a lead qualitative researcher reviewed the interviewers' field notes and transcriptions in real time during data collection for consistency between interviewers, and 3) updates on how interviews were progressing were held with the interview team weekly. In addition, our qualitative sample size is sufficiently large to allow for some variation as qualitative analysis carefully considers the participants' lived experiences as reported and not absolute counts of data.

Second, though we endeavored to mimic the universities' student demographics for gender and ethnicity, our sample pool did not allow this. Thus, interpretation of our analysis required us to be cognizant of our actual sample demographics (provided in Table 1) and recognize that they may not represent each university; which students agreed to participate in the interviews, and why, is a question for future consideration.

Third, the interviews were conducted from November 2016 through February 2017. During this time, some students were actively seeking a job and perhaps even making decisions on job offers. To mitigate the impact of timing, we asked questions to understand where the participant was in the job acquisition process (i.e., job offer status) and have a record of the interview dates.

Discussion, Future Work, and Implications

Recalling Eccles' Expectancy-Value Theory (EVT)⁵⁻⁷, interviews with 62 engineering juniors and seniors revealed a variety of key socializers whose beliefs and behaviors influence the post-graduation career planning of undergraduate engineering students. In the interviews, family, peers, university related socializers, and work related socializers were all cited by students as influencing their plans along three main areas: thinking about specific jobs, job exploration in generation, and deciding whether to pursue advanced education. Further, some socializers were shown to influence students' thinking in certain areas more so than others (e.g., family members appeared to influence students' thinking about specific jobs, while peers influenced their job exploration more broadly) suggesting the impact that a given socializer has on students' career planning may be domain-specific. Thus, our work builds on and extends EVT not just by demonstrating a relationship between socializer influence and engineering student career plans, but by providing a more comprehensive understanding of *who* the socializers that students report as influencing their plans are and *what* part of the process each socializer influences.

Such understanding can contribute to more focused study of the socializers that influence engineering students' job search and career decision-making. Combining EVT with other theoretical frameworks may shed even further insight onto these processes. Bandura's social learning theory (1977), for example, posits that people influence one another via several modes, including verbal persuasion and role modeling.³² Future work could investigate how the socializer, influence, and mode of influence all work together to alter students' thinking about their career trajectory. In our larger study, we combine EVT with Sampson et al.'s model of Cognitive Information Processing²²⁻²³ to create the Professional Pathways Model.²⁶⁻²⁷ This model specifically focuses on how socializers and other factors influence student career plans, confidence, preparedness in the CIP domains of option knowledge, self-knowledge, career decision-making skills, and metacognition. We are also expanding our analysis to take into consideration student demographics (i.e., gender, race/ethnicity, institution, etc.) or experiences (e.g., internship and/or research), to help delineate how personal and environmental factors combine to impact the socializers to whom students have access and the types of support and information that those socializers provide. Going forward, follow-up with other students who participated in our larger research study would allow us to determine to what extent our current findings transfer to students in majors besides chemical engineering and mechanical engineering. Additional longitudinal studies could also allow for better comprehension of how the influence of socializers on students' career planning changes over time.

Our findings also hold implications for university and industry stakeholders. This research, similar to other research,³³⁻³⁴ highlights the great deal of impact that a single socializer or group can have on an engineering student's career decision-making. Even near the end of a four- to six-year bachelor's degree, family members and peers seem to account for a large amount of influence on their plans. Many students reported choosing a specific job or career based on observing their parents or talking with friends, sometimes even before enrolling in college. Other students seemed to make decisions about their next steps based on a single co-op or internship, or a single summer research experience, even though these experiences may have been their only insight into industry or graduate school, respectively.

Thus, engineering programs can facilitate students' exposure to a wider range of socializers, and perhaps, career options, by encouraging them to get more involved in co-curricular and extracurricular activities and to take greater advantage of on-campus academic and career resources. Through this engagement, students may be more likely to meet potential socializers who can stimulate and expand their career planning. Engineering programs can also liaise with employers to make sure that job exploration and career mentorship are an explicit component of co-op and internship programs, in addition to impressing upon industry personnel the impact of individual, one-on-one interactions with students on student career decision-making.

Engineering faculty particularly have a large platform with which they can influence students' decisions, as they interface with students as professors, academic advisors, club advisors, and research supervisors. Participants in our study mentioned the benefits of hearing faculty talk about different pathways and research areas, including their own, during lectures and personal conversations. Faculty could also motivate students to be more proactive in researching their job options (e.g., offering course credit for attending the engineering career fair).

It is critical to note that our participants never mentioned specific individuals within career service centers, or career service centers in general, when discussing their career plans. Students did mention these individuals when discussing the help they received related to job acquisition. Students may see career services centers as a resource for learning about job application sites and activities, such as resume help, or for those without a specific job in mind. They may also not know the background of career counselors at the career service center, some of whom have engineering degrees or have worked in industry. This disconnect may represent a lost opportunity for students. Career services could potentially reach more students by helping students understand not just the services they offer, but their backgrounds as well; such outreach could change student images of these socializers, and with it, their perceived value.

Lastly, all socializers – including parents, professors, advisors, and work supervisors and coworkers, among others – can support students by reminding them they will be exposed to many career pathways as undergraduates and they should carefully consider the variety of information they gain when making career decisions. For their part, students should be encouraged to start researching their career options as soon as possible, given the prior research on this project suggesting the importance of students beginning to think about what job they want early on.³⁵ Early career professionals' experiences on the job are shaped by numerous factors, such as the nature of the work, company culture, and work conditions.³⁶⁻³⁸ Choosing a job that is the right fit for them is therefore important.

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