First Impressions: Evaluating Student Performance in Demonstrating Engineering Leadership

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First Impressions: Evaluating Students' Performance in Demonstrating Engineering Leadership

Abstract

ABET's accreditation standards revised in 2001 highlight the importance of including technical and non-technical components in engineering curriculum. Employers also identify non-technical skills, such as leadership, as top qualities contributing to attractive candidates during the on-campus recruiting process. In a previous study, the authors identified three themes from recruiters' perspectives that demonstrate engineering leadership potential during a career fair: communication, connection, and confidence. There are two primary purposes of this study. The first is to describe an active learning environment for engineering leadership classrooms engaging employers and simulating the career fair experience. The second is to utilize the active learning environment to collect feedback from recruiters on students' performance in demonstrating their engineering leadership based on the themes generated from the previous study.

Students participated in a mock career fair during an engineering leadership course. Data were collected over two semesters. During class time, 24 recruiters from five different companies participated in a mock career fair for four sections of an engineering leadership course. During the mock career fair, recruiters heard the students' 30-second pitch, provided verbal feedback to the students, and rated the students' effectiveness on demonstrating engineering leadership in their 30-second pitch on a scale of one to five, with five being the highest rating. At the end of the mock career fair, recruiters filled out a three question survey to provide feedback on the importance of the themes generated from a previous career fair study as well as determine which of the themes contributed most to a high rating of students' 30-second pitch during the mock career fair event.

This study is important as it seeks to support recruiter-identified themes related to demonstrating engineering leadership during career fair interactions. Supporting these themes helps to inform leadership development programs as to the important behaviors engineering leadership students should be demonstrating during recruiting events. This study provides a perspective of how leadership students present themselves and characterize their leadership skills to potential employers. Recruiters, as one of the first observers of engineering leadership graduates outside of academic programs, provide feedback on interactions with students related to their communication of engineering leadership potential. Engineering leadership educators can benefit from these findings to support student knowledge and professional skill development aligning with ABET requirements and industry needs.

Background

In meeting industry demands for both technical and non-technical skills for the engineer of 2020, leadership programs must not only develop these non-technical skills but should also consider how students are evaluated on leadership characteristics during on-campus interactions with recruiters to ensure that our students are effectively communicating their abilities during the recruitment process. In a previous study[1], the authors used a qualitative approach to explore recruiters' perspectives on determining engineering leadership potential during busy career fair interactions. With employers consistently ranking leadership as an important characteristic to

demonstrate during on-campus recruiting activities[2], Handley, Lang, and Erdman sought to understand how a student could effectively demonstrate leadership during these busy recruiting activities.[1]

The Handley, Lang, and Erdman findings suggested that recruiters first wanted to hear about engineering students' experiences within student organizations, engineering projects, and internships or co-ops. However, it was not enough to name involvement in these experiences. Students who effectively demonstrate engineering leadership communicate what they learned about their leadership through their experiences, connect their experiences, interests, and skills to the company, and confidently interact with the recruiter. Communication centered on self-awareness, where a student reflected on their personal leadership development based on various experiences. Recruiters wanted to see that students showed an understanding of leadership as being more than just a position as identified in the following excerpt:

"I look for candidates who have leadership experience either in clubs, extra-curricular activities, projects, or through internship experiences. This does not necessarily mean being the 'president' or 'treasurer' of a club. In some cases, students have difficulty articulating their leadership qualities if they do not have a title. Certainly a clearly defined position title helps recruiters understand what particular leadership skills the candidate demonstrated. However, it would be valuable to help students learn how they can describe their leadership capabilities outside of having held a defined position."

Connection centered on students' abilities to demonstrate big-picture thinking and was the second theme identified by Handley, Lang, and Erdman.[1] Big-picture thinking, determined to be an important behavior for technical executives[3] relates to a student's ability to think about the position at a career level and not just towards getting a job upon graduating from college. Students connecting with a company show an understanding of what the company does, the position the student is applying for, and how it relates to their career goals. Recruiters were alerted to engineering leadership potential if students connected their interest and knowledge in the company with their experiences and leadership development.

"For me, I want to see how quickly they can establish a connection and pull me into their experiences. Get me interested in who they are not just what they do or have done. Are they [committed] and focused on a career or are they just looking for a job."

The final theme, confidence, is a well-established indicator of successful leadership within organizations.[4] Students demonstrating confidence had a professional appearance, strong hand shake, approached the booth with an upright posture, and made good eye contact. In addition, students delivered a 30-second pitch with confidence and composure. Building confidence requires that students practice and receive constructive criticism.

"I usually first evaluate how candidates present themselves. Leaders seem to have more confidence and practice in intimidating situations and come off more composed."

Student-recruiter interactions involve an interpersonal exchange by which both technical and human attributes are communicated for evaluation of fit in a particular job or organization.[5,6,7] Successful exchanges include effective delivery of experiences based on self-

insight and research into the job opportunity and employer.[6,8,9] Studies focused on developing effective student-recruiter exchanges incorporate active learning strategies. Active learning, associated with constructionist theories of learning, provide learning environments where students build knowledge through experiences and may also involve interpersonal interactions with others. [10] Mock interviews are shown to be an effective active learning strategy for developing knowledge of successful student-recruiter exchanges. Initial incorporation of mock interview experiences in the learning environment focused on peer review and self-assessment.[11,5] Reddan's study asked students how mock interviews prepared them for real world experiences finding that the most common learning outcome, self-reported by students, included understanding the importance of preparing and demonstrating what recruiters are looking for.[5] Participants of mock interviewing activities also consistently report an increase in confidence based on self-assessment. [11,5,12] Vidalis criticized these experiences for the lack of industry involvement in the mock interview process.[13] Utilizing active learning techniques, Vidalis provided an opportunity for civil engineering, structural design, and construction engineering students to practice the skills associated with the knowledge they learned regarding student-recruiter exchanges with industry representatives and to receive immediate feedback.[13] Feedback from recruiters to participants included the importance of: being confident, researching the company, describing aspirations for the future, and knowing every detail of your experiences on your resume. [13] The review of background literature highlights the importance of active learning environments, such as mock experiences, and the important feedback that can be obtained through student-recruiter exchanges within these active learning experiences.

Based on the literature, the first purpose of this study is to describe an active learning environment, which incorporates a mock experience for students to obtain feedback based on student-recruiter exchanges. The active learning environment, in the form of a mock career fair, also provides an opportunity to collect immediate feedback from recruiters on students' performance in demonstrating engineering leadership potential. Therefore the second purpose of this study is to obtain feedback from recruiters during the mock career fair in an attempt to support the previously identified themes of communication, connection, and confidence as important indicators of engineering leadership potential when incorporated into student-recruiter exchanges. This study is important as it seeks to support recruiter-identified themes related to demonstrating engineering leadership during career fair interactions as well as provide a description of an active learning environment for engineering leadership programs.

Mock Career Fair as an Active Learning Environment

Active learning theory includes various types of strategies, one of which is experiential learning. Experiential learning theory is based on the foundation that "learning is the process by which knowledge is created through the transformation of experience". [14,p.38] Experiential learning utilizes a four-step cycle of learning[14] including:

- Concrete experiences: students actively carry out an experience or an activity
- Reflective observation: students reflect on their experience
- Abstract conceptualization: the reflection allows the emergence of a new idea
- Active experimentation: application of the new idea and observation of results

Kolb's theory requires that students are provided with knowledge and then an opportunity to experience that knowledge.[15] Students in the engineering leadership course were provided information in advance to prepare for the mock career fair. The mock career fair was coordinated with experienced recruiters who provided the concrete experience for the active learning environment. Recruiters invited to participate were given instructions to interact with the student as they would in a normal career fair, but then save time to provide feedback to the student on their performance in delivering a 30-second pitch. Students then had time to reflect on the feedback before practicing again with another recruiter during the mock career fair experience. Additionally, an important logistical element of the activity centered on the timing of the mock career fair in coordination with the actual career fairs on campus. Students were then able to reflect on their experiences in the classroom, establish conclusions, and try out what they learned and refine their pitch during the actual career fair the following day(s). This logistical consideration provided ease in confirming employer attendance. One hour and fifteen minutes is ideal for a class of 30-40 students, requiring that each student speak with at least three different recruiters for feedback. Fifty to sixty minutes is ideal for the experience; leaving 15-20 minutes for each employer to comment broadly on student performance and advice for student-recruiter interactions.

For engineering leadership programs seeking to provide meaningful experiences for potential corporate sponsors or donors of programs, the mock career fair provides a value added activity when implemented as a benefit to corporate giving and support. Anecdotally, recruiters comment on the benefit of this event toward their recruiting efforts in identifying talent within an ideal population (engineering leadership programs) earlier in the recruiting process through participation in this activity.

For this particular study, the mock career fair experience was also utilized to collect employer feedback in an attempt to support the themes generated from the previous Handley, Lang, and Erdman study. While collecting this information was important for this particular study, further implementation of this active learning experience should incorporate a more formal method of student reflection and assessment as well as track results during the active experimentation stage of the experiential learning model. The following section outlines the methods utilized to collect and analyze feedback from employers participating in the mock career fair activity.

Methods:

There are two primary purposes of this study. The first is to describe an active learning environment for engineering leadership classrooms engaging employers and simulating the career fair experience. The second is to utilize the active learning environment to collect feedback from recruiters on students' performance in demonstrating their engineering leadership based on the themes generated from the previous study. To address the second study purpose, the study design utilized a survey method. The survey method required recruiters to review students' 30-second pitches and rate the students' performance in demonstrating engineering leadership potential. A total of 135 students and 24 recruiters participated in the study over two semesters, 61 students in Fall 2016 and 75 students in Spring 2017 semesters (Table 1). Students participating in the mock career fair were a part of an engineering leadership course and included both pre-major students (freshmen and sophomores) as well as post-major declaration students (juniors and seniors) across multiple majors. The breakdown of students by year of enrollment

across the four course sections is included in Table 1 below. Students came to class prepared to give their 30-second pitch and were instructed to give their 30-second pitch to at least three recruiters.

Table 1: Breakdown of students by year enrolled in engineering leadership course.

Section	Year Standing					
Fall 2016 Semester	**1st**	**2nd**	**3rd**	**4th**	**Grad**	**Totals**
Section 1	0	7	12	8	0	27
Section 2	1	6	13	13	1	34
Spring 2017 Semester						
Section 1	0	6	5	22	0	33
Section 2	0	4	11	27	0	42

Twenty-four recruiters participated in the mock career fair, 10 in the first semester, representing three different companies and 14 in the second semester representing five different companies. Recruiters participating in the mock career fair were active in yearly on-campus recruiting activities and hired across multiple engineering majors. Recruiters were instructed to listen to 30-second pitches from each student, give feedback to individual students, and rate student performance immediately after the student-recruiter interaction ended. Students were instructed to meet with at least three recruiters each. As a result, students were rated by multiple recruiters resulting in 296 ratings (Table 2).

Table 2: Total number of student ratings during mock career fair.

Section	Total Number of Ratings Across Recruiters
Fall Semester	
Section 1	67
Section 2	60
Spring Semester	
Section 1	78
Section 2	91
Total	296

At the end of the mock career fair, a second data collection instrument was administered to recruiters asking them to answer a three-question survey, which included the following questions.

1. Select which behaviors demonstrate engineering leadership during a 30-second pitch. Select all that apply.
2. Which of the following behaviors were most influential in rating students in ENGR 408 as a 4 or 5 in their effectiveness of demonstrating engineering leadership during the 30-second pitch? Select all that apply.

3. Of the most influential behaviors selected above, rank each item in the following list in order of importance for demonstrating engineering leadership during a career fair (1 being most important).

The questions above were in reference to the following seven behaviors:

- Articulation of personal leadership development and awareness through experience in internships/co-ops, student organization involvement, or engineering project groups.
- Describe how experiences connect to the company; establish a connection with the company
- Confidence
- List student involvement activities, internships/co-ops, or project groups
- Identify an interest in the company
- Give the title of a leadership position held with a student organization, internship/co-op position or technical project position
- Name a technical engineering project they participated in

Descriptive statistics were analyzed to determine the frequency of responses to questions 1 and 2 above (i.e. the proportion of recruiters that selected each of the seven behaviors in response to questions 1 and 2) as well as the mean ranking obtained from responses to question 3 (i.e. the mean ranking for each of the seven behaviors) across recruiters participating in the mock career fair. Recruiter rankings of student performance were totaled and summarized. Both data collection instruments can be reviewed in appendix A.

Results

Table 3 summarizes the distribution of recruiter ratings of student performance of student effectiveness in communicating engineering leadership potential during a 30-second pitch from the first data collection instrument. Students were rated on a scale of 1-5 (1 being poor and 5 being excellent). Table 3 summarizes the distribution of ratings given to the students participating in the mock career fair across the fall and spring semesters.

Table 3: Distribution of student ratings during mock career fair.			
Student rating	**Fall Semester**	**Spring Semester**	**Total**
1 (poor)	5	0	5
2	16	12	28
3	40	48	88
4	40	54	94
5 (excellent)	26	55	81
Totals:	127	169	296

Data collected from the second instrument included recruiters' responses to a three question survey where they identified behaviors that demonstrate 1) engineering leadership, 2) identified behaviors that influenced their student ratings, and 3) ranked the influential behaviors by

importance. The list of behaviors recruiters evaluated was built on the authors' previous study and included the three themes of communication, connection, and confidence. The list of behaviors also included basic behaviors utilized in typical career fair preparation training and educational modules based on career coaching experience by one of the authors. The results from the second data collection instrument are included in Table 4. Results for the Fall and Spring analyses are presented for each of the three questions in the survey provided to the employers after the mock career fair. Table 4 includes the percentage of recruiters that selected each of the seven behaviors in response to questions 1 (columns 2 and 3) and 2 (columns 4 and 5). Table 4 also includes the average ranking by importance for each of the seven behaviors described previously (columns 6 and 7).

1. Select which behaviors demonstrate engineering leadership during a 30-second pitch. Select all that apply.
2. Which of the following behaviors were most influential in rating students in ENGR 408 as a 4 or 5 in their effectiveness of demonstrating engineering leadership during the 30-second pitch? Select all that apply.
3. Of the most influential behaviors selected above, rank each item in the following list in order of importance for demonstrating engineering leadership during a career fair (1 being most important).

Table 4: Recruiter selection of engineering leadership behaviors and their importance

Behaviors	1. Behaviors demonstrating engineering leadership*		2. Influential in rating effectiveness in demonstrating leadership*		3. Ranking of importance of influential behaviors**	
	Fall	Spring	Fall	Spring	Fall	Spring
Articulation of leadership development and awareness	90 %	93 %	80 %	71 %	1.13	1.50
Connecting experience with company	70 %	71 %	60 %	64 %	2.33	2.89
Confidence	60 %	79 %	30 %	71 %	3.33	2.60
Involvement in (activities, internships/co-opt, project groups)	40 %	36 %	30 %	21 %	3.33	3.67
Interest in company	40 %	57 %	30 %	36 %	3.33	3.20
Mention of leadership positions held	40 %	50 %	40 %	29 %	3.50	4.00
Mention of technical engineering project involvement	20 %	36 %	20 %	21 %	5.0	4.75

* The percentage of recruiters identifying each behavior.

** The average ranking for each behavior across recruiters.

Discussion

Recruiters, trying to identify top talent in busy career fair settings, perceive student non-technical skills through behaviors displayed in 30-second pitches. In this study, employers supported the importance of the themes identified in the previous study; communication, connection, and confidence in student-recruiter interactions during career fair settings. The mock career fair activity provided a format to immediately evaluate student performance in student-recruiter interactions.

These findings are important as they demonstrate that students seeking to convey engineering leadership to recruiters should consider the positive impacts of incorporating the elements of communication, connection, and confidence into interactions with recruiters. Leadership development programs can use this information to inform curricular or co-curricular programs in helping students to effectively develop 30-second pitches for career fairs. Leadership development programs should consider incorporating the themes of communication, connection, and confidence into learning environments. First, effectively communicating experiences requires that students build self-awareness of leadership. Incorporating activities where students can reflect on experiences and articulate what they learned or developed are key strategies in developing self-awareness of leadership abilities to utilize in student-recruiter exchanges. To restate one of the participating recruiter's insights:

"..it would be valuable to help students learn how they can describe their leadership capabilities outside of having held a defined position."

Connecting with companies requires that students spend time thinking about their career goals and why a particular company fits those career goals. Engineering leadership programs providing learning environments where students can explore career opportunities and discuss career plans help students to think beyond a first job to a career. Confidence requires students to practice describing both their leadership development and the connection with a particular career path. Providing an active learning environment such as a mock career fair provides students with the opportunity to think about career goals as they prepare for the activity and provides an opportunity to practice and receive feedback in order to develop a confident interaction with recruiters.

The current study aimed to provide preliminary support of the important elements of student-recruiter interactions demonstrating engineering leadership potential. It is not meant to generalize, but to assist in future studies assisting engineering leadership students in effectively demonstrating engineering leadership potential during student-recruiter interactions. Future studies should include an experimental design controlling for variables such as training/information provided, education level, job or internship status, and individual student recruiter ratings of demonstrating engineering leadership potential during student-recruiter exchanges. Additionally, future studies should include student self-assessment and outcomes from participation in the actual career fair, such as invitations for interviews. Also, obtaining student self-assessment pre and post mock career fair can also inform the effectiveness of the mock career fair active learning environment on students' learning and transfer of learning to an actual career fair setting.

Engineering curriculum focused solely on technical skills, fails to address the industry identified non-technical skill needs for successful engineers in today's global economy. Creating classroom environments that provide active learning environments, reflection, and connection with engineering career paths enhance learning experiences for engineers related to industry expectations. The student-recruiter exchange is the first impression of the engineering education received at our universities and should reflect both the technical and non-technical potential in alignment with industry needs. Engineering leadership programs are positioned to develop and educate engineers on non-technical abilities, but also need to provide learning environments that foster the development of effective student-recruiter exchanges, reflecting the student's non-technical learning.

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Appendix A

Data Collection Instrument 1: Student Ratings by Recruiters

Please circle your answer for each student you speak with during the mock career fair activity:
On a scale of 1-5 (1 being poor and 5 being excellent) please circle the student's effectiveness in communicating ***engineering leadership during their 30 second pitch***.

Student	Rating					Section 1 ✓	Section 2 ✓
1	Poor (1)	(2)	(3)	(4)	Excellent (5)		
2	Poor (1)	(2)	(3)	(4)	Excellent (5)		
3	Poor (1)	(2)	(3)	(4)	Excellent (5)		
4	Poor (1)	(2)	(3)	(4)	Excellent (5)		
5	Poor (1)	(2)	(3)	(4)	Excellent (5)		
6	Poor (1)	(2)	(3)	(4)	Excellent (5)		
7	Poor (1)	(2)	(3)	(4)	Excellent (5)		
8	Poor (1)	(2)	(3)	(4)	Excellent (5)		
9	Poor (1)	(2)	(3)	(4)	Excellent (5)		
10	Poor (1)	(2)	(3)	(4)	Excellent (5)		
11	Poor (1)	(2)	(3)	(4)	Excellent (5)		
12	Poor (1)	(2)	(3)	(4)	Excellent (5)		
13	Poor (1)	(2)	(3)	(4)	Excellent (5)		
14	Poor (1)	(2)	(3)	(4)	Excellent (5)		

Appendix A Continued:

Data Collection Instrument 2: Recruiter Survey

Employer Survey #2

Following the mock career fair activity in ENGR 408, please answer the following two questions:

Select which behaviors demonstrate engineering leadership during a 30 second pitch. Select all that apply.

- ☐ Articulation of personal leadership development and awareness through experience in internships/co-ops, student organization involvement, or engineering project groups.
- ☐ Describe how experiences connect to the company; establish a connection with the company
- ☐ Confidence
- ☐ List student involvement activities, internships/co-ops, or project groups
- ☐ Identify an interest in the company
- ☐ Give the title of a leadership position held with a student organization, internship/co-op position or technical project position
- ☐ Name a technical engineering project they participated in
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Which of the following behaviors were most influential in rating students in ENGR 408 as a 4 or 5 in their effectiveness of demonstrating engineering leadership during the 30 second pitch? Select all that apply.

- ☐ Articulation of personal leadership development and awareness through experience in internships/co-ops, student organization involvement, or engineering project groups.
- ☐ Describe how experiences connect to the company; establish a connection with the company
- ☐ Confidence
- ☐ List student involvement activities, internships/co-ops, or project groups
- ☐ Identify an interest in the company
- ☐ Give the title of a leadership position held with a student organization, internship/co-op position or technical project position
- ☐ Name a technical engineering project they participated in
- ☐ Other: _____ (please add any 'others' from above)
- ☐ Other: _____ (please add any 'others from above)
- ☐ Other: _____ (please add any 'others from above)

Of the most influential behaviors selected above, rank each item in the following list in order of importance for demonstrating engineering leadership during a career fair (1 being most important).

— Articulation of personal leadership development and awareness through experience in internships/co-ops, student organization involvement, or engineering project groups.
— Describe how experiences connect to the company; establish a connection with the company
— Confidence
— List student involvement activities, internships/co-ops, or project groups
— Identify an interest in the company
— Give the title of a leadership position held with a student organization, internship/co-op position or technical project position
— Name a technical engineering project they participated in
— Other: _____ (please add any 'others' from above)
— Other: _____(please add any 'others' from above)
— Other: _____ (please add any 'others from above)