Fostering a Relationship with a Corporate Sponsor to Grow an Engineering Leadership Development Program

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Introduction

In an apparent nod to the need for greater emphasis on leadership in engineering education, the Accreditation Board for Engineering and Technology (ABET), through its Engineering Accreditation Commission, updated its accreditation criteria for student outcomes in 2017 [1]. ABET shifted from simply stating the need for engineers to "function on multidisciplinary teams" to a more detailed criterion, which identifies specific aspects of leadership, including "an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives" [1]. The importance of including leadership as a focus in an engineering curriculum has long been confirmed by the National Academy of Engineering, which states in *The Engineer of 2020: Visions of Engineering in the New Century* that "engineers must understand the principles of leadership and be able to practice them in growing proportions as their careers advance" [2]. A follow-up report by the NAE, *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5*, further confirmed the importance of STEM leadership [3]. In response to this call for greater emphasis on leadership in engineering education, engineering colleges and departments have built partnerships with industry and corporate partners to help shape engineering curricula. In these partnerships, it has become apparent that industry is also looking for academic programs to extend their focus beyond technical curricula and delve into professional development programs, leading to the emergence of engineering leadership development programs [4]. In this work-in-progress, we discuss the evolution of a leadership development program that involves a direct relationship with a corporate sponsor and a scholarship program and its effectiveness of increasing students' confidence with leadership skills.

Brief history of Chevron Leadership Academy at LSU

The Chevron Leadership Academy (CLA) has been a part of the LSU College of Engineering scholarship program since 2013 and is wholly funded by Chevron through Chevron's University Partnership Program. The program began as a one-semester leadership training program typically comprised of 13-17 students from most engineering majors. In the beginning, the program's seminar-based workshop curriculum primarily enlisted the help of faculty from the College of Business, and students received a $1,000 stipend upon completion of the semester. Student participants attended lectures, discussed leadership topics with mentors from a variety of industries, and composed either a reflection essay or poster to conclude their participation.

Chevron Leadership Academy redesigned

Settling on specific goals and methods for creating a new leadership program is often an iterative process, with a good deal of trial-and-error in the beginning [5]. Voice-of-the-customer techniques determined in fall of 2017 that the program was not meeting corporate sponsor goals, nor was it effective in assessing the professional development of participants. Feedback from Chevron indicated that there were many opportunities to enhance the program. Most remarkable from the feedback was that Chevron wished to have a more integral role in the program and more contact with the students. As with most industry partnerships, Chevron sought in part to use this as a recruitment and professional development tool. Chevron employs around 575 LSU alumni across the company, including several in senior level executive positions around the world. LSU is an integral part of Chevron's employment pipeline. To cement the relationship between Chevron and LSU students, Chevron chose mentors for the students from the company. Students and mentors meet regularly via web meetings or face-to face at Chevron Leadership Academy events.

In addition to having a more integrated role with the Academy, Chevron wished to make a bigger impact on the professional development and financial needs of the students. Specifically, the corporate sponsor wished to increase the scholarship amount (from $1,000 for one semester to $5,000 for one year). This increase made the Chevron Energy Leaders Scholarship, the second highest award given in the College of Engineering and the College of Business at LSU. The College of Business is involved in this program because Chevron hires students in information data systems (ISDS), which is a major in this college. Chevron also entirely funds the Chevron Leadership Academy; $65,000 of their annual gift to LSU is allocated directly to the program to cover all expenses from the program, including speaker fees, activity fees, and food for all activities. To develop a more lasting relationship with the students, Chevron requested that students be allowed to re-apply through their senior year.

This also required that the curriculum of the program be redesigned. Not only would the program have to mirror that of professional development programs found in entry-level engineering position programs [6-10], but the program would have to be tiered and designed such that the knowledge base would build year after year. The updated curriculum incorporated active learning workshops rather than mere lectures. The revamped program and workshop curriculum carefully incorporated established engineering leadership core competencies: communication, innovation / creativity, execution, teamwork, leadership toolbox and personal drive [12-18, Figure 1]. Each workshop was evaluated to determine

which topics were covered and, by the end of the first year, students had touched upon each one.

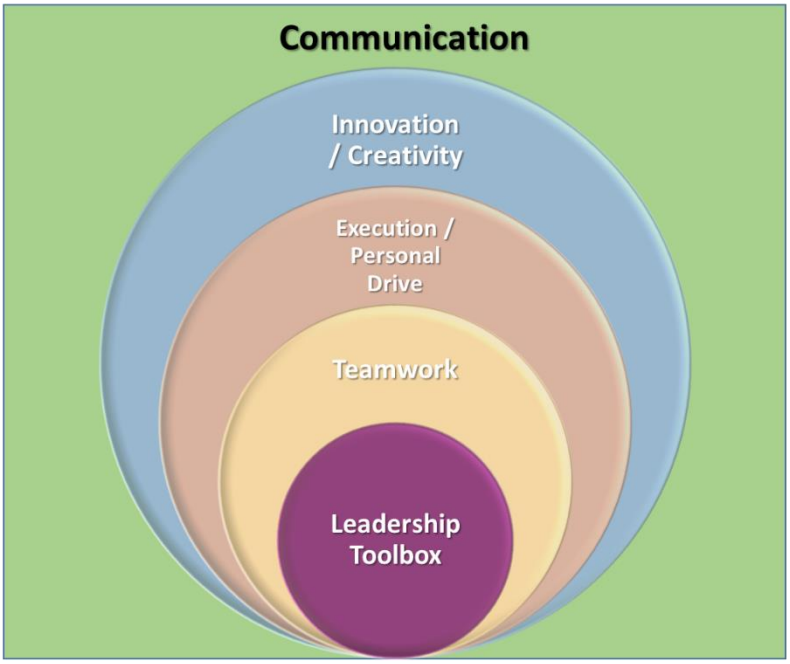

FIGURE 1: Leadership core competencies

Application process and selection criteria

For the 2017-2018 academic year, each academic college vetted their own students for the Chevron Leadership Academy. However, this lent itself to a lack of consistent communication of the program expectations amongst the students. For the 2018-2019 academic year, all applicants, regardless of degree program or college, followed the same application process and were vetted by the same committee. The selection committee was comprised of faculty and staff from both the College of Engineering and the College of Business. This streamlined process was more successful and will be continued in subsequent years.

To be eligible to apply, students must be pursuing a degree in one of the desired degree programs from which Chevron typically hires employees including: Information and Data Systems (College of Business), Chemical Engineering, Civil Engineering, Construction Management, Environmental Engineering, Petroleum Engineering, Computer Science, Computer Engineering, Electrical Engineering and Mechanical Engineering. For the sake of readability, all program participants will be referred to as engineering students. Students must enter as freshmen, rising sophomores, or rising juniors. Graduating seniors are considered only if they were in the program the previous academic year.

Freshmen must have a 3.5 high school GPA and a 27 ACT at a minimum. Sophomores and above must have a 3.2 overall GPA at LSU.
Finalists were chosen based on their financial need, interest in working in the energy sector, leadership experience, and whether or not the student is included in an underrepresented minority. Weight was given to students who had a connection with Chevron, either through an internship or by being a previous participant. Finalists participated in a 20-minute interview with 3 selection committee member panelists. Each committee member ranked individual candidates' responses using a Likert scale. Participant responses were based on interview questions developed by the Chevron recruiting team. Committee evaluation responses were normalized and combined to rate applicants on their teamwork skills, their ability to effectively communicate about themselves in an interview, and their ability to problem solve. This method facilitated the identification of candidates who were hirable by Chevron.

Chevron Leadership Academy demographics

The 2017-2018 Chevron Leadership Academy consisted of 31 students from freshmen to juniors from all engineering disciplines (except biological engineering and construction management) and ISDS. Between Fall 2017 and Spring 2018, three students failed to make the GPA requirements and were separated from the program. The breakdown of students can be seen in Figure 2.

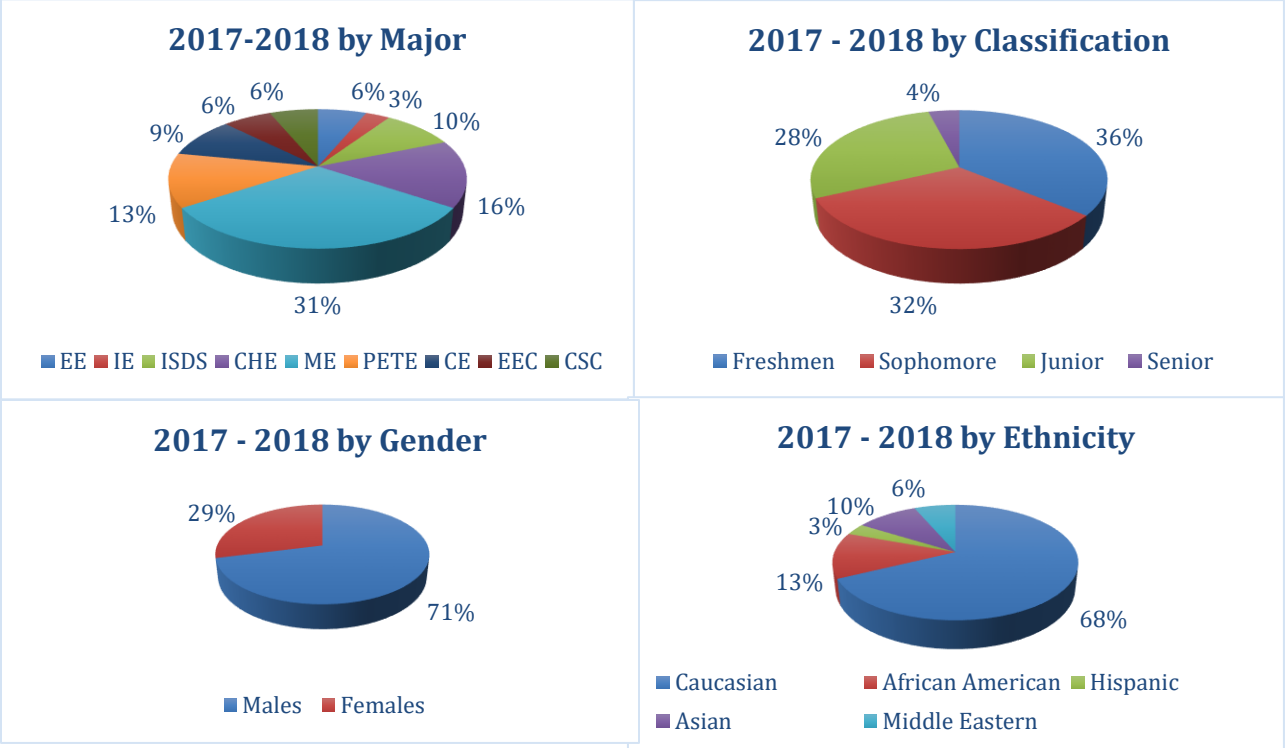

Figure 2: Demographics of the 2017-2018 Academic Year cohort by (a) major, (b) classification, (c) gender and (d) ethnicity.

The 2018-2019 Chevron Leadership Academy consists of 37 students from ISDS and all engineering majors (except biological) and all classifications (Figure 3). Of those, 21 students were retained from the previous year. This year, Construction Management was added to the distribution of majors. We were also able to increase the diversity of the program by adding more African American, Asian and Hispanic participants to the cohort. Between Fall 2018 and Spring 2019, three students failed to meet the GPA requirements of the program and were separated from the program.

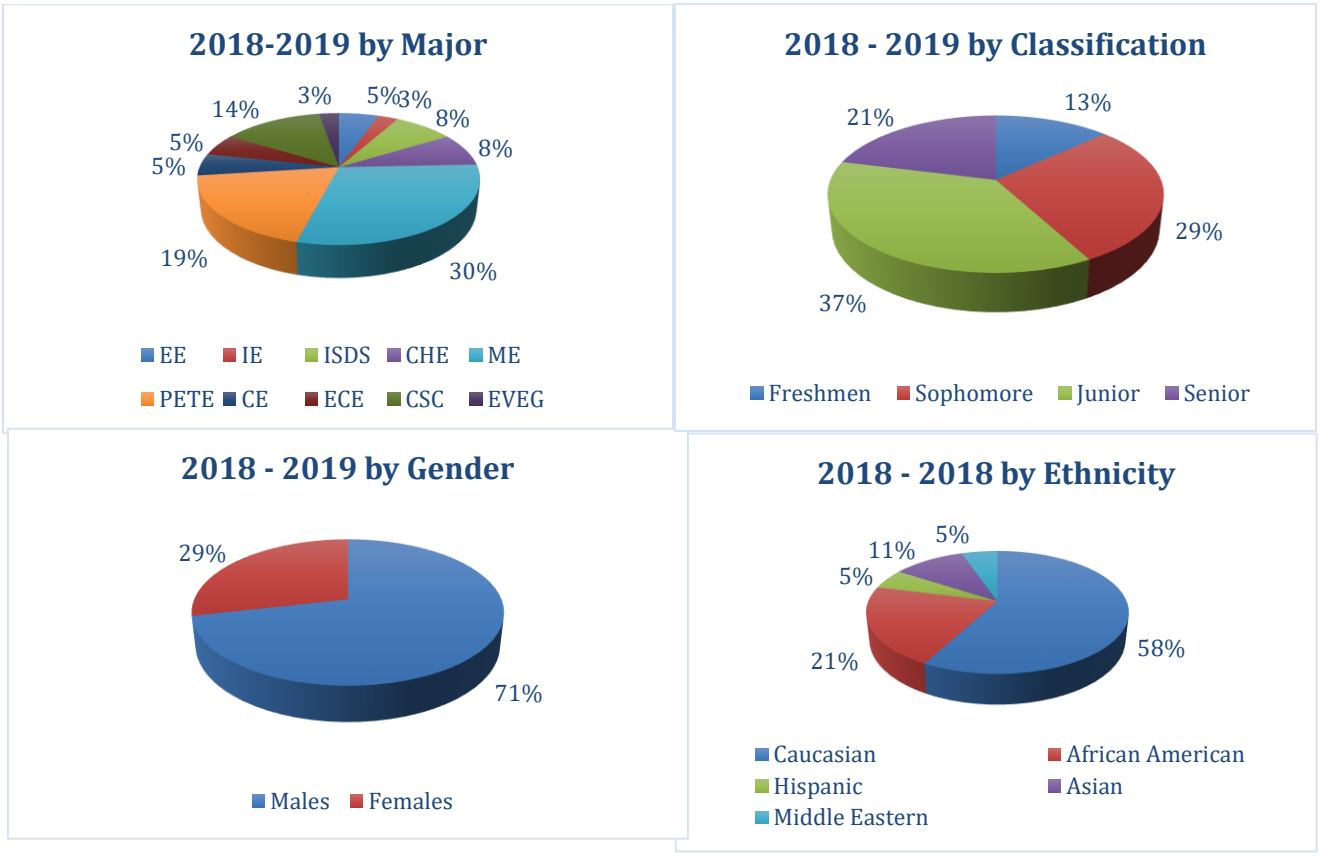

Figure 3: Demographics of the 2018-2019 Academic Year cohort by (a) major, (b) classification, (c) gender and (d) ethnicity.

In comparison with the demographics in the College of Engineering at LSU, the proportion of women and underrepresented minorities is somewhat higher. In the College of Engineering, since 2007, enrollment of women has been relatively flat (Figure 4). Enrollment of females in CLA is 9% higher than that of the college. Enrollment of non-white ethnicities is also higher in CLA as compared to the

College of Engineering. In particular, the percentage of African Americans in CLA is twice that of the enrollment percentage of African Americans in the college.

a) b)

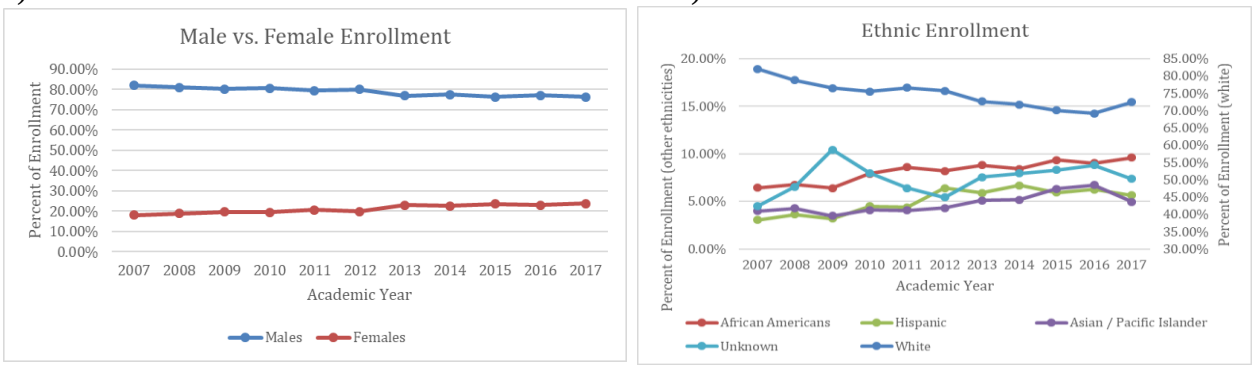

Figure 4: Enrollment in the College of Engineering at LSU from 2007 to 2017 of (a) males versus females and (b) ethnicities.

Chevron Leadership Academy program activities and curriculum

Presently, the Chevron Leadership Academy is not integrated into the engineering or business curriculum, nor is the program integrated into a certificate program. Receiving the Chevron Energy Leaders Scholarship requires participation in the program. The current Chevron Leadership Academy curriculum is comprised of workshops, activities, and outreach, all designed to teach leadership and professional development while giving the students opportunities to hone their skills and employ lessons learned.

Workshops

The Chevron Leadership Academy holds 8-10 workshops every academic year that run 3-3.5 hours in the evenings. Workshop topics are chosen to mimic new-hire engineering professional development programs that are typical in industry [6-10]. Many of the workshops focus on developing skills within the core engineering leadership competencies (FIGURE 1) [6-7]. Workshop topics included: resume / interview skills, speaking to management, negotiation, elevator speeches, diversity, project management, delivering presentations, networking, creating a personal brand, and Emergenetics, a personal assessment tool that highlights an individual's genetic predispositions for thinking preferences and behavioral preferences [11].

Table 1: Workshop topics for CLA (Note: All 2018-2019 workshops have not yet occurred)

	Engineering Leadership Core Competency							
Workshop Topic	**Communication**	**Innovation / Creativity**	**Teamwork**	**Execution**	**Personal Drive**	**Leadership Toolbox**	**2017-2018**	**2018-2019**
Chevron Introduction	X	X					X	X
Resume / Interview Skills	X					X	X	X
Emergenetics	X		X					
Speaking to Management	X			X			X	
Networking	X				X	X	X	X
Executing Presentations	X						X	X
Professionalism	X					X	X	
Social Media Etiquette	X					X	X	
Diversity	X		X			X	X	
Cultural Diversity	X							
Teambuilding – Chevron Low Ropes Course	X	X	X	X		X		X
Teambuilding – Chevron Escape Room	X	X	X	X			X	X
Project Management	X	X	X				X	
Conflict Resolution	X		X			X		X
Emotional Intelligence	X		X			X		X
Explaining Technical Topics	X	X	X				X	
How to do STEM Outreach 101	X	X	X	X				X
Elevator Speeches	X					X	X	
Creating Personal Brand	X	X			X	X	X	

Discussion Groups / Reading Assignments

All participants are given required reading and reflection assignments associated with a text [19]. The book and associated workbook are provided by Chevron. This book was chosen because it bridges the gap between students' current leadership experiences and those they would expect to have as they begin their careers. Readings from *The Student Leadership Challenge* are assigned periodically through the academic year. Discussion sessions were initially facilitated by the three CLA program administrators; however, in the 2018-2019 academic year, seniors led the discussions. This gave the seniors more prominent leadership roles within the program and a chance to practice their skills. Activities in the workbook guide students through the discussions of the chapters and ask them to relate the book to current and past leadership experiences.

Activities

Chevron Leadership Academy students participate in several activities. Every spring, industry representatives, who are typically LSU College of Engineering alumni and current Chevron employees, are invited to a Networking Breakfast. This gives students an opportunity to practice their interpersonal skills for professional networking, a skill identified in an earlier paper as an area for student improvement [20]. As a part of this breakfast, an open-forum discussion is initiated with the industry professionals for the students to ask questions and seek advice about their careers. In addition to building networking skills, another important activity takes place each year to help participants' work on their presentation skills. Students are broken into groups and given an assignment to give a presentation on a topic. Each student in the group is required to speak for at least 3 minutes. This semester, the freshmen, sophomores, juniors and non-graduating seniors will be giving a cultural-awareness presentation regarding a chosen Chevron global site.

In an effort to increase involvement between students and Chevron, students were required to attend a day-long tour in 2019 to two Chevron sites: a refinery in Pascagoula, MS and a technical center in Covington, LA. Students were given a safety orientation prior to touring the refinery. They also had the opportunity to meet with management of one of the sites. This gave the students an opportunity to learn more about the processes at Chevron, see those facilities, and learn more about the work culture at those sites.

At the end of every academic year, students, LSU administrators, Chevron mentors, and key alumni are invited to an end-of-the-year celebration where students are awarded completion certificates. This year, graduating seniors will be recognized with stoles that they will wear at graduation exercises.

Mentorship

Every student in CLA is paired with a Chevron employee mentor by major or job function. Students meet with their mentors regularly to discuss what they are learning in the program and to obtain general advice on careers and working at Chevron. Chevron mentors also regularly attend CLA workshops. Additionally, many CLA students visited Chevron sites with their mentors for individual tours and shadow days.

Outreach / Leadership

Community involvement is highly touted in the College of Engineering at LSU and at Chevron. All CLA students are broken into groups and required to design and execute a STEM outreach activity [12]. This is meant to give students a venue to practice many of the strategies, tools and techniques presented in workshops as well as giving the students an opportunity to be leaders in the community. Outreach activities are done in conjunction with a student mentoring organization in the college and include an Engineering Day at a local arts and science museum and other STEM nights at area K-12 schools.

Current program outcomes and successes

The Chevron Leadership Academy program continues to evolve and grow. Having an open line of communication with the donors, students, program administrators, and College administrators is critical to the program's success and evolution. More formally, Chevron mentors and CLA students were surveyed to help evaluate the efficacy of the program as it changes.

Chevron mentors were surveyed about their mentees. Specifically, mentors were asked to evaluate their mentees' fit in the CLA program and as a potential fit for employment with Chevron. Seventy-two percent of the CLA participants were fully evaluated by their mentors in spring 2017 following the conclusion of the academic year. The mentors noted that 91% of the students fit in the program well and tended to enjoy the workshops and activities. . Students were also evaluated as to how they would fit in roles at Chevron. Chevron mentors felt that 91% of the students in the program would be good fits for internships or full time positions at Chevron.

The CLA participants were surveyed before and after the program about their perceptions of leadership, their own leadership abilities, their knowledge base of leadership topics, and their feedback on the workshops. Preliminary evaluation of the data shows a distinct increase in student confidence in leadership roles.

Overall, there was not a distinct statistical difference in a students' confidence in any of the leadership topics between the beginning of the program in 2017 and the end of the program in 2017. However, in conflict resolution, confidence in communicating with others, seeking out new leadership opportunities, and their perception of whether they tend to be a leader or a follower, there was a distinct positive shift in the mean and a narrowing of the distribution of answers. In the histograms and box-plots below, the scale is based on a 5-point Likert scale for Figures 4-7 and a 10-point rating scale for the rating of personal leadership capabilities (Figure 8).

Students appeared to be more comfortable with the idea of resolving conflict by evidence of the mean shift from 3 to 4 (Neutral to Agree) and the increase of strongly agree responses (Figure 5). Comment-based feedback revealed that students felt the networking, negotiations, and Emergenetics workshops helped them to better understand themselves and the way they think. Many students admitted that they found themselves analyzing the behavioral and thinking preferences of the subjects with whom they had conflict.

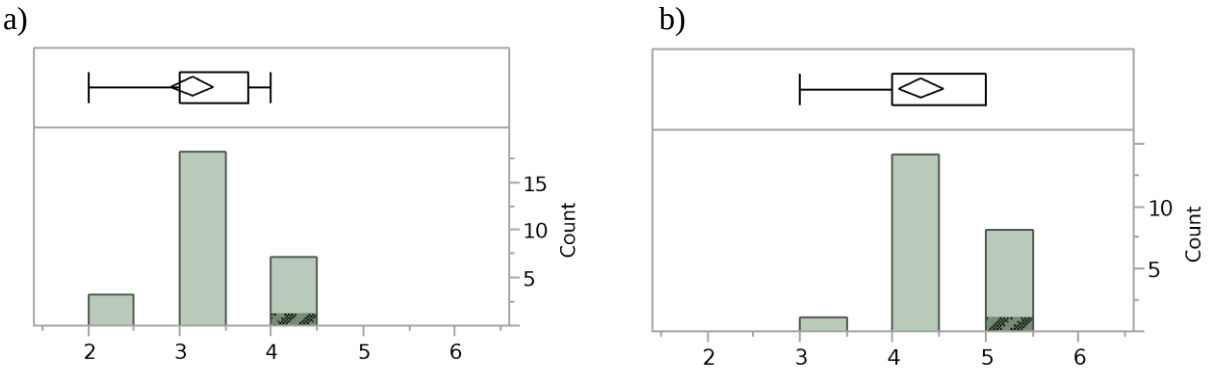

Figure 5: Histogram and box-plot of the responses in the 2017-2018 academic year (a) at the beginning of the program and (b) at the end of the program of the students' confidence in resolving conflict. The scale is based on a 5-point Likert scale (5 is highest, 1 is lowest).

The distribution of agreement widened in the end-of-year responses over the beginning of the year responses with respect to their confidence in communicating with others (Figure 6). Despite this, there was an apparent mean shift from 3 to 4. A few students admitted that, while they felt more comfortable with one-on-one interactions in interview and networking events, they still felt nervous about presenting in front of others and networking in larger groups.

a) b)

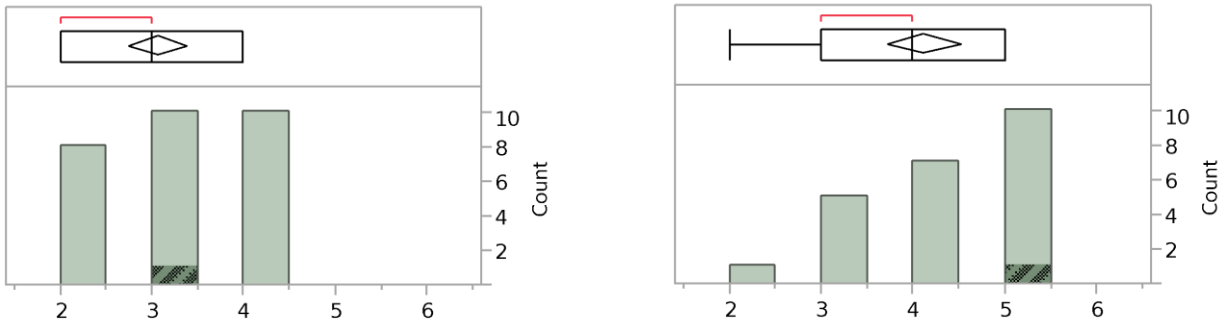

Figure 6: Histogram and box-plot of the responses in the 2017-2018 academic year (a) at the beginning of the program and (b) at the end of the program of the students' confidence in communicating with others. The scale is based on a 5-point Likert scale (5 is highest, 1 is lowest).

At the end of the 2017-2018 academic year, students also appeared to be more likely to seek out and assume new leadership roles than at the beginning of the program. This is apparent by the mean shift from 3.6 to 4.5 and the increase of frequency of "strongly agree" responses (Figure 7). Students also were more likely to perceive themselves as a leader rather than a follower at the end of the 2017-2018 academic year, apparent by the mean shift from 3 to 4 in Figure 8. By the end of the 2017-2018 program, students ranked their leadership skills higher, on average, than at the beginning of the academic year. The mean increased from 6.2 to 7.5 and the standard deviation decreased 30% over the 2017 academic year (Figure 9).

Anecdotally, the increase in confidence is apparent in many of the students' extracurricular pursuits. Many students were inspired to pursue leadership roles within the College of Engineering and university. Following the CLA program, students became representatives to student government at LSU, developed engineering competitions that invited students from across the state, worked with visually impaired K-12 students to develop methods to replace their eyewear using 3-D printing (ref to be added after blind review), and were awarded nationally recognized leadership and innovation awards.

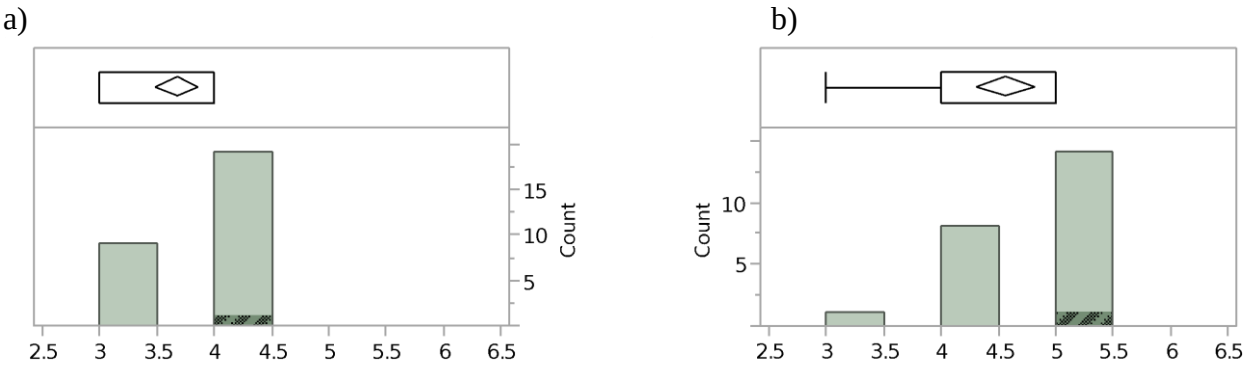

Figure 7: Histogram and box-plot of the responses in the 2017-2018 academic year (a) at the beginning of the program and (b) at the end of the program of the students' confidence in seeking out new leadership roles. The scale is based on a 5-point Likert scale (5 is highest, 1 is lowest).

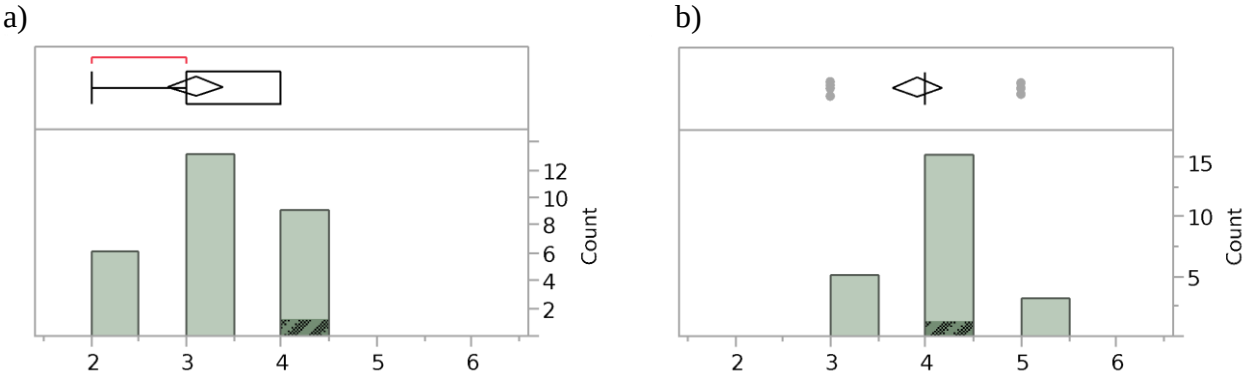

Figure 8: Histogram and box-plot of the responses in the 2017-2018 academic year (a) at the beginning of the program and (b) at the end of the program of the students' perception as to whether or not they see themselves as a leader or a follower. The scale is based on a 5-point Likert scale (5 is highest, 1 is lowest).

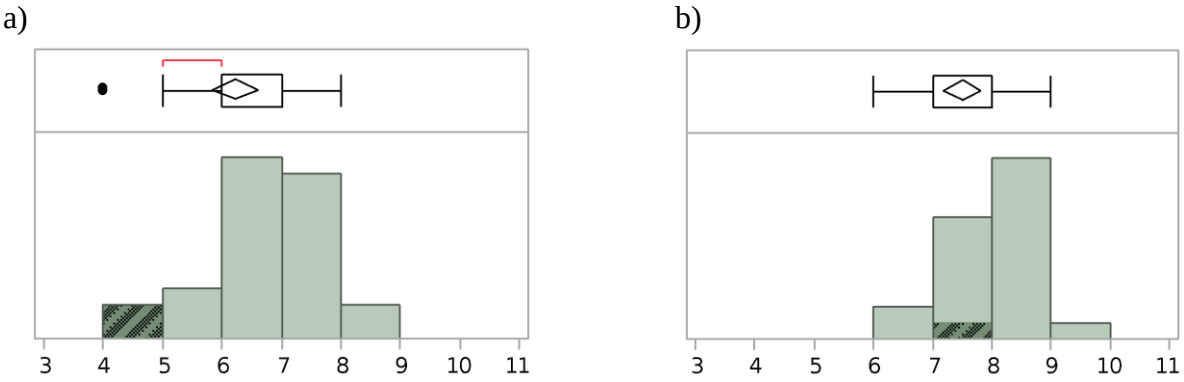

Figure 9: Histogram and box-plot of the responses in the 2017-2018 academic year (a) at the beginning of the program and (b) at the end of the program. The scale is based on a 10-point rating scale with 1 being the lowest and 10 being the highest (5 is highest, 1 is lowest).

Conclusion

With the Chevron Energy Leaders Scholarship, an internship or full time position is not guaranteed with Chevron. Chevron is, however, looking to increase hiring opportunities for students at LSU, and the CLA program is an excellent opportunity to create a program of well-trained prepared technical new-hires. In 2017, the re-vamped CLA program began after the Chevron recruiting season had already started. This made placing students difficult. Despite this, however, 3 students were offered interviews for internships, and 2 students were placed in summer internship positions. Both students were highly rated on their post-internship evaluations. The reputation of the program and better preparation of the students' resumes and interview skills made it such that 86% of the CLA students interviewed for internships or full time positions with Chevron in fall of 2018. Of those, 13 were offered positions, and 10 accepted positions with Chevron. Eight acceptances were for internships, and 1 was a full-time placement.

Having Chevron closely integrated with the program allowed our team to make beneficial changes to the program based on their feedback. Progress of the program and the students is presented regularly to the Chevron Advisory Board and to the Chevron Counsel, who visit LSU annually to meet with all entities who benefit from Chevron's program. The inception for the new Chevron Leadership Academy program was so successful that the Chevron Energy Leaders Scholarship gift was increased to $190,000 from $150,000 for the College of Engineering and increased to $24,000 from $10,000 for the College of Business. The Chevron Advisory Board has also increased the sponsorship to include more majors from the College of Business and the College of Engineering for the 2019-2020 academic year. The annual gift from Chevron has increased 25% over the last two years. Allowing our corporate sponsor more access to the students, as well as giving them regular reports of our progress, successes, and challenges, allows our sponsor more ownership of the Chevron Leadership Academy and other Chevron sponsored programs. As a result, Chevron has expanded their giving to sponsor more programs in the College of Engineering and LSU as a whole.

Future for work-in-progress

As a work-in-progress, the program continues to evolve in the 2018-2019 academic year. While the end-of-year data is not yet available, we hope to

analyze the two-year participant cohort against the new CLA cohort to determine their relative confidence with leadership soft skills. Now that the program is in its second year, the workshops have been designed to incorporate a tiered system such that participants can attend workshops that match their level of understanding of a topic. Upon building confidence of the leadership program with the corporate sponsor, it is the intent to grow the program to a college-wide leadership program.

At LSU, there is a well-established certificate program for Distinguished Communicators. To earn this certification, students must take at least 4 communication-intensive courses that involve four modes of communication: written, spoken, visual and technological [20-22]. What makes this program so successful, particularly in the College of Engineering, is that the communication-intensive courses are worked into the curriculum for all engineering majors. Using this framework and building from the success of Chevron Leadership Academy, the College of Engineering at LSU intends to initiate a leadership certificate for engineering students. The intent is to have leadership incorporated into core engineering courses. At first, courses that already incorporate leadership and teamwork into the course, such as design and project-based courses, will be targeted as potential Leadership Intensive (LI) courses. As the program becomes more established, we intend to work with faculty to develop leadership courses and incorporate leadership in courses where it might be a less obvious choice. As the Chevron Leadership Academy program continues to evolve, it will continue to be a test case for topics, activities, lessons, and curricula for the LSU Leadership Certificate. We hope to have the certificate program initiated in the Fall 2020.

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