Engineering Leadership Development Program – a Tenth-year Review and Assessment

Dr. Lawrence E Holloway, University of Kentucky

Dr. Holloway is currently serving as Interim Dean of the University of Kentucky College of Engineering. He also is the TVA Endowed Professor of Electrical and Computer Engineering. Prior to appointment as Interim Dean, he served nine years as Chair of the Department of Electrical and Computer Engineering.

Dr. Thomas Ward Lester, University of Kentucky

Thomas W. Lester retired from the University of Kentucky in 2015 following 22 years of service as Dean of the College of Engineering and 25 years as a Professor of Mechanical Engineering. Previously, he served as Professor and Chair of the Department of Mechanical Engineering at Louisiana State University and as a Professor of Nuclear Engineering at Kansas State University.

Mr. Joseph Anthony Colella, University of Kentucky College of Engineering

Mr. Tony Colella currently serves as the Director of Enrollment Management and Special Programs at the University of Kentucky College of Engineering. In this director's position, he holds the responsibility to recruit and assist in retaining and graduating students in the College of Engineering. He has served in this role for five years. Additionally, he oversees the Engineering Living Learning Program on the UK campus. This program provides over 550 engineering students annually the unique opportunity to reside in a specifically allocated residential hall to house these highly motivated academic scholars. Students are provided STEM-focused study/review sessions, career programming, and specialized opportunities to further their engineering/computer science journey. Tony also provides guidance and direction to the Scholars in Engineering And Management (SEAM) honors pathway allowing students the option to complete their honors requirements through a defined curriculum combining engineering and business focused course work. Lastly, Tony provides administrative and logistical support to the Dean's Leadership course. In this program, he is tasked with organizing all guest speaker visits, coordination of the student selection process, organizing the course capstone experience and any additional student affairs interactions required in the program. Prior to joining the UK College of Engineering, Tony served 24 years on active duty as a United States Air Force Commissioned Officer.

Engineering Leadership Development Program: A Tenth Year Review and Assessment

Abstract

In 2007, the University of Kentucky College of Engineering created the Pigman Leadership Development Program. The program had the following three objectives: (1) to develop the next generation of leaders from the college, (2) to expand students' expectations of the potential of their careers, and (3) to instill in the students a responsibility for "giving back", including through civic engagement and professional engagement. Each year, the program accepted only fifteen upper-level engineering students for a one-hour semester course that included study of literature on leadership, extensive interactions with successful alumni, and development on professional skills. The program completed its tenth year in 2017. Alumni of the program over those ten years were surveyed regarding how the program has made a difference in their life and career.

In this paper, we outline the structure of the Pigman Leadership Development Program and how different elements of the program contribute toward the program objectives. We then describe results of a survey of students over the ten year period of the program. The goal of the survey is to determine student perceptions of the influence of the program on their preparation for leadership opportunities, the influence of the program on the students' self-perception of their leadership potential, and the influence of the program on the students' responsibility to "give back". We consider both self-reported objective measures and respondents' subjective evaluations of influence of the program. Given that the data extends over ten years of students, we consider how responses differ as the respondents are further into their career since their graduations. We also consider evidence of the alumni's engagement in and support of the college as one measure of civic and professional engagement, one of the objectives of the program.

Introduction

The general goal of an engineering education is to provide students with the knowledge and skills necessary to operate effectively as an engineer. The main emphasis, of course, is on technical knowledge and skills, including problem-solving abilities. ABET engineering accreditation goes further and requires that the engineering education include ethics and professional skills, such as communication and the ability to work in multidisciplinary teams [1]. However, leadership skills historically have been overlooked in undergraduate engineering programs. Instead, students have been expected to learn skills through leadership experiences in student organizations or through workplace professional development programs or mentorship. The 2004 report on engineering in the new century by the National Academy of Engineering has provided impetus to some American engineering schools to incorporate leadership curriculum [2]. The report proposes two main premises as the rationale for the importance of leadership education at the undergraduate level in engineering. Specifically, the inclusion of engineering

leadership in the undergraduate engineering degree program will equip the graduate to be more competitive in an increasingly global marketplace, and will enable the graduate to fulfill their professional service responsibilities to society.

At the University of Kentucky (UK), the impetus for the creation of the Pigman Leadership Development Program came not only from the 2004 NAE report, but also from the feedback received by one of the authors (TWL) during his long tenure as dean of engineering. University of Kentucky College of Engineering alumni have had a rich history of success in a broad range of endeavors. Two of UK's mechanical engineering graduates have served as governor of the state of Kentucky. Two civil engineering grads have served as the civil engineer of the United States Air Force. Others have served in academic leadership positions at the dean, vice president, and presidential level, presidents and chief executive officers of Fortune 500 corporations and small start-ups. Others have served in legislative and agency leadership positons at the federal and state level. These individuals felt strongly that their engineering education prepared them to assume the diverse roles they were to later play as professionals, but most also opined that they felt unprepared when confronted with their first leadership challenges following graduation. The Engineering Leadership program at the University of Kentucky was initiated to address this.

The program was established in 2007 through the support and active involvement of L. Stanley Pigman, an alumnus of the College, and with the following goals in mind:

1. Program Goal 1: To develop a pilot program in the college for the enhancement of career preparedness of UK engineering graduates,
2. Program Goal 2: To help students realize their own potential through engagement with alumni who have been successful in a wide range of vocations, and
3. Program Goal 3: To instill in students the desire to give back to their university, their community, and their country through active involvement in civic, political, and professional organizations and through sharing their time, expertise, and resources.

The third goal was especially important to Mr. and Mrs. Pigman, who have had a long and stellar philanthropic relationship with the University of Kentucky, as well as other universities and community non-profits. As such, the Pigmans have served as role models for the nearly 100 students they have supported through academic scholarships as well as the 150 students they have supported through the leadership class.

In this paper, we consider an evaluation of the Engineering Leadership program at the University of Kentucky. The evaluation was initially motivated by a set of self-submitted information that past participants submitted for sharing with other participants at the tenth anniversary of the program. Since this first set of data was collected for sharing among participants, it is subject to social desirability bias [3]. However, this data was a driver for collecting the second set of data, collected through an anonymous survey of past participants of the program. This paper relies primarily on this survey data.

In the next section, we provide a literature overview regarding other engineering leadership programs. The third section outlines the structure of our Leadership Development program. The

fourth section outlines the evaluation method and survey structure, which is followed by a section examining the results of the survey.

Literature Survey on Leadership Programs

Given that the development of leadership programs in engineering education is a relatively recent occurrence, it is not surprising that the range of literature is still relatively modest. Klassen et al provide a survey of leadership programs supplemented by interviews to create a conceptual framework for leadership programs for engineers [4]. Their framework was based on considering engineering leadership initiatives among fourteen representative programs in North American universities. Their framework consists of seven key dimensions by which to classify engineering leadership programs, including organizational dimensions (participant selection, compulsoriness, and integration into the curriculum) and definitional dimensions (the goal of the programs, the application level, the scale of leadership considered, and the definition of leadership).

Paul and Gradon Cowe Falls also surveyed engineering leadership programs [5]. They initially reviewed over 40 engineering leadership programs, but reduced the set of programs considered to just eleven by applying three inclusion criteria. They focused on those programs that were strictly leadership in nature, that were offered by engineering faculty to engineering students, and that had clearly defined goals and competencies. The programs included one seminar class, three non-credit extracurricular programs, four certificate programs offered with credit, two leadership minor programs, and one Bachelor of Engineering Leadership program. Only one of the eleven programs was launched prior to 2007, and all but one were less than ten years old. Despite the program differences, all eleven surveyed included the fundamental goals of preparing future leaders, encouraging participation in public life, making social contributions, and going above and beyond the traditional engineering career.

There are several potential reasons for the delayed emergence of engineering leadership programs in universities. As noted by Bayless and Robe, many engineering educators have been resistant to include engineering leadership within the engineering curriculum, considering it a "soft skill, not relevant to the discipline," and thus potentially redirecting resources or instructional time from technical material [6].

Another impediment in the development of programs on engineering leadership is the nebulous definition of the term itself. Although several authors have attempted to summarize the characteristics required of effective engineering leaders (see for example Farr, et al. [7,8] and Goodale [9] for early work), Rottmann, et al. showed that there is a lack of consensus on defining engineering leadership among different professional cohorts [10]. The cohorts considered were engineers in industry, human resource professionals, entrepreneurs, politicians, and interns in industry. Depending upon the organizational construct in which the surveyed engineers worked, their views on engineering leadership varied greatly. Rottmann, et al. characterize the definition of engineering leadership with analogy to the blind man and elephant – depending on the location of the blind man's hands, he'll define the elephant differently; all his definitions will be correct, but all will be incomplete.

Consequently, the engineering educator is faced with the common dilemma, how to provide a suitable background in leadership for a group of undergraduate engineering students who will pursue professional careers in a wide-range of organizational settings, all of which have differing opinions on what constitutes engineering leadership? Depending upon the nature of the engineering school, the cultural background of the students pursuing degrees there, and the common destinations of their graduates, engineering schools will naturally develop programs tailored to their particular needs. Further, as Graham [11] explores in her report, engineering programs will do well in pursuing change to remember that (1) most creative approaches arise from the departmental level, not the college level and (2), the persistence of successful change in engineering education depends upon not only effective change agents to lead the initial innovations, but also upon buy-in by the disciplinary faculty who will own the change long after the change agent has disappeared from the scene.

The assessment of the effectiveness of engineering leadership classes has many challenges. Many programs, including the one discussed in this paper, are restricted in nature, either by enrollment management concerns or through a competitive enrollment limited to a small cadre of students with superior academic credentials. Selection bias is almost certainly an underlying complication in assessing such classes. Insofar as employers frequently provide leadership training to their most promising employees, it is also difficult for graduates to separate what aspects of their leadership abilities resulted from their undergraduate versus their subsequent post-graduate studies.

Perhaps the most comprehensive assessment of an engineering leadership program to date was conducted at Ohio University, whose leadership program was among the first nationally. Bayless [12] reviewed the results of a multi-dimensional assessment effort that incorporated exit interviews of students who completed their leadership class in five recent years. Retrospective surveys of alumni of the program were also taken for those up to seventeen years past graduation with special emphasis on those from 2008 and 2012. The author demonstrated statistically meaningful results to most questions from the various cohorts participating in the study but notes that the value of the course in developing leadership skills was not in question. The unanswered (and perhaps unanswerable) question was the value of the course in providing leadership skills over and above those the student would have otherwise developed in professional practice.

Faced with the issues noted in the foregoing, we were interested in finding out to what extent our students were actually engaged in exercising leadership in their professional environment and were engaged in civic or professional organizations. The evaluation of the outcomes of the University of Kentucky engineering leadership course considered in this paper is therefore conclusive focused and outcome focused as opposed to a constructive evaluation. Chen [13] views program evaluation as having two dimensions. On one dimension is process vs. outcome, depending on whether the evaluation is focused on evaluating the process of a program vs. evaluating the outcome of a program. On the other dimension, evaluation can be considered as constructive or conclusive. A constructive evaluation is focused on improvement of the program, whereas a conclusive evaluation is focused on determining whether the intended outcomes are achieved. While the outcome of this survey will also be helpful in the implementation of changes in the manner in which the course is taught, or to inform the development of spin-off leadership course sequences in departments and in the freshman year

experience at UK, we are following an outcome-based approach in the discussion of this paper. The next section describes the Engineering Leadership program structure. We then outline the evaluation process, and then summarize the results from the evaluation.

Leadership Program Structure

Throughout the ten years of the Pigman Leadership Program at the University of Kentucky, the program has been offered as a one credit-hour spring semester course to juniors or seniors in the College of Engineering. The course was designed specifically so that it could not potentially be used by students to complete the degree requirements in any of the college's undergraduate disciplines. While this may seem an odd approach for a course in engineering leadership, widely hailed as an essential element in the undergraduate education of engineers by the NAE and others, we intentionally took this approach (1) to assure ourselves that only those students genuinely interested in the course would apply for admission, and (2) to expedite the introduction of leadership education in the college without having to go through the oftentimes onerous chore of convincing disciplinary faculty of the wisdom of including a course developed by the dean's office in the graduation requirements.

In the implementation of the course, existing leadership initiatives at a number of other colleges and universities were reviewed. However, we found that two approaches at the time were best suited for our particular purposes, Leadership Vanderbilt and the Robe Leadership Institute at Ohio University. Similar to those programs, the Pigman Leadership Program is competitive – students must apply for the program and undergo an interview process. Factors considered in the selection of participants include academics, work experience, effective communication, and involvement in student or civic organizations. Since its inception, the program has always been led by either the currently acting dean or a former dean of the College.

The course is structured with the following elements:

Curricular elements:
1. Leadership literature and leadership from history: Students were regularly assigned articles and books on leadership and leaders. Students then were required to write reflections on these and to discuss these within the class.
2. Learning from leadership journeys of alumni before: Successful alumni of the college were invited to present to the class about their own leadership journeys, including their leadership "lessons learned" in their careers. These alumni have had a variety of career paths, including as leaders of industry, leaders in public service or military, and as alumni that took their engineering degrees as a base to then lead in law, medicine, or academia. These presentations are helpful for our students to see these successful individuals as real people, people who made mistakes, had their own self-doubts, and overcame adversity. This helps the students to see that these individuals were not unlike them when they were students, thus helping the students to visualize their own paths to success. A common theme among these presentations also is the importance of other people that encouraged and mentored these alumni during their careers.

3. <u>Development of professional skills:</u>   Additional classes are devoted to improving professional skills among the students. This includes instruction and assignments related to effective professional and interpersonal communication and networking, as well as instruction in professional and business-meal etiquette. The intention of the content on professional skills is to increase students' comfort and effectiveness in a variety of professional settings.

Extracurricular elements:
The program also includes activities expected of the students but held outside of class time. These includes:

4. <u>Business dinners with successful alumni:</u> Each alumnus/alumna who presents to the class is invited to attend a dinner with a small group of students after the class. These dinners give the students an opportunity for more personal conversation with the speaker in the setting of a professional business dinner, as well as experience in business dinners.
5. <u>Group travel experiences:</u> A class trip to Washington DC. This trip occurs over the first few days of spring break. During the trip, the students visit with congressional delegates or their staff and visit government or historical sites. The students are prompted to think about these visits in the context of leadership by others, as well as the students' own responsibilities for political, civic, and professional engagement.
6. <u>Other events:</u> Throughout the semester, the students have additional events outside the class period, including a mentoring session with selected freshman scholarship recipients, a meeting with the University president, and events with the sponsoring alumni, Mr. and Mrs. Pigman.

In 2017, Mr. and Mrs. Pigman organized a reunion of the leadership program participants as a tenth-year anniversary event of the program. One hundred fifty past participants in the program were invited to attend, and students from each of the ten classes were represented. The purpose of the event was to bring the former students together, see how their careers had progressed, and to remind the students that as they became successful, they needed to remember to "give back" to others. Unbeknownst to the Pigmans, the students had already been organizing with assistance from the Development Office in the College of Engineering to present a gift to the University in honor of the Pigmans. At the reunion event, the students announced that they had committed a total of $250,000 in gifts and pledges to the University in the Pigmans' honor as a very tangible demonstration that they already were practicing "giving back". Approximately 83% of the graduates of the program contributed. This can be taken as evidence that the students were "giving back" in line with Program Goal 3 of the course.

Evaluation Methodology and Survey Structure

The program evaluation was undertaken through a survey that was electronically sent to all one-hundred-fifty program participants from the 10 year history of the course. The former students were invited to participate by email, and were provided a link for an anonymous web-based survey. Ninety-five of the one hundred fifty students (63.3%) responded with survey instruments, with most survey items receiving at least ninety responses.

The survey was designed as an Objectives-Based Study [14], focused primarily on answering the following three main questions (objective questions):

(1) Looking back on the class, do the students feel that the class helped prepare them for leadership opportunities?
(2) Do the students feel that the course changed their perception of their own potential as leaders?
(3) Did the course instill in the students the importance and responsibility of "giving back", including through their involvement in civic or professional engagement?

Note that question 1 above is in support of Program Goal 1, question 2 above is in support of Program Goal 2, and question 3 is in support of Program Goal 3. In the terminology of Stufflebeam, this survey is a quasi-evaluation study, since the questions being addressed differ some from the program goals [14].

In addition to the anonymous survey, we also considered information provided by the former students for a book prepared for the tenth-year leadership reunion. In the book, students provided open-response statements as to what the leadership program meant to them. These books were distributed to all participants of the reunion event. The responses in the book are likely tainted by social desirability bias, since the participants knew the material would be shared with peers, so we are not focusing on the book responses in this paper. However, the book statements were a major motivation for the questions that we asked in the anonymous survey.

The web-based survey is structured in three parts:

- *Survey Part 1: Participant Information:* In the first part, the respondents were asked a series of informational questions around five topics including program graduation date, further education, current employment information, leadership experiences, leadership expectations for the future, and evidences of "giving back" through involvement in their communities or organizations. Each of these topics is explored with one or more questions with provided multiple choice or multiple response answers of typical expected responses (for example, typical types of advanced degrees for the question on further education). For most questions, an open response option is given for the respondents to use if their answer to the question did not fit any of the expected answers provided. These questions sought primarily factual data, as compared to the second and third part of the survey which were more about the respondents' perceptions. These were sought in terms of factual support of the program goals, for example evidence that the students were involved in "giving back". However, without the existence of a control group, evaluation of the actual impact of the program using this data is difficult.
- *Survey Part 2: Perceptions on Program Influence and Value:* The second part of the survey asked the respondents about their perceptions of the program's influence on their leadership development (whether the program increased interest in leadership roles, helped prepare for leadership activity, increased self-confidence, etc.), or on their activities outside the workplace (such as through seeking higher degrees, or involvement in professional, civic, or political activities). The specific items are presented in the

results section below. This portion of the survey was designed to help with an evaluation of the program goals mentioned above.

- *Survey Part 3: Program Implementation Evaluation:* The third part of the survey sought the respondents' input on the value of specific elements of the program, such as the case studies, guest speakers, etc.   The respondents rated each of the elements on a five point Likert scale ranging from "very important" to "unimportant (should be considered for removal or improvement)". This third part also included open response questions inviting the respondents to reflect on what they found most valuable about the program and what they felt should be changed about the program. This portion of the survey was intended to assist with an evaluation of the program implementation, to seek qualitative input on which program elements were most valued as students reflected back on their program experience.

The survey evaluation has two major limitations. First, all individuals invited to the survey were participants in the program, and so there is no comparison of survey responses to a control group of students who were not participants in the program. Second, there is an inherent selection bias. The students who were selected to be in the program were high achievers who had already demonstrated leadership prior to their participation in the program and applied to participate in the program, so even if there had been a control group of students from the more general student body within the college, the leadership journeys of the students in the program and those outside the program would likely have been different, regardless of the content of the program.

However, even with the limitation of the lack of a control group and the selection bias of the participants, the survey results are useful for evaluating the program, particularly for the first two survey objective questions which are based on participant perception of the value of the program for preparing them and the value for helping the participants understand leadership in others.

Survey Data

Out of 150 survey invitations, a total of 95 students took the survey, a response rate of 63%.

Survey Part 1: Participant Information. (Summary of results)

1. *Class Date:* Respondents were asked what year they received their engineering Bachelor's degree from UK, in order to identify when they participated in the programs. Each year had at least eight responses, except for the year 2011 for which there were only six.
2. *Education Beyond:* Respondents were asked if they pursued any additional schooling after their Bachelor's degree, if they completed the schooling, and what degree did they receive. Seventy-one percent of the respondents had completed some additional schooling beyond their initial bachelor's degree. Forty-three percent were pursuing or had completed an advanced degree in engineering or computer science, nineteen percent were pursuing or had completed an MBA, three percent were pursuing or had completed a law degree, one percent were pursuing or had completed a medical degree, and five percent were pursuing or had completed some other degree.

3. *Current Employment Information:* Seventy-three percent of the students indicated that they were employed in an engineering position. Thirteen percent indicated that they were in a non-engineering position, and fourteen percent indicated they were a full-time student. Of those who indicated that they were employed, when asked what their job responsibility was, sixteen percent indicated that they occupied a management position, four percent indicated a sales position, and seventy percent indicated that their position included some engineering responsibility. Students who indicated "other" positions listed research, CEO, business analyst, business development, professor, and physician as responses.
4. *Leadership Experiences:* Eighty-seven percent of the respondents indicated that their work duties since graduation included some leadership responsibility. The most frequent responses indicated that respondents were either project, team or committee leaders. Two respondents indicated that they were CEOs of startup companies, and another was a General Manager level. Seventy two percent of the respondents indicated that they had some leadership role outside of work, such as a religious organization, athletic group, professional organization, community group, or other.
5. *Leadership Expectations and Development:* Seventy-two percent of respondents indicated that since their graduation, they had participated in at least one leadership development activity at work or outside of the workplace. Of those reporting leadership development at work, twenty-three percent had a designated leadership mentor, twenty-seven percent were in a short-term professional development program, and thirteen percent were in a long term leadership development program. All respondents indicated that they expected to have formal organizational leadership roles in their future in their career. Ninety-one percent reported that they expected to actively seek out those roles and to have future "major leadership responsibilities", such as managerial or organizational officer roles.
6. "Giving Back": Twelve percent of the respondents indicated that they are not currently "giving back" to others with their time, money or expertise. Of the remaining eighty-eight percent who indicated they are "giving back", the highest twenty-seven percent reported that they were giving back to a community organization as a volunteer or supporter, nineteen percent indicated that they were giving back to a religious organization, and seventeen percent reported giving back to professional organizations. Other responses indicate involvement in charities, involvement in their alma mater, their local school system, and others.

Survey Part 2: Perceptions on Program Influence and Value

Table 1 shows the responses to the twelve questions on program influence and value. Each question was on a five point Likert scale, where "1" is "strongly agree" with a given statement, and "5" is "strongly disagree" with the statement.

The program showed very high influence (over ninety-percent of responses as "strongly agree" or "agree") in respondents' interest in seeking leadership roles, in understanding leadership roles in a diverse set of organizations, and in increasing their self-confidence. Participants were less positive (between sixty- and seventy-percent "strongly agree" or "agree") that the course

influenced their decision to become engaged with community organizations or involved in national, state, or local issues. Only about fifty-six percent of the respondents reported that the class experience had influenced their decision to pursue an advanced degree, while only a bit over thirty-percent indicated that the class had done the same for their decision to join a professional or civic organization.

Survey Part 3: Program Implementation Evaluation

As shown in Table 2, when the students were asked about the importance of different elements of the class, greater than ninety-percent of the respondents strongly agreed or agreed that the course success was benefitted by the incorporation of case studies, class discussions, small group dinners with invited speakers, the leadership trip to Washington, D.C., networking with fellow students, and instruction in professional communication skills. They were less positive (only about eighty-three percent "strongly agreed" or "agreed") that the etiquette instruction was important to the class success.

Survey Cross Tabulations Based on Graduation Year

An analysis of responses across different graduating classes showed surprisingly little variation in responses across the class years, other than the students from earlier graduating classes indicated more leadership experience and more schooling completed. Specifically, considering only those respondents who graduated in the first three years of the program (graduation years 2008-2010), 40% responded that they had *"managerial leadership, including responsibility of task assignment and evaluation of employees"* and 76% responded that they had been a "*leader of a project"*, compared to 17% and 42% for respondents from the last three graduating classes (2015, 2016, and 2017).

One surprising exception in comparing early participants of the course and later participants of the course was in regard to involvement in civic and political processes. Respondents from more recent years of the course indicated that the class more strongly influenced their involvement in civic and political processes. Specifically, 28% of respondents who graduated in the first three years of the program "strongly agreed" that the program "influenced my decision to be engaged in community government or political campaigns, etc.", whereas 49% of the respondents who graduated in the last three years felt that way. For the statement "The Program influenced by decision to be involved in my community (examples: volunteering in school system, Habitat, community organizations, etc.)", 9% of the first three graduating years "strongly agreed", vs. 27% of the last three graduating classes. It is unknown whether this difference in the perceptions of the different classes is due to variation in course content (such as different speakers or readings), or whether this is evidence of a broader difference between the student groups.

Table 1: Survey results on Program Influence and Value

Statement	"Strongly agree" (1)	"Somewhat agree" (2)	"Neither agree nor disagree" (3)	"Somewhat disagree" (4)	"Strongly disagree" (5)	Std. Deviation	Sum of percentages of "Strongly agree" and "Somewhat agree"
The Program increased my interest in seeking leadership roles for me. (n=90)	52.2%	43.3%	4.4%	0.0%	0.0%	0.58	95.6%
The Program helped me understand other people in their leadership roles. (n=90)	73.3%	24.4%	2.2%	0.0%	0.0%	0.50	97.8%
The Program prepared me for my first leadership activity. (n=90)	43.3%	40.0%	14.4%	2.2%	0.0%	0.78	83.3%
The Program increased my self-confidence in considering leadership opportunities. (n=90)	63.3%	32.2%	3.3%	1.1%	0.0%	0.61	95.6%
The Program influenced my decision to be involved in a professional organization. (examples: ASCE, AICHE, ASME, IEEE, American Medical Assoc., etc.) (n=90)	13.3%	17.8%	58.9%	8.9%	1.1%	0.86	31.1%
The Program influenced my decision to be involved in a civic organization (examples: Rotary, Kiwanis, etc.). (n=90)	7.8%	24.4%	61.1%	4.4%	2.2%	0.77	32.2%
The Program influenced my decision to be involved in my community (examples: volunteering in school system, Habitat, community organizations, etc.). (n=90)	18.9%	46.7%	31.1%	2.2%	1.1%	0.81	65.6%
The Program influenced my decision to be engaged in national, state, or local issues. (examples: voting, being engaged in community government or political campaigns, etc.) (n=90)	32.2%	34.4%	27.8%	4.4%	1.1%	0.93	66.7%
The Program influenced my decision to seek a higher degree (engineering, business, or other). (n=90)	32.2%	23.3%	34.4%	7.8%	2.2%	1.06	55.6%
I would recommend the Program to other students. (n=90)	95.6%	3.3%	0.0%	1.1%	0.0%	0.36	98.9%
The Program was of value to me. (n=90)	95.6%	3.3%	1.1%	0.0%	0.0%	0.27	98.9%
It was good that the Program included students from different disciplines (such as Civil, Chemical, etc.) from across the college. (n=90)	97.8%	2.2%	0.0%	0.0%	0.0%	0.15	100.0%

Element of Course	"Very important" (1)	"Somewhat important" (2)	"Neither important nor unimportant" (3)	"Somewhat unimportant" (4)	"Unimportant (should consider removal or improvement)" (5)	Std. Deviation	Sum of percentages of "Very Important" and "Somewhat Important"
Case studies (readings), with discussions and reflections (n=90)	23.3%	65.6%	6.7%	4.4%	0.0%	0.69	88.9%
Presentations and larger class discussions with guest leadership speakers (n=90)	87.8%	11.1%	1.1%	0.0%	0.0%	0.37	98.9%
Small group dinners and discussions with guest leadership speakers (n=90)	75.6%	16.7%	3.3%	4.4%	0.0%	0.75	92.2%
Classes on business and meal etiquette (n=90)	40.0%	43.3%	8.9%	6.7%	1.1%	0.91	83.3%
Classes on professional communication (n=88)	67.5%	26.1%	5.7%	0.0%	1.4%	0.70	93.2%
Leadership class trip to Washington DC (n=90)	78.9%	17.8%	2.2%	1.1%	0.0%	0.55	96.7%
Developing a professional network with fellow students in the course (n=90)	71.6%	21.6%	6.8%	0.0%	0.0%	0.6	93.2%

Discussion

In reviewing the results of the survey, we were pleased with the 63% response rate to an email requested survey. Nevertheless, we caution that nearly one-third of the students didn't complete a survey. Whether this reflects a more negative attitude about the class remains unclear. The survey was conducted with a relatively short response time.

The survey was intended to answer (1) if students feel that the course helped prepare them for leadership opportunities, (2) if students feel that the course changed their perception of their own potential as leaders, and (3) if the course instilled in the students the importance and responsibility of "giving back", including through their involvement in civic or professional engagement. Responses from the survey affirmatively answer each of these questions, but with several subtleties revealed through the responses to the various questions. The results are very strong that students perceive the course as influencing their interest in leadership and helping

prepare them for leadership through increased self-confidence and understanding of the leadership experiences of others. The survey shows that eighty-seven percent of the respondents had some leadership experience within their workplace, and that for the first three years of graduates (2008-2010), over forty percent had managerial responsibilities.

A large percentage (67%) indicated that they had been positively influenced to participate in civic affairs at the national and state levels, but at the same time, we see a disconnect insofar as a far smaller percentage reported increased interest in becoming engaged with either civic (32%) or professional organizations (31%). It is troublesome that the program failed to adequately convey that active membership in professional engineering societies (ASME, IEEE etc.) or civic organizations (Rotary, Chambers of Commerce, etc.) are among the most effective ways for engineers to effectively impact their local or national communities. Since this is one of the ways students are expected to "give back" as per Program Goal 3, we need to reevaluate the curriculum in order to strengthen this. However, given that 83% of the participants give financially to support their college in honor of Mr. and Mrs. Pigman, certainly the students are "giving back". However, it is not clear whether the college gifts are motivated out of affection and appreciation for Mr. and Mrs. Pigman, or out of a true commitment to "give back".

We are aware that the nature of the student body admitted to the class, and in fact the very act of admission to the class of small cohort, could have had a profoundly positive bias on the results. The results of the survey would be strengthened if there were a control group of students that could be used for a comparison. Assessing the longer-term impact of this course on the one-hundred fifty student participants will be an ongoing effort with periodic attempts to survey the attitudes in future years.

Program Goal 1 indicated that this program was a pilot program. Recently, the program has been expanded to include more students beyond the fifteen per year accepted in this program. There are now departmental-level leadership classes available to both chemical and materials engineering majors, and more recently an expansion of the program to a broader set of students across the college through a set of elective courses. Moreover, the college is developing a leadership module for its introductory engineering course work for all students in the college. Longitudinal studies of the attitudes of graduates who participated in these efforts will greatly augment our current understanding of where college efforts are bearing fruit and where future improvements are required.

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