

A Study of Alumni of the 'Leveraging Leadership for a Lifetime' Leadership Development Course

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Elaine has over 20 years of experience as an executive in Human Resources and Organizational Development, working in a Fortune 50 organization. She is a published author on facilitation, performance management and change leadership. She has served in multiple organizations including The Hudson Institute of Santa Barbara, the University of St. Thomas and Argosy University where she taught leadership development, strategic change and team effectiveness. She co-authored with Dr. Ron Bennett the 2012 McGraw-Hill book, "Leadership for Engineers: The Magic of Mindset."

She launched her own business Work-Wise Coaching & Consulting in 2000, serving individual leaders, teams and organization to increase their capacity to make significant contributions that are sustainable over the long-term future. She has worked in partnership with many other organizations and created two non-profit organizations, Graceful Passages, Inc. and Soul Source Foundation, both of which serve people

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A study of alumni of the *Leveraging Leadership for a Lifetime* leadership development course

ABSTRACT

Over the past two decades there has been abundant discussion, research and subsequent publication about the need for leadership skill development for both newly minted and seasoned engineers. The calls have come from both engineering practice and academic communities, and the expectations have been codified by ABET for engineering academic preparatory programs. But there is a dearth of information about whether, and how, this education has been of value to the graduates and their organizations. This study documents the results of a survey of alumni of several post-graduate engineering degree programs offered at the University of St. Thomas - Minnesota. The survey of alumni from 13 years of the courses' history assessed key instructional processes and intended leadership learning outcomes for experienced engineers: the development, deployment and professional and personal outcomes of core leadership processes; how the alumni have used this learning; the perceived long-term career and personal value of that leadership education experience; and aspects of the curriculum they perceived as most valuable. **The key question: has the study of leadership development been of value to the graduates in the years after completing a course, and if so, how?** The paper also describes how the leadership course has evolved in response to changing student demographics and a continuous improvement process. Key concepts, processes and outcomes developed during the course sequence include self-assessment and self-awareness, identifying their leader capabilities, developing a lifelong learning plan, authentic leadership, and reflection. The findings of this study suggest that leadership development can be meaningfully facilitated among engineering and technology graduate students through a graduate program course, setting the trajectory for subsequent growth and enduring benefit. This paper primarily fits the Assess strategic initiative of the LEAD division, and the presentation will meet the Inform initiative.

INTRODUCTION

BACKGROUND – LAUNCH OF AN ENGINEERING LEADERSHIP COURSE

Over the past two decades there has been abundant discussion, research and subsequent publication about the need for leadership skill development both for newly minted and seasoned engineers. The calls have come from both engineering practice [1] and academic communities [2], and the expectations have been codified by ABET for engineering academic preparatory programs [3].

At the recommendation of our School of Engineering Industry Advisory Board late in the 1990s it was decided to develop a new graduate program to address a changing manufacturing and industrial environment in our state. Increasing use of technology in this environment called for a different set of skills needed for engineers. A Master of Science in Technology Management degree (MSTM) was introduced in the 2000-2001 academic year.

The target audience was adults with technical backgrounds who worked primarily in local industry. Students typically were in their early 30s, worked full-time, and took evening classes as

part-time students. Most students required three to four years to complete the degree program. As noted later in the transition section of the paper, the student population has changed over the years as more students enter graduate programs directly from undergraduate degrees, and with the addition of more foreign students.

Working adults are highly motivated because they have excellent technical skills and enough experience to understand that it takes more than these skills to be effective workers. Taking classes two nights a week was daunting while maintaining a full-time job and often family and civic responsibilities. Consequently, they were prime candidates to understand the value of leadership development.

Several local employers were queried about how graduate programs in engineering might be improved to ensure a significant ROI on the investment they were making for their students. They responded favorably to the School of Engineering Mission, Vision and Values [4] and MSTM program objectives [5] suggesting it would be helpful for their employee-students to recognize themselves as leaders as well as technical experts. They wanted their students to be grounded in a broader understanding of global leadership requirements for the future and take broad leadership responsibilities in their organizations as a result of acquiring this master's degree. This university responded by designing a MSTM curriculum to meet that request.

A design committee was created to propose possible approaches and ultimately settled on a series of three one-credit courses on leadership as a requirement for students in the MSTM program. These three courses would be woven into the larger MSTM degree content – one at the front end, one in the middle and one at the end of the program. The three courses, called Leveraging Leadership for a Lifetime I-III, would focus on increasing the learner's self-awareness, identifying their leader capabilities and have each student create a development plan to guide their learning and leadership practices over the course of their degree program and beyond.

The program launch began in January 2003 with 21 students. Students responded very favorably and found the program immensely rewarding [6,7,8,9]. They began the process by assessing themselves on their leadership potential (a 360-degree instrument on leadership competencies) [10], their emotional intelligence capacity [11], a values assessment [12], their learning styles [13], and their personality preferences [14]. Students came to understand their profile as a learner and leader, identified their strengths and gaps, and developed a clear vision of the leader they expected to become. Their initial work was to define a roadmap for getting there and action steps to ensure they reached their targets. Midway in the program, they developed an action-learning project that was carried out in their organizations to test their leadership capability and capability for solving real issues within their organization. Finally, they left the graduate program with a plan for continuing their leadership journey beyond the university and into their future. Students worked in learning groups to support one another and actively coached each other on their progress. Many commented: *'this was my first time to truly assess myself in so many different dimensions and really put a plan in place to become the kind of leader I want to be'*. It was exciting to watch their leadership capabilities emerge and grow.

In the survey of alumni conducted for this paper, an ongoing effort to track and monitor the students in the LLL Series has been conducted, attempting to understand overall, long-term results of the process over time. The survey attempts to document the outcomes of their learning and leading plans, leadership impacts in their respective organizations and their growth as a leader in their communities.

CONTEXT – DESIGN OF THE COURSE SERIES

While the concepts of leadership can be learned in class, actually putting these concepts into practice takes time. In some respects, these concepts are simple, but they are not easy to master in practice. Since students were typically in the master's program for several years, the leadership development course was designed as three one-credit courses, spread over three years. This approach allowed 'assimilation time' for students to understand the concepts, put them into practice, and reflect on their learning.

Details of the courses have been previously covered in many other ASEE documents [6,7,8,9] and other publications. [16] While the specific learning tools and instructional techniques in the LLL course series evolved somewhat over time, its core course structure, objectives and components remained stable. A summary of the objectives and student learning outcomes, as originally conceived, for each of the LLL course series segments is provided here:

Leveraging Leadership for a Lifetime I (ETLS 550) (offered as the initial course in the MSTM program). This course provides a comprehensive orientation to the newly accepted student as well as launching the learning process for the upcoming three to five years. Expectations for the learning process will be identified; tools for student evaluation of program outcomes will be selected; portfolio design/development will be outlined; and critical communication tools/methods will be examined.

Leveraging Leadership for a Lifetime II (ETLS 650) (offered at mid-point of the program – after the student has completed 5-8 courses). This course, through a variety of methods, assesses progress with the learning process, re-evaluates growth in key leadership dimensions, and identifies critical success factors to date. Portfolio design and development will be evaluated, communication skills enhanced, and a beginning of a leadership agenda will be shaped.

Leveraging Leadership for a Lifetime III (ETLS 850) (offered at the conclusion of the student's program – after 13-14 courses have been completed). This course aims to provide a capstone for the graduate learning experience, identifying key learning outcomes, measuring growth in all self-assessment areas and designing the life-long leadership and learning plans.

Throughout the sequences of courses, the following assessment tools will be utilized: [MBTI, Kolb, EI and 360]. Supporting documentation for the use of these instruments can be found in the following references [19,20,21,22,23,24,25,26]

1. Emotional Intelligence (measures personal capacity for managing oneself and being in relationship with others).

2. A 360-degree assessment via a structured interview [10] and
3. A Self-Rating of MSTM Learning Objectives and Competency Levels.

Course	Course Objectives. The student will:
LLL I (ETLS 550)	<ol style="list-style-type: none"> 1. Build a base-line assessment of his/her competencies, values, learning style, leadership aptitude and personal/professional talents 2. Build understanding of the graduate program's mission, vision and values and its 'fit' with participants' values 3. Identify key leadership and communication competencies that need strengthening 4. Shape a learning plan that will serve as her/his contract for the next 3-5 years of professional life (graduate work, work, community, etc.) 5. Develop learning action steps that involve key stakeholders in their communities, and 6. Be assigned to a peer group that will serve as a support vehicle for applications of the learning process.
LLL II (ETLS 650)	<ol style="list-style-type: none"> 1. Modify learning action steps as needed 2. Build broader and deeper understanding of team effectiveness, workplace applications of learnings to date, and development of leadership competencies 3. Identify and prepare for an action learning project within his/her organization: results will be shared in the LLL-III course 4. Share presentations and writings with peers, seeking feedback and demonstration of newly developed competencies 5. Deepen her/his understanding of the global environment on technology strategy, and 6. Develop competencies with social and ethical responsibilities.
LLL III (ETLS 850)	<ol style="list-style-type: none"> 1. Identify leadership intentions for his/her future, based on a broad understanding of leadership style, competencies and character 2. Share her/his portfolio of learning with the class, demonstrating how this will be used in his/her workplace applications 3. Share results of his/her action learning project, demonstrating key learnings related to leadership actions 4. Give a final presentation on their learning process and how this will fuel their leadership/learning plans for a lifetime 5. Develop a vision for their leadership stance/influence in 5-10 years, and 6. Finalize the metrics for measuring the program objectives. This was accomplished by analysis of self-assessment papers written by the students.

Course	Student Learning Outcomes demonstrated by students
LLL I (ETLS 550)	<ul style="list-style-type: none"> • Self-awareness and applying this to leading and learning • Ability to function in multi-disciplinary teams • Ability to analyze and present information and describe their leadership vision • Ability to develop a leading and learning plan • Ability to effectively identify and use resources in achieving their vision for leadership
LLL II (ETLS 650)	<ul style="list-style-type: none"> • An expanded perspective on self as a leader, the leader's work and effecting positive change • How to give voice to his/her beginning leader's story and lessons learned • An understanding of the context for leader's work, focusing on team effectiveness and impact in the broader organization • The ability to adjust and define a new leading and learning plan that will focus on impacting positive change in her/his environment, including a specific action learning project

	<ul style="list-style-type: none"> • The ability to effectively identify and use resources for his/her advantage in achieving her/his goals
LLL III (ETLS 850)	<ul style="list-style-type: none"> • Demonstrate a broadened perspective on leadership and how to create positive impact • Global awareness of the practices and behaviors that reflect effective global leaders • Ability to use reflection as a key practice for leading and learning • Ability to present information that effectively describes their experience as a leader • Ability to effectively identify and use resources in achieving their lifelong learning and leading plan

Delivery of the courses was of course important, and skill of the instructors essential. The course was primarily designed by one of the authors who organized other instructors who had professional credentials and skill in leadership development teaching and coaching. Since initiating a course feedback evaluation tool in 2013 that has been repeatedly utilized since, student evaluation of the course has remained remarkably consistent despite rotation of teaching responsibilities among the core instructional team. While not a rigorous test of the instructor as a variable influencing learning outcomes, the consistency of student feedback suggests that a pool of skilled, experienced leadership developers and coaches can be similarly effective despite the natural individual variability in their style, 'stories from the field,' and personal feedback to students.

Throughout the LLL series emphasis was placed on authenticity. Authenticity was defined as '*conforming to fact and therefore worthy of trust, reliance or belief*' [39]. Authentic leadership concepts were developed, largely based on the 'True North' authentic leadership research project of George et al [40] and the notions of self-awareness, empowering others and transformation on the journey.

A GAP: UNDERSTANDING THE IMPACT OF ENGINEERING LEADERSHIP DEVELOPMENT

The three-course leadership development series 'Leveraging Leadership for a Lifetime' is unique and has been established for many years as noted above. Nearly 300 alumni have completed this course. It is expected that their experience would be a valued contribution to all who teach leadership development to engineering students and to the students themselves.

To emphasize the importance of this contribution, there is a dearth of information on the value to leadership development of engineers. Extensive research of the literature was conducted to identify other studies relating the long-term effects of prior leadership development of engineers. We were unable to find any published studies following specific students and the longer-term impact of leadership development education on them. The only relevant article identified was by Simpson et al. [27] Other research by Rottmann [27A], while an important contribution, was a review of literature and not specific to a group of engineers. Another by Reyes [27B] relating to the effectiveness of leadership development programs again was not specific to a group of engineers, and rather provided a summative and meta-analytic review to identify the state of leadership development programs for students of higher education. Our paper is designed to provide focused research on the outcomes of this program as an historical study of the aspects of

the program that are considered most valuable to the students, and the longer-term benefits of this learning experience. To accomplish this goal, we surveyed the alumni who have completed this leadership learning experience.

The leadership papers presented in the ASEE Engineering Leadership Development Division (LEAD) sessions have not yet addressed research on the longer-term usefulness of leadership development for alumni some years after graduation. With nearly 300 students having completed the three-course sequence dating back 13 years, it would seem that it would be worthwhile to share our experiences with others, consistent with the mission of our university. A research paper covering the results of the student learning would be a significant contribution to these programs, emerging programs and to industry.

Industry has been calling for leadership skills for decades, although not always labeling them as such. A study by the National Society for Professional Engineers (NSPE) in the 1990s identified what industry valued in graduating engineers and how well they perceived engineering schools were doing at educating students in those areas. [28] At the ABET Symposium in April 2015, a panel of industry representatives identified the primary characteristics they sought in new engineering graduates. [29] In addition, the Engineering Accreditation Commission (EAC) of ABET has identified several skills that engineering graduates must demonstrate in their Criterion 3: Student Outcomes. [3] Of the characteristics sought, other than technical, most relate to leadership.

In all cases, the skills and attitudes sought are being driven by those who hire engineers. Therefore, not only should the engineering schools who offer leadership training be the audience for our paper, but so should the industry people, represented in ASEE by the Corporate Member Council (CMC).

Therefore, we designed this research involving the alumni of the Leveraging Leadership for a Lifetime (LLL) course series to address several aspects.

PURPOSE OF THIS STUDY

DID THE COURSE HAVE THE INTENDED IMPACT?

The purposes of this survey project were to identify, through systematic survey research of the program graduates, the following: the most salient/beneficial aspects of the program, the impact of the LLL program on graduates' attitudes and behaviors, the perceived value of the LLL program among alumni, and the key learning from the program that continues to shape graduates' leadership today.

Through the survey, we sought to identify which parts of the curriculum the graduates view as most influential in their leadership development.

- a. Self-awareness through various assessment instruments
- b. Consciously creating a clear vision for one's future through a leading and learning plan
- c. Using action learning strategies for testing one's abilities centered on an action learning project
- d. Gaining more clarity about what "leadership" really is, what it looks like, and the practices that influence others

- e. Developing key skills in communications, influence and empowerment that inspire others to be their best, and
- f. Allowing the learner to have time for immersion in real life projects, tracking his/her progress, and receiving coaching and/or mentoring from peers.

The intention was to compile and use real-time data from LLL series graduates to demonstrate proven leadership education strategies for informing other engineering programs/universities, the ASEE Engineering Leadership Development Division (LEAD) and leading-edge organizations, the ASEE Corporate Member Council (CMC), Professional Engineering groups, engineering students themselves, and for the School of Engineering assessment process.

Therefore, there are several audiences for this work: The organizations that need their engineers to take an active leadership role for the benefit of the organization and the academic faculty and administrators of engineering programs, current students, engineers and other leaders in industry, particularly those represented by the Corporate Member Council of ASEE.

SURVEY DESIGN & STUDY METHODOLOGY

Note: This research was conducted under approval of the University of St. Thomas Institutional Review Board (IRB # B10-180-01).

As we began to develop this study, we prepared objectives that we wanted to achieve and identified audiences that would be interested in the results. Over the past decade, especially when students were in the courses, we have collected responses early in their learning of their perceptions of value of the leadership courses. We have published a number of papers [2,6,7,8,9,] documenting this information and have speculated on the longer-term value that alumni would get from this learning. We now wanted to verify whether our speculation, and actual results, were congruent. With objectives in hand, we drafted a series of questions to include in a survey of alumni.

The survey was designed to gather responses to questions on a Likert-scale, with space for individual open-ended responses for most questions. [30]

To test the questions, we identified six alumni and met individually with each, discussing the objectives and questions, and seeking their advice on modifications to the survey and how best to administer the survey to get maximum participation. They provided excellent recommendations which we incorporated in the survey. All then agreed to participate in a ‘pilot’ of the survey. Results were encouraging, so we decided to move ahead.

The next step was to identify email addresses for each student. This proved to be a more time-consuming process than anticipated, but eventually we collected email addresses for virtually all of the 293 alumni who had completed all three of the LLL courses.

Using Qualtrics [18], we surveyed the 293 alumni of the LLL program when the course was offered as three 1-credit courses to determine what impact this leadership learning has had on the students.

With email addresses for the alumni identified, each was sent an electronic survey with two parts (short and long) in the same survey with respondents being able to choose the level to which they wanted to participate, to collect the assessment data and evaluate for lessons learned.

During this process, we found that 57 of the email addresses were no longer valid, so the survey reached 236 alumni. Of those, we received 48 responses to the full survey for a 20.3% response rate. The data was collected via the Qualtrics application. By this paper, the results are being submitted to ASEE for publication to share with all post-secondary engineering faculty who are embarking on leadership programs in their institutions, to help them identify the most effective course elements and the expected outcomes, and with the St. Thomas School of Engineering as a component of their assessment process.

		Percent of responses to surveys sent
Total alumni	293	
Survey sent to	236	
Survey responses	48	20.3%

METHODOLOGICAL LIMITATIONS

Unlike statistically controlled survey research where an entire population or a carefully constructed proportionate sample can be surveyed, by its very nature, solicited survey data derived from voluntary participants may present a skewed picture of the issues in question by the fact that the quantitative and qualitative responses were voluntarily submitted. [31,32,33] A positive bias may be present in the data because respondents who chose to take the survey may have been more positively engaged with the issues in question than those who chose not to take the survey [34]. Nevertheless, findings from the assessed data and the evaluations derived from that assessment can significantly contribute both to policy and to decision-making going forward. The fact that this survey received responses from across the entire 13-year history of the three one-credit course sequence, not just from the earliest or more recent course participants, should add credence to the findings.

It should be noted that a further potential bias exists when assessing the optional written comments since, with the exception of three questions (Q14, Q17, Q18), only a minority of those who completed the survey took the extra time to offer one or more written comments. Perhaps students whose learning styles emphasize Reflection (a category in Kolb's *Learning Styles Inventory*) [13] were more likely to offer comments to these questions, and perhaps also were more likely to favor the separation of courses which would potentially allow for more reflection time between them. Ideally, if the data were available (no data is available since students kept their own scored profiles), it would have been valuable to see what proportion of each of Kolb learning style profile was present in the entire student population of engineers who took the course.

For most of the survey questions, participants were given the option of adding comments to support their responses. Questions 3-5 and 7-8, and 11-18 offered them the opportunity to further "Explain" or "Describe" their response. Every one of those questions received comments,

some lengthy. The percent of respondents commenting ranged from 15% to 79% of the respondents for applicable questions.

An assessment and analysis of the qualitative survey information identified meta-themes synthesized from the specific responses to questions 3-5 and 7-8, and 11-18. Then a more specific assessment of the array of responses to each of the individual questions was done. The assessment of data from question 6 was done separately.

The “Explain” and “Describe” written comments were overwhelmingly positive regarding the stated course goals, the core components of the three one-credit course sequence, and of the derived professional and personal benefits to the respondents in the time since their graduation. A sampling of those comments, question by question, will support this contention.

Question Number	Survey Question
1	Introduction to the survey
2	Do you recall taking the Leveraging Leadership for a Lifetime (LLL) courses?
3	What was your initial reaction to realizing the requirement that you take the leadership course series?
4	What is your current response to the requirement to take leadership courses?
5	The three courses were separated so that there was time for reflection between courses. How important was that reflection time in your understanding of leadership development?
6	On a 4-point Likert scale, what was the importance of the following in those courses?
	- Text and key concepts of authentic leadership
	- Reality assessment and process for seeking feedback
	- Personality and learning style assessments, and discovering their implications for working effectively with others
	- Creating a narrative of your personal leadership story and values
	- Small group discussions
	- Reflection papers
	- Instructor and classmate feedback
	- Action learning project
7	In the sequence you completed several instruments that helped you learn more about yourself, including the MBTI, Kolb Learning Styles, Strength-Finders, Emotional Intelligence, Etc. How important were the results of that learning about self to your leadership development?
8	Regarding the self-assessment instruments above, indicate the impact on you during the course. If one or more of these has had an impact in your life, please identify the instrument(s): MBTI, Kolb Learning Styles, Strengths-Finder Assessment (or equivalent), Emotional Intelligence (EQ) in Actin Profile or other (specify), and what was that impact?
9	You also completed a 360-degree instrument (Zenger-Folkman 360 Feedback Assessment; Leadership Circle 360 Assessment) that provided input on your leadership characteristics from superiors, subordinates and peers. How important were the results of that exercise to understanding of your leadership abilities?
10	You developed a leading and learning plan for continuing development of your leadership capabilities. To what degree have you put that plan into action?
11	To what degree have you applied your learning of leadership to your personal and community life?
12	Have you become a more authentic leader? Describe.
13	Have you continued your own development as a leader? Describe.
14	What aspect of this learning has had the greatest impact on your career and life? Describe.
15	Have you developed leadership attitudes and skills in colleagues and subordinates? Describe.
16	Has the LLL series, or your subsequent learning about leadership, helped you specifically lead in challenging situations? Describe.
17	What else has been happening in your life/career relative to your evolution as an authentic leader? Describe.

18	What is the most significant result of the learning you have gained by the study of becoming a more authentic leader? Describe.
19	What master's degree did you receive/
20	What year did you graduate?
21	How many years were you in the program?
22	What was your professional position/responsibility when you completed the master's degree program?
23	What is your professional position/responsibility now?
24	Please give us your name (optional)
25	Please give us your favorite email (optional)

FINDINGS & QUALITATIVE ANALYSIS

Forty-eight completed surveys were submitted. Survey respondents were given the option to add comments to questions 3-5, 7-8, and 11-18. The number of comments ranged from as few as 7 (question 11) to as many as 37 (question 14) thereby offering an enriched picture of the attitudes and sentiments of the graduates regarding the particular personal outcomes of the course series for them.

Respondents to the survey were spread over the entire duration of the course, with at least one respondent from each academic year.

Academic Years	Number of Students	Number of Alumni Responding
2004-2007	31	7
2007-2010	89	9
2010-2013	104	14
2013-2016	70	13

An assessment of the comments with a sample of quotes from each question follows.

Question 3 What was your initial reaction to realizing the requirement that you take the leadership course series?

Response	Number of Respondents
Positive	39
Negative	3
Don't recall	6
Comments	13

Two themes emerged from the comments: 1) an unsureness about the course expectations, and 2) positive excitement about the opportunity afforded with most of the comments positive about what could be gained. *“Wasn't sure about it at first.” “Not sure what to expect. It was something new that I had not done before at school or work.” “...(A)s an engineer it isn't too often that you get to work on Soft Skills”* and, *“My initial thought was positive because this was one of the main reasons I transferred from a regional state university's M.S. in Regulatory*

Affairs (to get a) Master’s program with leadership skills....” and, “I was hoping to get something out of a course where I could evolve into a senior leadership position.”

Question 4 What is your current response to the requirement to take the leadership courses?

Response	Number of Respondents
Positive	45
Negative	1
Comments	15

The survey gave the respondents the opportunity to reflect on the impact of the courses over time. They perceived that the course series had benefited them both in their personal and organizational lives. *“It challenged my view toward my career in general.” “The course helped me drive change in my organization....” “This is something that will stick with students for their entire career. While you might think that some of this will be forgotten it will always be in the back of your mind.” “A major life changer.”*

Though all respondents valued the first course, one comment was that the second and third courses were not as useful.

One person believed that the first course should be taken by undergraduate engineering students.

Question 5 The three courses were separated so that there was time for reflection between courses. How important to you was providing reflection time?

Very Important	25
Somewhat Important	18
Neutral	2
Somewhat Not Important	2
Not Important	0
Comments	13

This question offers important feedback to the School of Engineering. The aim of the original model for Leveraging Leadership for a Lifetime (LLL) course was to have three individual short courses threaded through the graduate degree program both to serve as an integrating factor for the student’s professional and personal development and as a complement to the career-specific cognitive and technical components of the graduate program. This format was particularly applicable to the original student audience of full-time employed engineering and technology professionals who were able to incorporate action learning projects into their organizational contributions. The current course presentation format, designed for a more diverse student audience and newly compressed graduate programs, consolidates the three discrete courses into a single 3-credit course (see Transition section later in the paper). The general sentiment of the original student audience of full-time employed professionals from the survey comments seems to favor the original course’s design. *“Trying to condense a leadership course is too much. You need to take parts of what you learn and apply them to life.” “Developing self takes time. (If we were to try to take these courses on top of each other (we) would not have time to apply our*

learnings before building on them.” “Not only did the separate courses allow me to track my growth, but I also found myself in various stages of confidence growing with time that allowed me to see the courses from different perspectives” and, “The time allowed me to reflect and practice what I learn. You can’t get that having them back-to-back in a row.”

But a few comments offered variant views: *“Maybe combine first and second (course) but keep the third separate.” “LLL 2 and LLL 3 were not very useful.” “The theory of them (being separated) made sense, but forcing separation made scheduling difficult.”*

Questions 7 & 8 In the sequence you completed several instruments that helped you learn more about yourself, including the MBTI, Kolb Learning Style, Strength-Finder, Emotional Intelligence, etc. How important were the results of that learning about self to your leadership development? Regarding the self-assessment instruments, indicate the impact on you during the course. If one or more of these has had an impact later in your life, please identify the instrument(s): Myers-Briggs Type Indicator (MBTI), Kolb Learning Style Inventory, Strengths-Finder Assessment (or equivalent), Emotional Intelligence (EQ) in Action Profile or other instrument, and what was that impact?

Question 7. How important were the results of learning about self to your leadership development?

Importance	Number of Responses
Extremely Important	32
Somewhat Important	13
Slightly Important	2
Not Important	0
I Don’t Recall	0

The MBTI and the EQ were noted as the most valuable assessment tools. They seemed to have tapped into fundamental components of personal and interpersonal knowledge needed to “lead” oneself and lead others. The Socratic dictum *“Know thyself”* is the foundation for a critical conceptual and supporting component of the LLL course. It is the notion that a person gains valuable insight into their potential for formal and situational leadership by seeking and gaining feedback regarding how they operationally view their world and concomitantly how they process information both about themselves and others with whom they are engaged as well as the broader environment. To that end the course offered the students the opportunity to use professionally recognized psychological assessment instruments and processes to help provide that feedback. Four tools, all rooted in the findings from differential psychology, were used during the course sequence. [35,36,37,38]. The tools are listed in Question 7 (above).

Respondents strongly supported the benefit of these feedback devices and processes. Sixty-eight percent saw those experiences as Very Important, and 28 percent as Somewhat Important. Comments indicate that in the years since taking the instruments and learning the interpretations and meanings of their scores the personal insights that were offered during the courses still positively resonate with the graduates. The MBTI, EQ, and Strengths-Finder were most often noted.

“The MBTI and Strengths-Finder helped me embrace things I thought were liabilities. I feel differently now about personality traits that I carry with me...some as strengths, and some that I need to de-emphasize.” “The MBTI had the most impact...and allowed me to corroborate my life experiences with the type of personality that’s inherent to me.” “The EQ profile gave me insight into my inner workings that I continue to work on. I think the emotional parts in a technical field help improve connections with others, and more importantly, identify when progress may not be possible in certain situations which allow me to regroup and change strategy.”

These statements are poignant. It is evident that the self-knowledge gained from the personal assessments went beyond the student. It had direct, concrete implications for leadership and management functions. Two more quote that with additional insight regarding the transferability of the knowledge gained during the course have direct implications for leading in organizations. *“MBTI, Strengths-Finder, and EQ, all three of these I was able to practice with my team, better understand and appreciate each individual’s ability and how to create a mutual win-win for each.” “The personality traits helped a great deal in managing others...approach may differ depending on personality trait.”*

Question 11. To what degree have you applied your learning of leadership to your personal and community life?

To a Large Degree	25
Somewhat	21
Very Little	1
None	0
Comments	7

Though this question generated fewest optional written responses, the following statement is insightful and again showed direct transfer of classroom learning to leadership issues at work. *“I try to spend more time (to) understand those who report to me. This allows me to not use the same management technique on everyone. I’m able to build better teams by focusing on people as individuals.” “I look for people’s learning styles and what they bring to the table.”*

Questions 12 Have you become a more authentic leader?

Yes	43
No	1
Comments	13

Question 13 Have you continued your own development as a leader?

Yes	46
No	1
Comments	13

These questions (Q12 & Q13) could have received a simple “Yes,” “No,” or “Somewhat” from the respondents. Instead, several offered some insight regarding the impact of the course long

after the program of study was complete. The respondents seemed to have sensed that to be “authentic” is not a one-time event [39,40]. Rather, a person needs continual “development” if they are to continue to be “authentic.” One graduate said: *“I have never stopped learning, practicing, making mistakes and trying new things that can help lead projects or bring others to work more effectively.”* Another saw a direct link to the insight gained from the psychological assessment during the course to their subsequent work: *“I was able to use my EQ awareness and leadership skills to help teams ‘do the right thing’ due to my improved abilities to respect and understand diverse perspectives. Kept the teams on track without being pushy.”* Two additional comments: *“I am not sure if I am a more authentic leader, but I’m more cognizant of authentic leaders.”* *“I can lead...while realizing that being a manager of people is not my core competency or ultimate desire.”* Such a statement demonstrates that a course of study can be a mirror in which a person can honestly assess their particular career orientations.

Question 14 What aspect of this learning has had the greatest impact on your career and life? Describe.

This question generated the highest number of responses, 79% of respondents. The submitted survey comments often speak beyond the particular question asked. This question gave the opportunity to make more global self-assessment statements that speak positively to the role that formal education can have in influencing careers long-term. A representative sampling follows.

“I have been told that I am very coachable, and I credit the LLL for developing me to be so.”
“Learn that leaders are rarely great at 100% of skills required.” *“Don’t spend the majority of your time to correct non-fatal flaws.”* *“I’ve become a better listener and reading of indirect signals given off when things are not always going good.”*

The following quotes exemplified both the personal and concomitant professional benefits that the course experience provided: *“This opened (the) opportunity to find yourself, (to) find out how you are in front of an individual or group...This class also made me seek corporate leadership opportunities.”* *“The experience was the catalyst (for) where I am today.”* *“Accepting feedback as a gift and listening with an open mind.”*

Questions 15 through 18 focused on the transfer of leadership skills and attitudes to aspects of the graduates’ professional lives.

Question 15 Have you developed leadership attitudes and skills in colleagues and subordinates? Describe.

Yes	32
No	3
Comments	12

This question examined a more specific aspect of leadership that focused on expanding the leadership skill base in work organizations. The notion of mentoring was prominent in many comments. Mentoring was overtly mentioned by five of the twelve respondents and implied by three others who focused on developing the next generation of employees and leaders in their organizations. *“I strongly encourage all of the managers working for me to actively mentor*

others.” *“I believe in mentoring just as I have benefited from great mentors.” “Your job as a leader is to develop others and give back to the world what others have given to you.”*

Question 16 Has the LLL series, or your subsequent learning about leadership, helped you specifically lead in challenging situations? Describe.

Yes	37
No	0
Comments	9

A few personal examples were noted. The following quote summed up responses: *“During stressful times (recessions, conflicts) I have learned that by being strong and open, people will come to you. Active listening and understanding how my personality affects others has allowed me to see through difficult issues and help others with the same issues.”* Additional reflections: *“I have always taken a personal interest in everyone I work with and put myself in their shoes before making any kind of decisions with regard to disciplinary action.”*

Finally, a poignant observation: *“I got a management position during my last year of graduate school. I have learned that you cannot copy a leader.”*

Questions 17 & 18 What else has been happening in your life/career relative to your evolution as an authentic leader? Describe. What is the most significant result of the learning you have gained by the study of becoming a more authentic leader? Describe.

These two questions generated the second-highest number of responses, 54% of survey respondents. Combined, the responses offer a robust picture of the long-term benefits of the LLL in the graduates’ professional lives. A representative sampling: *“Have an educated awareness of leadership styles of people in prominent local and national roles, both deemed positive and not.” “I took the first course in 2009; gone through many career changes...the courses really prepared me to become an authentic leader.” “I took on management as a full-time career after graduation.” “Became a manager in the second year after my master’s degree.” “I have accomplished everything on my personal development plan”* (referring to a task component of the course).

Finally, a realistic assessment about the nature of leadership in any organization: *“Leading people into challenging areas requires a vast amount of interpersonal skill and good leadership. Not everyone wants to change to benefit the greater good.”*

Question 6 On a 4-point Likert scale, what was the importance of the following in those courses?

	Very Important	Somewhat Important	Very Little	None
Personality and learning style assessments, and discovering their implications for working effectively with others	38	8		
Reality assessment and process for seeking feedback	33	14		
Instructor and classmate feedback	31	13	3	
Creating a narrative of your personal leadership story and values	29	14	2	2
Text and key concepts of authentic leadership	29	17		1
Small group discussions	27	16	3	1

Action learning project	25	17	4	1
Reflection papers	24	21	2	

Question 6 asked students to rank-order the perceived benefits of the tools used to promote learning across the three LLL courses. Those designated Very Important and Somewhat Important showed a clear preference for the assessment/feedback components. The assessment tools received the highest rating followed closely by formal feedback processes and in-class instructor [17] and classmate feedback. The action learning project was next followed by the reflection papers requirement.

Question 19 What master’s degree did you receive?

MSTM Master of Science in Technology Management	26
MSMS Master of Science in Manufacturing Systems	7
MMSE Master of Manufacturing Systems Engineering	10

The significance of this response lies in that the LLL series of leadership courses were *required* only for the MSTM degree program. It was an elective in other programs. As with the subsequent 3-credit course, the LLL series appeared to draw students intrinsically motivated to learn about themselves and build their leadership, independent of their degree program requirements. This motivation is echoed in a number of survey respondent comments, recognizing the value of developing their ‘soft skills’ and of broadening their skill set for their career potential in leadership roles. After being in the work force for a while, these adult learners sought out an opportunity to supplement and complement their technical training and experience with a course focused more on the personal and people skills so important to effectiveness and success.

TRANSITION TO A 3-CREDIT COURSE

In 2016, the 3-course LLL series was enriched and consolidated into a single 3-credit course, ENGINEERING LEADERSHIP, to accommodate a growing proportion of graduate students needing to complete their graduate program within a less extended timeframe. The single 3-credit course addresses two considerations: 1) the shift in student composition to more graduate students in engineering entering directly after completing their bachelor program, and as full-time students who are on campus for a shorter period of time, particularly more international students, and 2) student navigation of recently condensed graduate degree programs into fewer courses. Details of this course go beyond the scope of this study but results over the past few years show a remarkably similar response as those to the three one-credit courses.

While sacrificing the opportunity in the LLL series for the ‘steeping effect’ of applied learning over an extended time, the new course augmented and expanded the core content and learning processes of the original three course format. Student evaluation of the new course mirrors and reinforces the findings reflected in the LLL alumni survey discussed in this article. Students have quantitatively rated the value of the 3-credit engineering leadership course very highly in terms of its overall value, benefit to their career, and benefit to their professional effectiveness. Though often not knowing what to expect in coming into the course, qualitative feedback consistently includes statements to the effect that it is the best course the student has ever had. Like alumni of the LLL series, the most valued course components cited by students have been

the assessments, peer and instructor feedback, and structured small group discussions focused on their applied learning. It is not just the structure of the course, but more the essence of the content that so impressed more recent students and graduates.

These positive impressions of benefit and value appear to be stable and enduring, as evidenced in the findings discussed in this article from the course alumni years later in their career. The longevity of learning and course impact are often an unknown in academia. The findings of this study suggest that leadership development can be meaningfully facilitated among engineering and technology graduate students through a graduate program course, setting the trajectory for subsequent growth and enduring benefit.

CONCLUSION & SUMMARY

As noted in the abstract, the objective of this survey was to determine whether this leadership development has been of value to the students both during the course and in the years after completing the course and, if so, how? The responses of alumni suggest that the answer to whether the leadership development course has been of value to the students is clearly yes. The key values seem to be:

1. The importance of learning about self through assessment instruments to identify who their authentic self actually is. Most important were MBTI, EQ and the 360-degree instrument.
2. The vast majority of alumni have applied their leadership learning to not only their professional lives, but also to their personal and community lives as well.
3. Virtually all of the alumni see themselves as authentic leaders and have continued their own development as leaders, clearly demonstrating they are lifelong learners.
4. The majority of alumni have also developed leadership skills in colleagues and subordinates and have taken an active role in mentoring.
5. Learning about leadership has helped alumni specifically lead in challenging situations.
6. While reflection was identified as a plus during the course, it is clear that alumni have developed the habit of continuing to reflect and to grow.
7. Perhaps the most significant result of their leadership learning has been to become more authentic leaders.

Future Work

This study suggests that there are several possible areas for future research, including:

1. Additional studies of the long-term impact on individual students from engineering leadership development training, particularly in undergraduate students.
2. A more detailed comparison of individual alumni responses to their responses as students.
3. A study of the impact of instructor style and methods on the effectiveness of leadership development.
4. A study of how inclusion, diversity, and equity are addressed in engineering leadership development courses.
5. Going forward, collect student profiles of the LSI, MBTI, and EQ and correlate with which graduates move into formal leadership positions and which do not. The comparative data could:

- 1) be a useful predictor for manager selection by engineering organizations,
- 2) be valuable information for students and graduates in their career development and planning,
- 3) add to the respective research literatures of the LSI, MBTI, and EQ assessment instruments.

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