ALAN BLIZZARD AWARD

Application Form

SECTION 1—General Information	
Descriptive title of the project:	**Curricular and Co-curricular Leadership Learning for Engineering Students**
Period of implementation:	**2007-present**
Contact person for the group:	**Doug Reeve**
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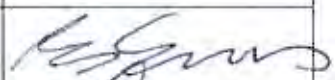
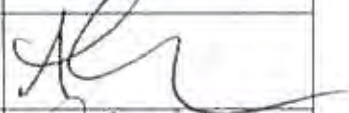
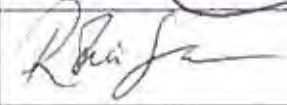
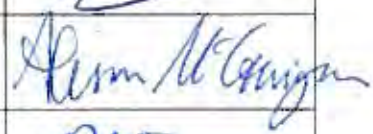
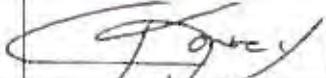
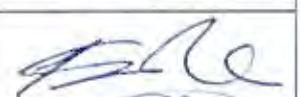
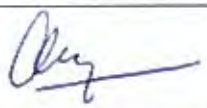
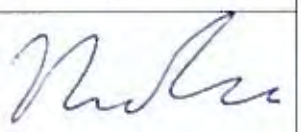
Date of Application:	**March 14, 2014**

SECTION 1—Continued

Add the name, affiliation, and academic status of each member of your teaching group. Attach additional page(s) if required.

Name	Academic Status	Unit/Department Institution	Signature
Doug Reeve	Professor/Director	Chemical Engineering and Applied Chemistry / Institute for Leadership Education in Engineering, Faculty of Applied Science and Engineering (ILead)	
Greg Evans	Professor / Associate Director	Chemical Engineering and Applied Chemistry / ILead	
Annie Simpson	Assistant Director	ILead	
Robin Sacks	Assistant Professor	Chemical Engineering and Applied Chemistry / ILead	
David Colcleugh	Leadership Development Professor	Faculty of Applied Science and Engineering / ILead	
Estelle Oliva-Fisher	Leadership Education Specialist	ILead	
Cindy Rottmann	Research Associate	ILead	
Alison McGuigan	Assistant Professor	Chemical Engineering and Applied Chemistry	
Patricia Sheridan	Graduate Student	Chemical Engineering and Applied Chemistry / ILead	
Cecilia Konney	Summer Program Assistant (2012-)	Chemical Engineering and Applied Chemistry	
Deborah Peart	Summer Program Assistant (up to 2012)	Chemical Engineering and Applied Chemistry	
Kristina Minnella	Leadership Education Specialist (2012-2013)	ILead	
Brian Tran	Teaching and Learning Program Assistant (2010-2012)	ILead	

Amy Huynh	Teaching and Learning Program Assistant (2013-)	ILead	
Nick Evans & Wayne Stark	Lecturers (2009-)	Executive Coach, Principal, Dialogue*C / Management Consultant & Founding Partner, Pursuit Development Labs	

From left: Doug Reeve, Annie Simpson, Cindy Rottmann, Greg Evans, Estelle Oliva-Fisher, Amy Huynh, Brian Tran, Kristina Minnella.

Inset: Robin Sacks, Patricia Sheridan, David Colcleugh, Nick Evans, Deborah Peart

SECTION 2—Statement describing the precise nature and features of the collaboration among team members (maximum 300 words)

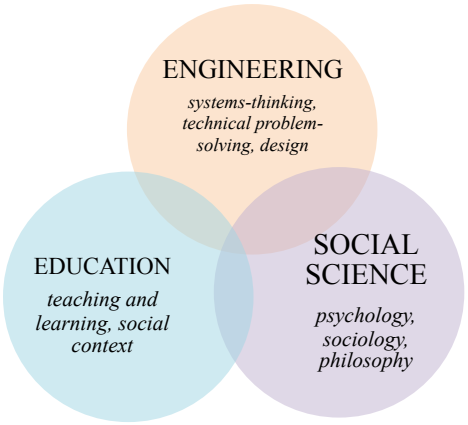
The Nature and Features of Collaboration

A foundation of collaboration: Our multidisciplinary team of education specialists, engineers and social scientists is dedicated to bringing leadership learning opportunities to engineering students. This collaboration is rooted in a shared passion for student development, leadership learning, innovative teaching methods, and the positive impact that engineers are positioned to have in the world. Design and implementation of this program brought together a team with diverse experiences and perspectives:

- Engineering: Reeve, Evans, Colcleugh, McGuigan and Sheridan
- Education and Social Science: Simpson, Sacks, Oliva-Fisher, Rottmann, Minella
- Student Life: Oliva-Fisher, Minella, Peart and Kooney
- Corporate: Colcleugh, Evans, Stark, Reeve and our Board of Advisors
- Research: Evans, Sacks, Rottmann and Sheridan
- Academic Administration: Reeve and Evans

A collaboration that takes many forms:
Most members of the ILead team have met bi-weekly since 2007 and many share an office. All elements of our programming have a collaborative nature. Our four co-curricular certificates, six leadership infusion lectures and our summer program are all collaboratively designed and delivered , and our research projects inform the development of our future programming.

The multi-disciplinary nature of our team has enriched the program design.
For example, members' expertise in counseling, psychology, experiential learning design and arts-based pedagogy brings a focus on personal growth that helped to shape our certificate programs. The engineering perspective brings a focus on systems-thinking and efficiency that helped scale up instruction to enable leadership education in large classrooms. The research perspective brings a focus on evidence and data that helped us to undertake studies to expand knowledge in this emerging field. The academic administrative experience helps us recruit buy-in across our Faculty and beyond. The leadership experience from the professional world (Colcleugh and Reeve) shaped one of the courses, and better identified competencies that contribute to student career success.



Section 3—Abstract of the Project Suitable for Publicity Purposes (maximum 500 words)

Abstract

It is our belief that leadership education will enable engineering graduates to contribute more effectively in the workplace and society through innovation and positive social change, yet few Canadian Faculties of Engineering formalize leadership education for their undergraduate or graduate students. The initiative we highlight in this proposal is a collaborative project blending curricular and co-curricular programming, research and outreach to support the development of engineering leaders. Our collaboration in design, implementation, and assessment has been formalized as the Institute for Leadership Education in Engineering (ILead), founded in 2010.

ILead currently offers the only comprehensive leadership development program for engineering students in Canada. This program has been designed by a team with backgrounds in engineering, education, psychology, and industry, drawing on the work of seminal theorists such as Susan Komives (the Social Change Model), Daniel Goleman, Dan Seigel, Kouzes and Posner (emotional intelligence), and David Colcleugh (organizational development and change). The program offers a range of optional educational experiences using diverse pedagogy. The learning experiences include academic courses, co-curricular certificate programs, guest lectures in courses and numerous seminars, workshops, and panel discussions. Delivery methods range from PowerPoint lectures in very large classes, to intimate arts-based experiential workshops in small groups. The content covers four realms of leadership: self, team, organization, and society.

We use various types of assessments to evaluate the effectiveness of delivery, understanding of the nature of leadership, and development of specific leadership competencies. These methods have included anonymous feedback forms after events, pre- and post surveys of student cohorts, evaluations of courses, and student testimonials. These assessments have provided evidence that students are learning, that they value this learning and that our collaborative initiative is enabling significant personal growth.

In summary, our collaboration has enabled the creation of an innovative program that is at the forefront of engineering education in Canada. The program is breaking new ground: it has produced a new Certificate in Engineering Leadership, the first of its kind in Canada. Other Canadian engineering programs are now also introducing their own leadership learning opportunities. Further, ILead has enjoyed impressive growth in terms of its offerings and student participation. Finally, the instructional methods have been found to be effective and to enhance learning. Thus we feel we have achieved our goal by creating an educational program that has enhanced the effectiveness of leadership learning within engineering.

Section 4—Project Description (Maximum 5000 Words)

Institutional and Academic Context

Expectations for Engineering Education are Changing.
Societal expectations for the contributions of engineers are changing, which is driving a transformation in engineering education. Engineering programs must meet the broader criteria set down by the Canadian Engineering Accreditation Board in 2008, including "an ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting" (Engineers Canada 2008). The Ontario government has also established Under-Graduate Degree-level Expectations which have been translated by the University of Toronto Faculty of Applied Science and Engineering as: "…an education that will allow them to be leaders in society in developing solutions to the most pressing problems".

Our Response: A short history of our program.
Our own work on engineering leadership education has its origins in a summer program that began in the Department of Chemical Engineering and Applied Chemistry in 2002 called 'Leaders of Tomorrow.' At this time leadership learning was acquired implicitly, if at all, as there was no targeted instruction. Over time the program expanded to the full year and to include graduate students. In 2006 we won $1 million funding over five years from the University Provost to create leadership programming across the Faculty that:

> "…strengthens the experience of engineering students by providing coherent, structured and intentional learning opportunities to enhance their leadership development."

The vision for the program, known as Engineering Leaders of Tomorrow (LOT) was:
An engineering education that is a lifelong foundation for transformational leaders and outstanding citizens

In 2009 our Dean created the Task Force on Engineering Leadership Education to assess progress in leadership education within LOT and beyond. In 2010 the Task Force recommended the creation of the "Institute for Leadership Education in Engineering" (ILead) establishing an institute that would be:

> "the first of its kind in the Canadian engineering landscape offering curricular, co-curricular and extra-curricular leadership education.…. empowering engineering students to succeed as leaders in their profession and beyond."

The vision statement for ILead was established as: *Engineers leading change to build a better world*.

Goals of the Project

Engineers are uniquely positioned to create innovative solutions to many local and global challenges. Leadership skills complement technical capabilities and enhance translation of those capabilities into work that benefits society. The overall goal of our project was to create an educational program to enhance the effectiveness of leadership learning within engineering so that engineers would be better positioned to lead positive change in society.

Our program has been influenced by three bodies of literature: social change theory (Komives); leadership theories (Goleman, Bennis, Kouzes and Posner) and models emphasizing organizational development and change (Colcleugh). Our collaborative team brought together an awareness of the varied roles that engineers could and should play and integrated this with novel pedagogical approaches. We identified four leadership domains: self-leadership, leading teams, leading organizations, and leading in society (citizenship). Underlying the development of this framework was a belief that:

> ***Leadership is a process that begins with self and inspires and empowers others, teams and organizations to effect positive change.***

Our strategic planning team (Reeve, Evans, Simpson, Sacks) collaborated to identify beliefs and overarching goals associated with each of these four domains of leadership (Table1). Learning objectives were then identified within specific instructional components (e.g. courses) to help students develop towards the ideals articulate by these goals.

Table 1: A High-level Framework for Instruction of Leadership

LEADERSHIP DOMAINS	BELIEFS	OVERARCHING GOALS
SOCIETY	Grand challenges demand leadership from great engineers	Be an agent of change; leverage your engineering expertise to create positive impact.
ORGANIZATION	Leadership is a process, not just a position	Optimize your value to an organization by reading and shaping its currents and culture; focus your talents and passions, and those of others to contribute to its success.
TEAM	The whole can be greater than the sum of its parts	Use your strengths and catalyze the strengths of others to maximize creativity and impact.
SELF	Leadership begins with the self	Dream, learn, do and be daring; bring your best self to all that you do.

Additional core beliefs informed our philosophy of leadership:

1. **Leadership starts with the self**: Self-awareness is a necessary foundation for effective leadership. Students must be aware of their strengths, their communication style, their personal values and work to develop greater congruence between values and actions.

2. **Leadership is a process, not just a position**: Leadership happens in the context of teams and groups; it is a relational process. People work together to achieve a common goal. Therefore, leaders need to learn how to engage with people.

3. **Everyone has the potential to be a leader**: We recognize, and value, many different leadership styles (Bolton and Bolton) and work to empower the natural abilities of each student.

4. **Leadership is a shared responsibility**: Leadership is not the responsibility of one individual. We all have a responsibility to offer our best and to engage in the work of leadership.

5. **Leadership empowers engineers**: Engineers are involved in generating solutions to the worlds' most pressing problems (climate change, clean energy, water, sustainable development). Leadership skills compliment their technical education and better position engineers to create positive change.

This philosophy led us to our actionable mission statement:

> *To develop curricular, co-curricular, and extra-curricular programming for leadership education for undergraduate and graduate students in engineering; to conduct research on the pedagogy of leadership education in engineering; to conduct research on leadership practice in engineering-intensive enterprises; and to reach out to others to develop a community of practice dedicated to advancing engineering leadership.*

Project Design

Collaboration produced a program with multiple types of educational experiences so as to increase the effectiveness of students' learning.

Our program was designed around high-level frameworks. The frameworks for instructional delivery included elements of conceptual, experiential and reflective learning, producing a variety of teaching pedagogies. Led by the members of the team with an education background (Simpson, Sacks, Oliva-Fisher, Rottmann, Minnella), curriculum was collaboratively designed to include active skill development and intentional reflection activities. As expressed by Kolb's experiential learning theory, learning should not just involve cognition, but the full range of thinking, feeling, perceiving and behaving (Kolb, 1984). Efforts are made to engage students mentally, emotionally and kinesthetically in their learning.

The program was designed with three levels of student engagement in mind (Table 2). Basic level programming provides all students with an appreciation of the nature and value of leadership. Mid-level programming offers students opportunities to exercise newfound skills. Highly engaged students can pursue their leadership education at an enhanced level.

Table 2: Examples of Program Components Addressing Different Levels of Student Engagement

Basic Level	Mid Level	Enhanced Level
• Curriculum Infusion Lectures • Individual Lectures, Seminars or Workshops	• Summer Programs • Certificate Programs • Student Working Groups • High-intensity Retreats	• Courses • Research studies

Program Implementation

The ILead engineering leadership education program that has emerged from this collaboration now offers engineering students intentional, structured, and meaningful leadership development programming that integrates leadership theory and application. The program is unique in Canada, and globally, in that it integrates leadership development through curricular, co-curricular, and extra-curricular facets of engineering student experience. In addition to the instructional and experiential elements, the program also uses recognition, certificates, awards, and scholarships to increase the value placed on leadership, and to thereby inspire leadership involvement and initiatives throughout the Engineering Faculty. The sections that follow describe instructional components included in our current leadership program. The substantial program growth, indicative of increased student engagement in leadership learning, should be noted.

BASIC LEVEL OF ENGAGEMENT:

The Curriculum Infusion Initiative

In 2008 we launched a curriculum-infusion initiative with two objectives: First, to provide all engineering students with a basic understanding and awareness of the nature of leadership; the design of these lectures was a collaborative effort between the engineers and the leadership educators (Evans, Simpson) that took place over several months. A second objective was to motivate some students to pursue a higher level of engagement through participation in other components of the program. Six lectures are presented as one-hour guest-lectures within existing engineering courses. The goal of these six lectures is to provide every undergraduate engineering student with a foundation for ongoing learning while at university and after graduation. A table in the Additional Documentation outlines the topics and learning objectives of these six lectures.

The lectures consist of PowerPoint presentations combined with personal, in-class learning activities. Thinking frameworks simplifying abstract concepts are a common element. The frameworks are presented as figures since engineering students have a preference for visual learning (Felder and Brent 2005). These learning frameworks provide the students with a foundation for thinking about different aspects of leadership that can be used for structured reflection so as to promote continued leadership learning. The use of assessment inventories and tools allows active personalized learning even in large classrooms.

First year engineering students receive leadership lecture delivered by Reeve (2012)

Delivery of lectures is a format that many students are comfortable and familiar with and allows us to reach the "typical" engineering student who might not see value in participating in any of the optional curricular and co-curricular components of a leadership program. The packaged format also makes these lectures easily transferable to multiple instructors and has allowed us to collaborate on delivery. It also allows easy transfer in response to requests from other universities.

Since 2008, we have delivered over 100 lectures reaching over 10,000 students in class sizes ranging from 15 to 700. Anonymous feedback solicited from the students after each lecture (presented in the next section of this report) indicate that in general the lectures achieve the overall objectives of increasing awareness of the value of leadership and interest in pursuing further leadership development.

MID-LEVEL ENGAGEMENT:

Departmental Leadership Learning Groups

To create a culture of leadership and a sense of community for students, student leadership groups have been formed in all departments and divisions across the Faculty. The intention of the department programs is to give students opportunities to practice their leadership. With guidance from appointed faculty and staff members, students generate ideas for events and together turn those ideas into reality. Through this venue students build community, engage with alumni and gain hands-on leadership experience by taking their ideas and turning them into action. The range of programming includes research, panel discussions with industry leaders, personal development workshops, political debates, professional development sessions, and alumni networking. Approximately 100 students participate as working group members each year. The events they organize, along with the seminars, workshops and other "one-off" events offered across the Faculty, attract thousands of student participants each year.

Summer Program

As ILead continues to grow, more programming is being offered throughout the summer months. The most comprehensive summer leadership learning opportunity is offered to students in the Department of Chemical Engineering and Applied Chemistry, where our program took root. Since the summer of 2002 more than 450 students have participated in this 14-week program.

Sessions are held on Friday afternoons from May through August. Students who attend 80% of the workshops receive a non-credit certificate.

Konney (left-most) with students of the summer leadership program, co-developed by the Department of Chemical Engineering and Applied Chemistry and ILead (2012).

Over time the team members involved (Reeve, Simpson, Oliva-Fisher, Peart, McGuigan, Konney) have worked together to enrich and deepen the content. Each year members of the team revisit the learning objectives and infuse fresh content and/or fresh instructors into the program. Since the summer of 2007, the program has had three segments: 1) 'Personal Development' - emphasizing the importance of self-awareness to effective leadership; 2) 'Group Leadership' - the skills that are needed to contribute to, and lead, teams; and 3) 'Leadership in Society,' promoting the notion of engineers as active citizens and change agents in the world. Examples of subjects covered over the last few years are given in the Additional Documentation. As well as seminars, speakers and workshops, students participate in design/research project teams, attend tours of industry facilities and engage in community service activities. Planning and execution of the program is very much a collaborative effort.

Certificate Programs and One-day Intensives

Another highly collaborative element of our program has been the design and delivery of our co-curricular certificate programs, offered during the Fall and Winter terms. ILead delivers these mainly through two-hour workshops over four or five weeks or through "intensive" certificate programs offered, for instance in a one-day session. Students who complete a certificate program will receive a printed certificate and a notation in their Co-curricular Record in recognition of their participation. Students also benefit by joining a vibrant and supportive community of leadership-minded engineering students.

Curriculum has been developed and delivered through a highly collaborative effort mainly by the leadership education specialists within the team (Simpson, Oliva-Fisher, Minnella). In some cases development and delivery has had assistance from student life leadership professionals. As the learning is highly experiential and so logistics are often complex, the contribution of the program assistants is critical to its success (Tran, Huynh).

Presently there are four certificate programs that are regularly offered; detailed descriptions provided to prospective students are on our website and reproduced in the Additional Documentation section:

Learning to Lead: Emerging Leaders – (Level 1) For students interested in getting more involved on campus in a learning community and/or applying for peer mentorship or leadership positions on campus.

Team Skills – (Level 2) For students interested in knowing how to build strong teams for group projects and industry experience.

Leading from the Inside Out – (Level 3) For students who want to discover the power of self-leadership.

Organizational Leadership - For students who hold or aspire to hold leadership positions in a student club or organization.

Since inception of the certificate programs there have been 20 offerings and a total enrolment of 731 students. Annual participation has increased continuously from 40 in 2008-09 to 261 in 2013-14.

Table 3: Evolution in Co-curricular Certificate Offerings and Participation

Year	Number of Offerings	Number Attendees
2008-2009	1	40
2009-2010	3	95
2010-2011	2	62
2011-2012	4	133
2012-2013	5	185
2013-2014	5	216

Examples of print posters to promote ILead programming (2013-2014)

Simpson and Oliva-Fisher with recipients of our Organizational Leadership Certificate (2011).

ENHANCED-LEVEL ENGAGEMENT:

Leadership in Elective Courses and in the Core Curriculum

The first for-credit course on leadership was offered in the Fall of 2007 to a mixed class of undergraduate and graduate students, - APS501 "Leadership and Leading for Groups and Organizations." The principle instructor was one of our team, Dr. David Colcleugh, former CEO of Dupont Asia Pacific and then Dupont Canada, who had ample expertise in engineering and corporate leadership but had never taught a course. A collaborative effort was mounted to provide the needed complimentary expertise in engineering education and experiential learning (Colcleugh, Simpson, Reeve). At the end of each lecture (Colcleugh), an experiential learning exercise was facilitated (Simpson) to offer students a more impactful development opportunity. The course was a great success, necessitating an application procedure to constrain and optimize enrolment.

The course was based on the principles of leadership developed at Dupont Canada over a twenty-year period: leadership is a process; leadership can be learned; leaders must always be learning and everyone can be leader. The course has evolved since that time and in 2012 was split into separate graduate and undergraduate courses, APS1501 and APS443 respectively, in order to accommodate growing demand.

A strong collaboration continues between the principal instructors of the two courses (Colcleugh for 1501 and Reeve for 443). The core material continues to be the Dupont leadership philosophy and practice. Similar teaching methodologies are used in both courses. It is noteworthy that out of the "laboratory" of these courses a textbook has emerged. "Everyone a Leader - A Guide to Leading High-Performance Organizations for Engineers and Scientists" (authored by D. Colcleugh) has just been published by University of Toronto Press/Rotman (Colcleugh 2013).

Several other courses have been developed by other principal instructors, each course playing a key role in achieving the overarching goals of the program and emerging from our shared vision and values:

- Cognitive and Psychological Foundations of Effective Leadership (for undergraduate and graduate students) (Taught by Dr. Robin Sacks)
- Positive Psychology for Engineers (for undergraduate and graduate students) (Taught by Dr. Robin Sacks)
- Concepts and Applications of Authentic Leadership (for graduate students) (Taught by Wayne Stark and Nick Evans)

Reeve and Colcleugh (not pictured) work together to bring business leaders to a co-instructed class to share their leadership experiences with students (2013).

In 2014-15 we will deliver two new courses:

- Engineering Presentations
- The Power of Story: Discovering your Leadership Narrative

The leadership courses are becoming an integral part of the Faculty programming. The graduate courses are part of a special certificate program for the course-based Master of Engineering (MEng) students called the ELITE Certificate (Engineering Leadership Innovation Technology and Entrepreneurship). The undergrad courses are approved electives for the Faculty's extremely popular Business Minor and, beginning in September 2014, will be approved electives for a new Certificate in Engineering Leadership – the first of its kind in Canada. Demand has been strong and enrolment has increased in each academic year. To date we have had over 800 students enrolled in the leadership courses.

Table 4: Evolution in Course Offerings and Enrolment

Year	Number of Courses Offered	Number of Students
2007-2008	1	40*
2008-2009	1	40*
2009-2010	3	100*
2010-2011	3	100*
2011-2012	5	167
2012-2013	5	183
2013-2014	6	241
2014-2015	10	420*

* = estimated

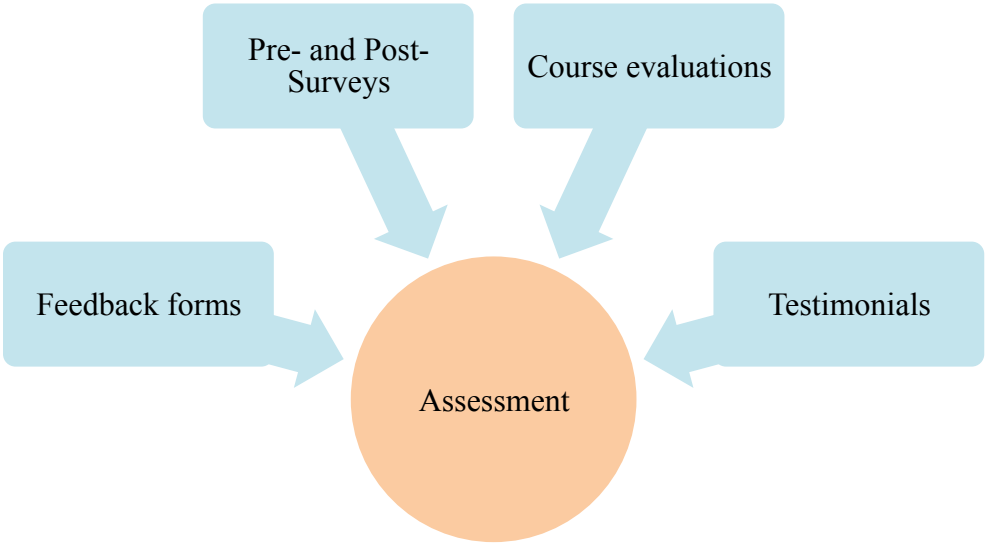
Engineering Leadership Research Projects

Three of us (Evans, Reeve and Sheridan) have been collaborating closely on increasing team skills learning opportunities for undergraduates, especially in large classes, by developing an on-line tool for self- and peer-evaluation of individual performance in a team. The tool is part of an on-line learning system that provides a student with remedial on-line learning to facilitate improvement of performance. This is the output of a PhD research project (Sheridan) funded by The Higher Education Quality Council of Ontario (HEQCO) (Sheridan et. al. 2012, 2013 and 2014). The tool is being tested as a mechanism to enable leadership learning in our large first year design courses that involve over 1200 students. The tool is being used in CHE230, Environmental Chemistry taught by Evans. Here the tool and the associated "team effectiveness framework" was found to enhance leadership learning in this core technical course with 180 students (Evans et. al. 2010 and 2013). Finally, the tool has been used in one of the leadership courses (443) (Sheridan is the Teaching Assistant (TA)).

In a separate research project, three of us (Reeve, Sacks, and Rottmann) have been collaborating to discover: how engineers lead in the workplace; what skills and behaviours are important to successful leadership, and where they learned those skills and behaviours. Our ultimate objective is to use this information to create evidenced-based curriculum. This work is already informing some courses and has been submitted for publication (Rottmann, Sacks & Reeve, 2014).

Impact on Student Learning

We have a thorough and multi-faceted approach to assessment, which includes both qualitative and quantitate measures. For example, pre- and post- surveys are used to evaluate leadership learning in our co-curricular certificates. Course evaluations and feedback forms show that we are consistently measured above the Faculty average. Impromptu testimonials – including personalized emails, letters written to the Dean and thank you notes from our students and alumni - demonstrate our lasting positive impact on student learning.



BASIC LEVEL ENGAGEMENT (Leadership lectures and individual events/workshops)

For our basic level programming, which includes leadership lectures and individual events, it appears that we are successfully engaging students and contributing to a greater level of interest in leadership education.

Table 5: Evolution in Basic Level Program Participation

Year	Number of Events	Number of Attendees
2007-2008	142	4000
2008-2009	191	8300
2009-2010	251	7600
2010-2011	288	8000

The program enjoyed such phenomenal growth in the first years of Faculty-wide activity that demand soon exceeded our capacity to deliver. This initial growth was a clear indicator that we had substantially increased student engagement in leadership education. In 2011 we recognized we had reached a ceiling in terms of numbers of students participating and began to focus on deeper measurements of engagement and learning. Since 2011 we have continued to enjoy high demand for access to our courses and certificates; applications for both have usually significantly exceeded the number of places available.

Leadership Infusion Lectures:

At the end of each infusion lecture, students were asked to complete a brief feedback form. In the first part of this questionnaire, students were asked to answer five questions. These questions primarily measured interest in leadership learning by students who did not self-select to participate in any leadership learning— a sample of the masses. For example, the difference between the responses on the first two questions indicated a strong growth in interest in leadership learning as a result of the lecture, In open ended questions, students also described what they learnt from the lecture. These were scored and compared, usually very favourably, against the intended learning outcomes.

Table 6: Feedback from Infusion Lecture to First-Year Engineering Students (Fall 2013)

Question	Average Value
Your interest in learning about leadership before the lecture was	3.8
Your interest in learning about leadership after the lecture was	5.0
The effectiveness of the learning experience was	4.7
The value of the learning experience was	5.0
The relevance of the lecture to your professional development is	5.2

Likert scale of 1 = Very Low, 7 = Very High; n = 213

Assessment evidence shows that students learned what was intended.

For all of our certificate programs and for our summer program we distribute pre and post surveys, based on intended learning outcomes, to measure student learning. These assessments focused on evaluating student perception of their increased understanding and development of specific leadership competencies.

Certificate programs

Pre- and post-surveys of the students who participated in the certificate programs consistently reveal impressive individual personal growth. As an example, data from two of the recent certificate programs are given below. What is notable is that in every case (each question asked) there was an increase.

Table 7: Pre- and Post- Surveys from the Team Skills Certificate Program - 5-Week Program (Fall 2013)

Question	Pre Averages	Post Averages	Increase
Q1: I feel confident in my ability to contribute leadership skills to a team	4.3	5.87	1.6
Q2: I have a clear sense of the strengths that I bring to a team	4.04	5.6	1.6
Q3: I am familiar with techniques that I can use to resolve conflict	3.87	5.27	1.4
Q4: I am confident in my ability to facilitate a group/meeting	4.07	5.73	1.7
Q5: I am quick to recognize the strengths of other group members when in a team	4.35	5.6	1.3
Q6: I am a skilled active listener	5.09	5.73	0.6
Q7: I am aware of how to create an inclusive team where all members despite gender, language, culture, physical ability, sexual preference - are valued for their viewpoints	4.48	6.07	1.6
Q8. I consider myself a leader	4.04	5.67	1.6
		Average Increase	1.4

Likert scale of 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree; n = 23

Table 8: Pre- and Post- Surveys from the Organizational Leadership Certificate Program – 5-Week Program (Fall 2013)

Question	Pre Averages	Post Averages	Increase
Q1: I can identify the various facets of organizational leadership	4.5	6.4	1.9
Q2: I can explain the relationship between my personal vision and values and those of my organization	5.0	6.4	1.4
Q3: I employ tools to uncover the deeper motivations and values of others	4.5	5.9	1.5
Q4: I implement tools to effectively facilitate meetings and/or processes within a diverse group	4.8	6.1	1.2
Q5: I provide constructive and empowering feedback to my teammates	5.4	6.4	1.0
Q6: I communicate clear expectations to my teammates	5.4	6.2	0.8
Q7: I recognize how I can help develop individual members who have differing strengths	5.3	6.4	1.1
Q8: I can identify tools for recognizing and rewarding team members	4.7	6.1	1.4
Q9: I can describe the importance of encouraging and enabling individual team member's goals	5.2	6.4	1.2
Q10: I consider myself a leader	5.1	6.1	1.0
		Average Increase	1.2

Likert scale of 1 = Strongly Disagree, 4 = Neutral, 7 = Strongly Agree; n = 33

Leadership Courses:

The leadership courses were also very well received, as indicated by the course teaching evaluations. These confidential surveys consist of ~30 questions. A summary of the responses to five key questions is provided for three courses taught in the Fall of 2013 in the additional documents section. Students consistently rate the quality of their experience as superior to the faculty average. These assessments also indicated that the students valued these learning experiences and recognized the learning as being important to their professional development. Deeper assessments of learning outcomes are also used in the courses, including essays, presentations and exam questions. For example in APS1010 and APS442, assignments follow an iterative process with formative feedback at each step. Students are permitted as many iterations as is necessary, guided by the professor, until they have not only gained the intended level of personal insight but also a new understanding of his/her personal preferences and methods of self-inquiry and reflection.

Feedback from Alumni:

The greatest impact of our program will be seen years after our students graduate through the positive impact that they will have on society locally, nationally, and globally. In addition to the

frequent testimonials, emails and letters (see additional documentation) that we receive, we actively track our alumni so that we can evaluate this impact. In a recent survey of alumni indicated that they felt that learning from our program had made them more effective at work and better engineers.

Table 9: Feedback from Alumni

Question	Average Value
My experiences at Leaders of Tomorrow/ILead have made me more effective in my work.	6.0
My experiences at Leaders of Tomorrow/ILead have made me more self-aware.	6.5
My experiences at Leaders of Tomorrow/ILead have made me a better team player.	6.3
My experiences at Leaders of Tomorrow/ILead have increased my commitment to leadership development.	6.3
My experiences at Leaders of Tomorrow/ILead have made me a better engineer.	6.0

Likert scale of 1 = Strongly Disagree, 7 = Strongly Agree, n = 15

Other Measures of Success

In recent years we have placed increased emphasis on engineering leadership related research. Collaborative pursuit of this research has brought together expertise within our team in engineering, education and leadership. This fusion has created interesting "hybrid" research strategies. For example our study of team effectiveness has integrated elements of engineering design with 360^0 assessments, with the impact assessed with mixed methods. One measure of our success in regards to research is the growing number of papers we have produced. A second is the number of presentations at the American Society for Engineering Education (ASEE) and Canadian Engineering Education Association (CEEA) annual conferences (see bibliography). These metrics provide a measure of our impact on the scholarship of teaching and learning relating to engineering education.

A second measure is the extent to which our program is attracting other Canadian universities and having influence beyond UofT. Colleagues at McMaster, Western, Ecole Polytechnique, and Calgary have contacted us about our experiences with engineering leadership education. Last summer, we used these experiences to organize a day-long symposium on engineering leadership including18 presentations from Canadian and American universities as part of the annual CEEA conference. We supplemented this coordinating role by offering a three hour leadership education workshop to ~35 engineering department chairs, faculty and staff from Canadian universities. This workshop drew heavily on our collaboratively developed pedagogy.

A third measure is our growing international profile. We are the only Canadian member of the recently formed Community of Practice for Leadership Education for Twenty-first-century Engineers (COMPLETE). This influential network of engineering educators meets two to three times each year to share resources, research and examples of best practice related to engineering leadership education. . The community involves major engineering schools with engineering

leadership programs in the US including MIT, Northeastern, Northwestern, UC San Diego, and Penn State. In the fall of 2012, we hosted the first meeting held outside of the United States.

Future Developments

In the coming years we plan to increase elective curricular offerings for both undergraduate and graduate students to accommodate growing demand. We also plan to influence core curricular programming by refining our on-line team-effectiveness inventory in a larger number of mandatory design courses. We believe that this evidence-based tool will be of interest to other engineering schools. Finally, we aim to extend our mixed-methods study of engineering leadership in the work place through a survey, the development of exemplary engineering leadership profiles and a case study book of engineering leadership dilemmas.

By helping engineering students recognize their leadership potential through the provision of engaging, challenging and sustainable programming, we are well on our way to collectively realizing our institutional vision— "engineers leading change to build a better world."

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Section 5—Additional Documentation

The table below contains the learning objectives for the 6 leadership lectures that we aim to deliver to all undergraduate students.

Lecture Topic	After attending this lecture, a student will be able to:
Engineering Leadership	• Describe how leadership relates to Engineering • Use a framework to describe the nature of leadership • Describe how leadership is related to self-awareness • State their values, talents and passion • Identify their leadership style
Developing Your Potential	• Use self-awareness to develop a positive cycle between their choices and activities • Use a framework to describe EQ • Identify an EQ competency they want to develop and habits to help do that • Determine if they are an introvert or extrovert • Articulate a framework for developing leadership potential
Leadership and Teamwork	• Describe the stages of team development • Use a framework to describe how their leadership type may affect group function • Explain the roles of trust and conflict in effective teamwork
Leadership and Vision	• Describe how leadership links to vision • Critically analyze a vision statement • Create a compelling vision statement • Use vision as a starting point from which to implement change
Leadership and Citizenship	• Describe elements of citizenship and global citizenship • Connect citizenship to the Social Change Model of Leadership Development • Use a framework to envision putting inspiration into action
Reflection and Personal Growth	• Describe the experiential learning cycle and the role reflection plays in it • Utilize reflection to build leadership capacity • Pursue lifelong learning through regular, structured reflection on their life experiences • Develop and articulate their personal vision

The Summer Program is a 14-week leadership development program. Here is an example of the kinds of sessions that are collaboratively designed and taught.

Personal Development	Group Leadership	Leadership in Society
Myers-Briggs Typology Leading Transformational Change Emotional Intelligence Ethics and Leadership Navigating Your Career Leading with Integrity: Living Your Values Strengths Quest Structured Reflection The Lead Horse – Leading without Words	Leadership Styles and Myers-Briggs Communication and Collaboration for Leaders What you Learn from an Outward Bound Ropes Course (Field Trip) Transforming Conflict: Skills for Resolving Conflict while Strengthening Relationships How to Effectively Facilitate Groups and Meetings How to Lead a Workshop Giving Active Feedback	Nurturing Diversity and Inclusion Debate Practice Habitat for Humanity Build Community Project Leader Training Responsible Citizenship Who could you be in the world? (A Personal Visioning Workshop)

Detailed Descriptions of Certificate Programs:

We have collaboratively designed four certificate programs. Cohorts of students meet once a week for four or five weeks. Curriculum is highly experiential and students receive recognition of completion on their transcript.

1. Learning to Lead: Emerging Leaders – (Level 1) For students interested in getting more involved on campus in a learning community and/or applying for peer mentorship or leadership positions on campus.

Everyone can be a leader if they learn and practice leadership skills. Join this certificate program and be better positioned when you graduate to emphasize your leadership skills to prospective employers. This program gives you the opportunity (1) to develop your personal philosophy of leadership that includes understanding of yourself, others, and your community; (2) explore effective ways to get involved on campus and make a difference; (3) connect with a community of students that want to learn more about their own leadership capabilities.

2. Team Skills – (Level 2) For students interested in knowing how to build strong teams for group projects and professional experience.

Professional engineers often work in multi-disciplinary teams. Team settings are a natural laboratory for learning leadership. In this certificate program you will gain practical knowledge of your personality styles and how this translates into leadership strengths.
You will (1) explore alternative leadership styles and how to adapt your style when working with others, (2) practice conflict resolution techniques, and (3) examine social identities and how culture, gender, economics, and sexuality impact your experiences and your leadership, and (4) gain practical skills in meeting facilitation.

3. Leading from the Inside Out – (Level 3) For students who want to discover the power of self-leadership.

Becoming a leader takes courage, self-awareness, vision and the ability to reflect. Through this dynamic, arts-based certificate you will discover your core values, explore your relationship to power, articulate your personal vision, engage in theatrical exercises in order to grow more confident in expressing yourself, and become part of a supportive community.

4. Organizational Leadership - For students who hold or aspire to hold leadership positions in a student club or organization.

As a student leader you have multiple responsibilities: to develop and promote a vision and strategy, to facilitate meetings, to make difficult decisions, to recruit and support new members, to foster team learning, to build relationships, and to negotiate transition and change. This certificate program will help support you by providing tools and knowledge of best practices. By participating you will get opportunities to articulate your values and personal vision. You will also explore effective ways to encourage member participation, to give and receive effective feedback, and to practice techniques for enabling members to achieve their goals.

Evaluations from the graduate leadership courses APS1010 and APS1501 (Fall 2013) Note: We are consistently rated above the Faculty average.

Question	APS1010 Average	APS1501 Average	Faculty Average
How do you rate the learning experience offered by the course?	6.2	6.4	5.9
Was the course relevant to your professional development?	6.2	6.5	5.9
How do you rate the course overall?	6.2	6.5	6.0
	n = 25	n = 28	n = 220

Likert scale of 1=Lowest Rating, 7=Highest Rating

Evaluations from the undergraduate leadership course APS443 (Fall 2013)

Question	Average	Faculty Average
The course provided me with a deeper understanding of the subject matter.	4.0	3.5
The instructor created a course atmosphere that was conducive to my learning.	4.1	3.6
Overall, the quality of my learning experience in this course was…	4.1	3.3
The course expanded my understanding of the ethical and environmental issues concerning Engineering in society.	4.0	3.1

Likert scale of 1 = Not At All/Poor, 5 = A Great Deal/Excellent; n = 31

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

March 7, 2014

The Society for Teaching and Learning in Higher Education
McMaster University
1280 Main Street West
Hamilton, ON L8S 4L6

RE: Application of the ILead Program for the Alan Blizzard Award

Dear Selection Committee Members

On behalf of the Faculty of Applied Science and Engineering, it is my great pleasure to write in support of the application of the team behind the Faculty's Institute for Leadership Education in Engineering (ILead) for the Alan Blizzard Award. This diverse team has created and continues to lead a program that has significantly enhanced our students' education and better prepared them for the demands of engineering in the 21st century.

The purpose of ILead is the development of engineering leaders though curricular, co-curricular and extra-curricular activities. Traditional engineering curricula have focused solely on technical skills and have neglected professional skills such as communication and leadership, which are necessary to effectively address the challenges of our increasingly complex and interconnected world. The ILead program seeks to ensure that U of T engineers can take on leadership roles throughout their lives. Its vision is an engineering education that is a foundation for transformational leaders and outstanding citizens; citizens who are equipped to create positive change in their profession and their communities.

Until recently, structured leadership education was not part of any engineering program in Canada. ILead (and the Leaders of Tomorrow program out of which it grew), represents the first long-term initiative to incorporate leadership into Canadian engineering education in a formal and structured way. The Leaders of Tomorrow program was initially created in 2002 to enhance the experience of undergraduate students conducting summer research projects in the Department of Chemical Engineering and Applied Chemistry. It was expanded throughout the entire Faculty in 2006. In 2011, in response to the recommendations of the Faculty's Task Force on Engineering Leadership Education, ILead was established. The program continues to grow.

The leadership programming offered by ILead is becoming increasingly integrated into the Faculty's curriculum. The graduate courses it offers are part of a special certificate program for Master of Engineering students called the ELITE Certificate (Engineering Leadership, Innovation, Technology and Entrepreneurship). The undergraduate courses are approved electives for the Faculty's extremely popular Business Minor. Beginning in September 2014 we will also offer a Certificate in Engineering Leadership – the first of its kind in Canada.

Galbraith Building, 35 St George Street, Room 170, Toronto, ON M5S 1A4 Canada
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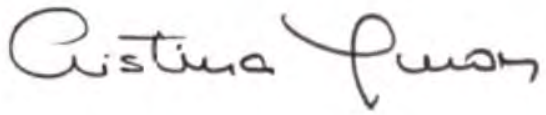
In addition to the originality of the programming ILead offers, what makes it so unique is the way faculty, staff and alumni have combined their skills to create and deliver a leadership education curriculum. The ILead team consists of engineering scholars, corporate leaders, academic administrators and education specialists. The result is a diversity of experience, expertise and perspective that allows them to successfully reach students with different backgrounds, skills and learning styles.

ILead offers students tremendous opportunities to engage in their own development, be part of an exciting community of learners, and place their technical skills in a broader societal context. It enhances our students' learning experience and strengthens ties between the engineering profession and society, enabling graduates to contribute more fully to social change. I wholeheartedly support the application of the team responsible for this exceptional program for the Alan Blizzard Award.

Sincerely



Cristina Amon
Dean, Faculty of Applied Science and Engineering

A group of engaged students collaborated and wrote a letter to the Dean, appreciating the transformative opportunities that ILead provides.

7 February 2014

Dear Dean Amon,

On 17 January, 2014, the Institute for Leadership Education in Engineering (ILead) organized an event for students and industry leaders. This '*Lunch with Visionaries'* served as an opportunity to understand the gap between the goals engineering students are striving towards and the real needs in industry.

This event was reflective of ILead's commitment to development of leadership skills, while providing an excellent opportunity for students to observe leadership in practice. We, the students, had a rare opportunity to: observe the way the leaders interacted with each other, to hear about their approaches to success, to discover their perspectives, and to notice their personal traits of humility and confidence. There were gems in every interaction and we were afforded this rare opportunity.

The *Lunch with Visionaries* strengthened our belief in the quality of education and development opportunities available to us at the University of Toronto. In a degree program as professionally oriented as engineering, it can be difficult for students to comprehend the industry perspective with respect to: what lays ahead, potential challenges, and the skills that should be cultivated.

It was not only valuable to hear perspectives on technical and engineering leadership, as it applies to a variety of sectors, but it was also incredibly motivating to recognize that the pursuit of leadership and professional development is valued. This direct interaction with industry representatives complements academic learning.

Given that the suite of leadership skills is not well defined throughout our undergraduate curriculum, the opportunity to interact with prominent leaders provided an integral step towards shaping our ideals for the future of this profession. This forum offered a chance to practice networking and interpersonal communication skills by providing a unique opportunity to have a direct conversation with well-known, experienced leaders in distinct fields. The insights gained will influence careers, define goals and will be life-changing.

We appreciate the initiative of the ILead team for providing this unique opportunity, and strongly believe that more engineering students should be given such chance. The event illuminated the broad professional canvas engineers carve out for themselves and ingrained the knowledge that leadership is not about the position, but about the impact they make. The Faculty's continued support and expansion of such great integrative initiatives will surely be of benefit to future students.

Sincerely,

Emanuel Diomis
B.A.Sc., MEng (candidate)

Lobna El-Gammal
B.A.Sc. (candidate)

Yee Wei Foong
B.A.Sc. (candidate)

Albert Huynh
B.A.Sc., M.A.Sc. (candidate)

Jacquelyn MacCoon
B.A.Sc., MEng (candidate)

Kasra Modares
B.A.Sc. (candidate)

Nusrat Nowrin
B.A.Sc. (candidate)

Jaquelyn Rodriguez
B.A.Sc. (candidate)

Michael Suppa
B.A.Sc., MEng (candidate)

Nader Yared
B.A.Sc., MEng (candidate)

Student Testimonials

"LOT/ILead taught me how to have greater impact through leadership. While I had an intuitive sense for what being a leader meant, LOT/ILead helped me put structure around my reflections. It helped me understand that leadership is much more than simply being "the boss" or "in charge." I came to realize the many things I can do on a day to day basis to influence others around me, be a positive role model, and ultimately be more effective at creating the change I'd like to see in the world."
- Shahed Al-Haque

"I learned the differences between management and leadership and how one can strive to be a good leader. I had many opportunities to practice a wide range of leadership skills, which are not taught as part of the engineering curriculum but are extremely important in the workplace. One of the most important things I learned through the LOT/ILead program was the concept of personality types (Myers-Briggs) and how it can be used to identify each individual's strengths and weaknesses. Using this knowledge, I have been able to improve my leadership abilities immensely by taking advantage of each team member's strengths and working around their weaknesses for high overall team effectiveness."
- Parnian Jadidian

"Where there is a will, there is power. The LOT/ILead Program presents and motivates a strong will amongst students to build a strong community that together brings positive change. This program is about transformation – of yourself, and the situations that surround you. It's about making decisions, listening to others, and communicating effectively the vision that you keep building for yourself each day. This vision can be something you want to be, something that you want to see happen such as a policy, or a movement. It can be anything, but it all comes down to sharing that vision, finding it in others, and revising it such that it can be everyone's vision. Once a common ground is established, people become committed to working towards a vision, and then great outcomes arise."
- Navila Uddin

"By participating in the LOT/ILead working group and the engaging co-curricular certificate workshops, I developed a genuine appreciation for self-leadership. I learned that despite being naturally introverted, I can inspire and convince others by developing a strong rapport and being empathetic and assertive – which when exercised in the right situation at the right time – can create wonders in my performance as a prospective leader."
- Sami Khan

"I really learned that my potential, like everyone else's, is limitless. Before I engaged with ILead, I had a very simple view of what I wanted for myself and for my life based on what I thought I was capable of. ILead helped me develop the other sides of me that I didn't know I had, and have turned me into a person I didn't know I could be. I used to think I'd be an engineer working in a 9-5 at some R&D department for a big corporation, happy to go home with a decent pay at the end of the day. Now I'm studying in Asia, getting a graduate degree, meeting with incredible people and I've dedicated my life to using my skills to make the world a better place."
- Jason Sukhram

We have also gathered student reflections after some of our events and programming. In these short videos, students share their experiences and learning outcomes, and how ILead has helped them grow. You can access the videos on our YouTube page: https://www.youtube.com/user/uoftilead.