

Information and Systems Engineering Leadership Program (ISELP): A New Honors Program Concept at Lehigh University

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Abstract

This paper describes the Information and Systems Engineering Leadership Program (ISELP), a new program that was initiated this year by the Industrial and Systems Engineering Department and the Enterprise Systems Center (ESC) at Lehigh University. It is linked to the Information and Systems Engineering (I&SE) degree program. ISELP is available to high achieving students beginning in their freshman or sophomore years and continuing through the senior year.

ISELP was started based on feedback received from employers, industrial partners and alumni about qualities they valued in recent graduates. In addition to technical skills they desired industrial experience and leadership capabilities. The program was built on the strength of contacts between the Industrial and Systems Engineering Department, industry partners, and the Enterprise Systems Center.

This paper describes the requirements for admission, the implementation schedule and the following key features of the program:

- Instruction in leadership theory and leadership skill development
- Use of leadership assessment tools
- Individual interaction with industrial and faculty mentors
- Preparation and presentation of case problems
- Access to official leadership transcript
- Networking with industry partners, faculty, and peers
- Use of ESC's Collaboratory and meeting facilities
- Opportunity to practice skills in projects, seminars and classes

A Case for Leadership Experience

One of the most pressing issues facing companies today is the need for an increased number of employees who demonstrate positive leadership skills. Over 70% of top company executives supported this statement in a study conducted by the Human Resources Institute¹. Furthermore, only 8% of executives surveyed rated their employees' leadership skills as "excellent."² Many companies do not have leadership training programs to enhance the skills of their employees. They expect those working in higher education to develop leadership competencies in the individuals they are sending into the workforce. To that end, there is clear evidence that teaching

students leadership skills, and giving them opportunities to apply that knowledge within their chosen fields of study is imperative.³ These skills and opportunities give the student an added advantage during the hiring process and the ability to be proactive and affect change in the workplace.

Lehigh University has a strong commitment to fostering leadership skills among its students. With over 200 clubs, organizations, fraternities, sororities, athletic and intramural teams, and a population of 4,500 undergraduates, there are many opportunities for students to gain leadership experience. Recognizing the importance of a formalized, comprehensive, leadership development program, in 2003 the Office of the Dean of Students created the position of Assistant Dean of Students for Leadership Development. The Assistant Dean has formalized leadership training across the university in both curricular and co-curricular programs. She has worked closely with the ISELP program director to provide the instruction in leadership theory and skills development. ISELP is the first academic program to formally link with the leadership branch of the Dean of Students Office. It is intended to be a model for programs within other disciplines at the university.

ISELP builds on the industry-liaison model used by the Industrial and Systems Engineering Department and the ESC for over 30 years. This began with students performing their capstone projects by working on problems in industry. It progressed with interaction between company executives and students in real and virtual classrooms. It culminates with ISELP students forming strong bonds with industry mentors and solving real-world problems throughout their educational program.

ISELP students graduate with the following highly-valued leadership skills and technical competencies:

- Ability to identify and solve unstructured problems
- Proven ability to design, build and implement complex systems
- Self-knowledge and the ability to work well with others
- Communication skills and confidence to lead change

Key Features of the Program

Instruction in Leadership Theory and Leadership Skill Development. ISELP students begin learning about foundational leadership theories and developing specific skills as first year students. A series of workshops are conducted throughout the program. Examples of workshop topics include leadership styles, leadership skills assessments, effective communication and problem solving skills. Students practice their leadership skills by assisting with workshops offered to new students who join the program.

Use of Leadership Assessment Tools. ISELP students learn to assess leadership styles using various assessment tools. They first assess their own leadership practices as well as their skill strengths and weaknesses. Later, as they gain experience, they assess the leadership practices of their peers and provide feedback for improvement. They formulate a plan to improve their own leadership skills and meet individually with their industry and faculty mentors to critique and

improve according to their plan. Later in the program, they assess the success and/or progress of their plan.

Individual Interaction with Industry and Faculty Mentors. Throughout the four years, ISELP students interact closely with a team of mentors consisting of faculty, industry experts, and research engineers. Close interaction with mentors and industrial projects in systems engineering and information technology ensures that the students can apply what they learn in the classroom to real-world problems. Mentors also help students assess their leadership capabilities and plan activities to improve their leadership skills.

Preparation and Presentation of Case Problems. Students interact with each other and industry experts to solve industry problems. This prepares them for life in the workplace. They develop case problems based on their industrial experiences. Finally, they present the case problems to the classes below them. This allows them to sharpen their leadership skills as they direct student teams, lead discussions, and assist with problem solving sessions.

Access to Official Leadership Transcript. With the creation of the position of Assistant Dean of Students for Leadership Development, all Lehigh students have the opportunity to build an official leadership transcript. Just as the academic transcript is maintained by the Office of the Registrar, the leadership transcript is maintained by the Office of the Dean of Students. Data maintained includes participation in leadership workshops, leadership positions in clubs and organizations, and other leadership activities. Students may provide this transcript to potential employers to document the leadership training and experience they have received.

Networking with Industry Partners, Faculty, and Peers. ISELP students have the opportunity to network with industry partners, faculty, and other ISELP students at social mixers and program sponsored seminars. Students are invited to ESC open houses to talk to potential project sponsors and employers about their projects and experiences. Students also have the opportunity to meet with and recruit perspective students interested in the program.

Use of ESC's Collaboratory and Meeting Facilities. ISELP students have access to the ESC's newly renovated facility. This includes access to meeting space, computers, and the Collaboratory. The Collaboratory provides distance learning and virtual meeting systems for students to discuss projects with industry partners who remain at their site. Industry seminar speakers address the class face-to-face or virtually in the ESCs Collaboratory.

Opportunity to Practice Skills in Projects, Seminars and Classes. The students progress in leadership roles until as seniors they are leading projects teams of underclass students. Since the program is an honors program, not all students have access to the program. Students not in the program also have the desire to enhance their leadership skills. Therefore, students in the ISELP assist with leadership seminars and classes for other students in the Department of Industrial and Systems Engineering.

Implementation Details

ISELP is an honors program and as such requires students to maintain a 3.0 GPA to remain in the program. The reason for this is that students are required to overload by taking an extra credit each semester of the upperclass years. These 6 credits cannot be applied to the graduation requirements for the Information and Systems Engineering degree. Normally the I&SE degree requires 132 credit hours. A student in the ISELP program needs to complete 138 credit hours to graduate and complete the ISELP program.

Students are admitted to the program at one of two possible times: 1) as an entering freshman or 2) at the beginning of the sophomore year. For a student who is an entering freshman, selection is based on application information including high school record, leadership positions in extra-curricular activities, and SAT scores. Positions are offered through the Office of Admissions. Students who enter the program at the beginning of their sophomore year indicate a desire to enter the program when they select their major at the end of the freshman year. Selection is based on prior leadership experience, GPA, and an essay. Selection at this point in time is the responsibility of the program director.

Since Lehigh has a common freshman year for engineers, ISELP cannot require additional courses in the freshman year. The activities during the freshman year consist of evening workshops, social interactions, and field trips. In each semester of the sophomore and junior years and the first semester of senior year, the students register for IE 185 ISELP Honors Seminar. This is a two-hour lab during which most of the formal activities take place. In the final semester of the senior year, students register for IE 385 ISELP Honors Project Seminar. This one-credit course requires a written project for completion of the program.

The activities in each year follow a theme, with each year's activities building in complexity on the previous year. Table 1 provides an overview of the focus and activities of each year in the program. ISELP students are encouraged to work as interns during the summer on projects with the ESC. These experiences allow them to practice both their problem solving and leadership skills.

Table 1. Overview of Activities in ISELP

	I&SE Curriculum for ISELP students	Experience	Mentoring	Competency
Freshman Theme: Teambuilding and introduction to thinking in leadership and unstructured problem solving.	Basic Math/ Science/ Computer/ Communications ISELP seminar/ project -Introduction to unstructured problem solving	- Field trips – understand the major functions/ systems of typical enterprises - Problem-Solving Case Studies	- Leadership assessment baseline & development plan. - Exec. Interactions-Advisor/mentor team meetings and socials	-Identify & solve unstructured problems -Teamwork & self-knowledge -Communication & presentation skills
Sophomore Theme: Learn problem solving and principles of enterprise systems.	Statistics/Programming /Data Structures/ Math. Modeling/ Economics/ Accounting ISELP seminar/ project – exposure to specific systems structures and applications	- Problem-Solving Case Studies - Voluntary summer internships at ESC to work on projects and case studies - Field trips	- Faculty advisor/mentor team meetings. - Interactions with industry leaders and executives. - Interactions with industry experts.	-Communication & presentation skills -Creative use of information technology in controlled environments
Junior Theme: Participate in enterprise systems improvement projects and case studies based on real industry problems.	Engineering Principles/ Mgt. Information Systems/ Web Technology/ Operations Research/ Engineering Economics/Humanities ISELP seminar/project - Design, build, implement IT in broader contexts	- Problem-Solving Case Studies - Work closely with industry experts and client companies. - Voluntary summer internship at ESC to work on industry projects	- Faculty advisor/mentor team meetings. - Leadership assessment & update - Executive Interactions	-Lead change -Writing and Oral Communications -Design, build, implement IT in broader contexts
Senior Theme: Participate in and lead case studies and real enterprise systems improvement projects.	Advanced Operations Research/ Supply Chain Logistics/ Stochastic Processes/ Organizational Behavior/ Data Communication Networks / Humanities Senior Capstone ISELP project - develop major project case study. Coaching lower class ISELP seminars	- Problem-Solving Case Studies - Mentor other students - Participate in leading case studies for Freshman seminars - Lead portions of ESC industry projects	- Faculty advisor/mentor team meetings. - Lifelong leadership development plan. - Executive Interactions	-Creative use of information technology -Mentoring and coaching others

Details of the Sophomore Curriculum

In the sophomore year, students begin their discipline specific studies by taking a 2 course sequence in probability and statistics, a course in programming, and a course in algorithms. The majority of the time in this year is spent learning about leadership issues. In addition, some time is spent solving case problems that are based on industry projects, which reinforce and enhance the introductory courses they are taking. The case problems normally take one or two classes to present. Then the students have several weeks to solve them while other activities occur in class.

Each week the class could focus on one of the following:

- One or more mini-lectures about a different leadership trait or leadership situation from current literature. This usually requires students to write a one page reaction or experience paper for the following week. These papers are used as a basis for a short class discussion when they are submitted.
- One our of the four workshops. A workshop delves in detail into a specific aspect of leadership such as Leadership Styles, Communication, Problem Solving, or Networking and Resumes. Sometimes this occurs in the evening hours, if more time is required.
- Case Problem presentation or analysis. During the sophomore year the academic theme is probability and statistics. There is one case problem each semester. The first is less quantitative and uses various analytical tools, such as cause and effect diagrams, histograms, process flow charts, Pareto diagrams, and force field effects, to draw inferences from industry problem scenarios. The second occurs while they are taking statistics and involves design of an experiment and analysis of variance calculations. They determine which variables have a significant effect on the output of a grinding mill. The case problems take 2-4 sessions to complete.

Results to Date

The first group of sophomores was initiated into the program in September, 2003. They have completed a semester and a half in the program. During that time they have completed three workshops and participated in the first case problem presented by an industry partner. Currently they are completing the second case problem involving a design of experiment used on a research project at a local company. They have met individually with industry and faculty mentors.

Feedback about their experience has been positive and the entire group returned to the program for the spring, 2004 semester. In particular they have found the leadership workshops to be extremely valuable in their day-to-day life. The assessment of their own leadership strengths and weaknesses has allowed them to practice and enhance their skills in group activities in other classes. They have had the opportunity to network with 30 industrial partners. While they had reservations initially about how to meet and talk to industry leaders, they expressed the unanimous opinion that ISELP prepared them for the opportunity. Some have acquired summer employment from the contacts they made.

Finally, they have indicated that the case problems have allowed them to see how the textbook material they have read about can be applied in an industrial situation. They are particularly interested in analyzing more difficult case problems.

Many have stated that this class is the highlight of the week for them. It could be the cookies, candy, or soda that usually awaits them. More likely, it is the bond that has formed between them as they work in small groups on immediately applicable problems. In one case a student has decided to stay in engineering based primarily on experiences in ISELP. It is hoped that ISELP will continue to enhance their experience in the I&SE degree program.

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Biography

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