Developing Leadership Skills in Engineering Students – Foundational Approach through Enhancement of Self-Awareness and Interpersonal Communication

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Engineering leadership education is emerging as a vital addition to the development of the profession. However, practitioners of engineering leadership education are still defining outcomes, objectives and curricula. The assumptions, desired outcomes, and our pedagogical approach to engineering leadership education discussed in this paper starts with a strategic assumption to minimize the emphasis on development of “vision” that is a clear focus of leadership training in business and other disciplines. While vision is clearly a critical leadership characteristic, engineering schools already excel at developing students who envision solutions to complex problems. Therefore, less effort is needed for the engineer to transition “problem solving” into “leadership vision.” Instead, the focus is placed on interpersonal communication (vs. organizational communication) and understanding of motivation and behaviors of self and with respect to interactions with others. This paper will present the methodology and reflective assessments in teaching engineering students “leadership communication,” and “self-awareness.” Leadership communication consists of techniques to develop intentional listening skills and questioning/interviewing approaches to define problems and understand motivations with emphasis on application of lessons learned from behavior inventory assessment. Further, the use of self and group reflection will be discussed in the context of both learning leadership concepts and increasing self-awareness.

Introduction

Engineering education has been designed to produce capable technical problem solvers and innovators. As engineers, we create, solve and fix. Yet, engineering students receive little formal education on the “soft skills” necessary to lead organizations that often inherently resist change. While elements of teamwork and communication are emphasized in engineering education, it is generally accepted that in a limited time frame to matriculate, students (graduates) will have to acquire leadership skills either through employer training, via observation, or “on-the-job” action. Anecdotal evidence indicates that deferred leadership development often puts the engineer at a disadvantage compared to other graduating majors where leadership is emphasized (e.g., Business). Perhaps most important to society, the lack of engineers with sufficient leadership skills stifles innovation. While we would like to believe that development of intellectual property is a true “Darwinian” meritocracy, the reality is that most innovations are only implemented through the hard work of a champion(s). Skill and vision is needed to usher an innovation through the development pathway that is full of obstacles, including lack of resources, organizational inertia, and regulatory resistance. While there is no reliable estimation for the value of these unrealized innovations, such failure undoubtedly reduces business competitiveness and possibly overall economic activity. These concerns have led to several calls for engineers to understand and develop leadership skills. [1-3]

Thankfully, a number of excellent programs have emerged to begin to fill this need [4]. One such program, initiated in 1996 at Ohio University’s Russ College of Engineering and Technology, is the T. Richard and Eleanor K. Robe Leadership Institute (RLI). The Robe

Leadership Institute's annual leadership class (seminar) focuses on development of the student's leadership styles through understanding of leadership concepts, emotional intelligence, examining the leadership styles of proven leaders, team building, and self-realization. It is a stand-alone course, not part of a minor or longer development program.

The engineering principle-centered approach to leadership education taken by RLI fosters development of critical thinking skills – a hallmark of engineering education to help students understand the context of leadership. This approach enables logical problem solvers (engineers) to understand that decision making is not always, or often, data-driven. Emotions, tolerance for risk, perceptions, and relationships drive human decisions. By analyzing these factors, engineering leaders can mitigate negative factors inhibiting advancement of innovation, while taking calculated risks, focus on necessary problems, and integrating resources.

RLI Seminar Model

The RLI seminar starts with the selection of students in the spring prior to the fall seminar. The process involves recommendations, screening, interviewing and selection of students that could most greatly benefit from the class. The process involves setting high expectations for the class, including no excused absences, the culture of the class as a team, the substantial required reading, the general class assignments, expected time requirements, and the expectation for them to apply the concepts learned in their duties as student organization leaders. This begins building a team of scholars that will help each other learn more about leadership and themselves.

The course learning outcomes are explicitly given to the students before the class. They include differentiating between leadership and management, learning the characteristics of effective leadership, learning about self through focused surveys and reflection, developing effective listening and interviewing skills to engage experienced leaders, interacting with other members of the class, improve the class experience with your studies, reflections on the class, and recommendations, and finally to become better observers and learners of leadership lessons in current and future venues.

Class Structure and Activities

The selected students are given summer readings and an assignment to evaluate critically aspects of the readings before the start of class. Examples of these readings range from Sample to Goleman. [5-9] Assigned summer readings are designed to help understand the terminology, concepts, and framework of successful leadership. The summer readings are often the first time the students have critically considered concepts such as “competence,” “character,” “vision,” along with “knowing and dealing with self,” “continuously listening and learning from those around you,” “communicating and inspiring a shared vision with others,” and finally “enlisting, engaging and empowering followers.”

Students are asked to prepare an autobiography of themselves before the first day of class. The autobiography is the first of several assignments to help the students more fully understand themselves and their leadership styles. The value and benefit of each student writing about their own lives helps them start to understand the importance of “getting to know themselves,” relating to “emotional intelligence” and “understanding and dealing with self.” This exercise also helps the instructor learn more about each student.

The first two lectures of the class are devoted to reviewing summer reading and discussions of the autobiographies. As the class is highly interactive, the discussion is generally student-led, with the instructor acting as facilitator. These discussions help the students develop a common

framework for understanding leadership and learning about other members of the “team.” At the conclusion of the review of the summer reading, the students are provided an overview power-point presentation summarizing some of the key leadership characteristics and concepts. As with the course booklet, these slides are available from the author via email request.

Students also spend significant time on development of emotional intelligence, with at least two behavior inventories (such as True Colors or Myers-Briggs Type Indicator test) and discuss results in class. Building strong interpersonal skills requires the students to understand their own behavior pattern to recognize their own strengths and weaknesses. Also from this, they learn the styles of others and how these styles interact with their own personal style. This effort gives the student framework for the application of different leadership styles based on the personalities of their followers, as well as teach them why they make certain decisions. Note that while students may think this effort is repetitive at first (one inventory exercise is the same as another), if they are challenged to find the differences, they can critically understand the importance of each effort designed to help them learn more about themselves.

As soon as can be scheduled after the first week, the students participate in a four-hour team-building exercise run by Ohio University’s Campus Recreation Department. Generally speaking, before the exercise, the students know little about anyone else in the class. After the intense common experience, the class comes closer together, making it easier for them to envision themselves as a team, thereby immediately improving class discussion and speaker interviews.

The team concept is a fundamental building block of the seminar. Not only is the concept of team used to emphasize the importance of participation and interaction, but it is critical in the early speaker interviews. It may be intimidating for the students to ask probing and sometimes uncomfortable questions of company executives that could be their boss’s boss next year. Understanding that they are a team takes the pressure off the individual student, allows them to focus on learning, and helps with the overall class atmosphere. The team culture emphasizes that no one wants to be the weak link in the discussion, encouraging the participants to prepare thoroughly for each speaker and assignment so that they can make a relevant contribution.

Guest Speakers and Interviews

The heart of the fall seminar is the interaction between the RLI Scholars and the guest speakers for two+ hour “interview” sessions (classes). Because these speakers are often active CEOs, presidents, or executives of various operations, and because there are typically ten speakers per seminar, scheduling is critical. Speaker scheduling matters to the development of the scholars. The order of guest speakers will create a leadership story and provide reinforcement of concepts to maximize learning of leadership characteristics and development for the students. More seasoned leaders who have developed methods for “teaching” leadership should be scheduled later. Less experienced leaders or leaders who are comfortable making a specific point (or points) to emphasize recent learning in the classroom are scheduled earlier in the seminar. Keep in mind that because schedules are very tight, such scheduling may or may not be possible. Further, it is a good idea for the instructor to talk with the speakers before formally inviting them to describe the scope of their interactions with the students and the overall goals of the course.

Students must be instructed on how to interview the guest speakers; discussing proper etiquette, as well as general types of questions they could pose to learn more about the leadership style of each speaker. Immediately after that preparation, a “practice” guest speaker comes to the class; usually the instructor. The preparation of the students to ask good questions is significantly

enhanced by asking one student to introduce a speaker for the session. This gives each student the valuable experience of talking to the speaker before the seminar.

To deliver the optimal overall message about leadership, there needs to be diversity of speakers in age, gender, venues, as well as experiences. This diversity can help the students understand that leadership development is a lifelong effort. It can also help the students understand that “they too can do it,” but they must continuously strive to become better. Further, annual variety is also an important factor in keeping the course “fresh.” Over the course of sixteen years, the RLI seminar has hosted more than 60 different speakers.

In addition to the classroom interviews, the speakers generally agree to attend a dinner with 3-6 students in a less formal environment. The dinner setting facilitates a more open discussion of personal experiences, and often leads to a greater sense of awareness for the students of what it means to be a leader. Anecdotal evidence from student journals indicates that opinions of the speaker’s styles may change over the course of the dinner.

Student Reflections and Introspection

Daily reflection of leadership lessons learned and periodic discussion of the speakers is a key component of class learning. The discussion and reflection helps the students articulate what they have learned and also most importantly helps students learn from each other. Also it helps each student learn the importance of listening to others and not get fixed on just their own points of views. Two class periods and several assignments are devoted to evaluating critically the speaker’s styles, leadership characteristics, and lessons learned from the interviews. This generally requires the students to not only evaluate their daily journal reflections, but also to review the key aspects of the summer reading to frame their responses.

The classroom discussion assessing the lessons learned from the speakers is held after the students submit initial answers to some critical review questions. The students then hold an open discussion on each question, allowing everyone to make their answers known and present justifications for those answers. These review sessions tend to be quite lively, with very well-reasoned debates. Students generally have reflected that these sessions helped them focus their understanding of the speakers beyond what they attained through their own journal reflections.

Seminar Conclusion

The capstone event of the seminar is the exit interview of the individual scholars with the RLI Director. The students are given a general listing of questions to prepare themselves for the session. The interview covers details the students may have addressed in their daily journal reflections or in their papers or about a key leadership concept described by one of the speakers. Students are also reminded that they committed to using their leadership knowledge to enhance the efforts of their particular student organization(s). They are asked to describe how they plan to accomplish some improvement and what leadership skills they will employ. While the exit interview is not meant to assess fully the student’s comprehension of the material, it does give a strong indication of the effort the student has put into the class, and it assists the instructor in helping the student address perceived deficiencies.

Alumni Surveys and Course Evaluations

As documented in [4], RLI scholars were surveyed to assess the effectiveness of the course over the first twelve years. A follow up survey was conducted with 33 responses. The survey involved both numerical ratings of success with respect to course objectives, but also asked for

direct responses to questions and request for course-specific feedback to assist in continuous improvement of the seminar. The survey questions were as follows:

Rate (1-5) from lowest to highest the value of the class with respect to

- a. Development of critical thinking about leadership*
 - b. Learning leadership styles*
 - c. Understanding the role of emotional intelligence in leadership*
 - d. Teambuilding skills*
 - e. Interfacing with others as you lead*
 - f. Differentiating between leadership and management*
 - g. Listening skills*
 - h. Leadership application in your profession*
 - i. Leadership applications in your personal life*
- *Do you have any personal leadership experiences that the RLI seminar helped shape?*
 - *What did you find positive about interfacing with the speakers?*
 - *What was negative (or could have been improved) about interfacing with the speakers?*
 - *Do you have any suggestions regarding how to improve the course based on your experiences?*

The focus was on alumni from the last five years of the seminar, as the older alumni had already been surveyed. [4] The numerical results of the 25 responses are given in Table 1 and compared to the survey done in 2008 of previous RLI alumni. The most recent survey data indicate that recent students find a slight improvement in the quantified areas, except for application of leadership to personal life. While the trend appears positive, it is likely these improvements are likely from the natural refinement of the course over the years.

Table 1. Survey Data

	2011 Survey	2011 Survey	2008 Survey
	Average	Std. Dev.	Average
a.	4.52	0.44	4.35
b.	4.61	0.28	4.21
c.	4.30	0.47	4.21
d.	4.03	0.69	3.71
e.	4.15	0.66	4.12
f.	4.70	0.22	4.41
g.	4.45	0.41	4.24
h.	4.09	0.56	4.18
i.	3.97	0.53	3.97

The survey data indicate students believe they are able to apply critical evaluation to the field of leadership studies and differentiate between leadership characteristics and management skills. The data also indicate some strength in helping the students discern different styles of leadership,

to understand how to apply the concepts of emotional intelligence and personality styles to leadership, and to be better listeners. Some weakness appears in the areas of teambuilding skills, interfacing with others, and applying leadership skills to personal concerns.

Conclusions

The RLI model is specifically for a single course option for leadership development of engineering students. It is limited in scope and focused to students who have had previous leadership experience. Nevertheless, it appears that this model can help engineers with leadership development by focusing on the basics of competence, character, and vision through reading, exercises, and use of leadership speakers. Survey data indicates that students find the course useful for development of leadership skills.

References

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