

**LEADERSHIP 101
DEVELOPING THE LEADER IN ENGINEERING AND ENGINEERING
TECHNOLOGY STUDENTS**

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“The one quality that can be developed by studious reflection and practice is leadership.”
General Dwight Eisenhower

Abstract

Conventional wisdom defines leadership as a skill and as such it can be learned. The question becomes one of where to begin when teaching leadership skills? Researching the voluminous amount of leadership material available to industry clearly indicates the starting point must be with the individual focusing on themselves. Students of leadership must first scrutinize their trustworthiness and integrity ensuring they are genuine and authentic in their personal character. Once they have ascertained their trustworthiness, the students then focus on the level of trust they must develop with others to have a positive influence on them so as to create a synergistic relationship with the various members of a team.

This paper will discuss the content of a highly successful course entitled “Engineering Leadership” taught primarily to senior Civil Engineering Technology students. Based on two nationally recognized books, the first half of the course teaches students habits for personal and interpersonal effectiveness as a leader. Emphasis is on introspection of one’s own life followed by examining the character based requirements essential for meaningful and productive interpersonal relationships.

The second half of the course specifically develops the leader inside the students. The pedagogy for this portion of the course requires students to study leadership material and present mini lectures on certain areas. Essential leadership traits, skills and attitudes representative of an authentic leader are the targeted requirement of each mini lecture.

As noted above, leadership can be developed by studious reflection and practice. This course provides students with both tenants ensuring a thorough understanding and comprehension of leadership. The evaluations of this course, by both students and other faculty, along with testimonials of graduates, indicate this objective has been accomplished for this unique course.

Introduction

Most engineering and engineering technology curriculum contain a very comprehensive compendium of technical courses designed to insure students are competent upon graduation. It is obvious ABET¹ accreditation requirements necessitate the need for adequate and in depth coverage of the technical content in each discipline. Accreditation ensures a high academic standard exists in every program receiving ABET accreditation.

Close examination of a university or college's technical curriculum, course textbooks, methods of instruction, and laboratory experience quickly reveal the quality and adequacy of the various technical programs. Student scores on national exams such as EIT/FE exam also speak of the effectiveness of providing the students with the skills and abilities necessary to be technically competent in their specialty.

Upon completion of all graduation requirements, students are conferred with an appropriate degree in their specific discipline. Students leave the university environment with full confidence in their technical ability and the education they received as undergraduates. After obtaining employment, students are very eager to demonstrate their ability and competence.

Assigned to a particular project or task the former students quickly delve into their new role, knowing their technical education will provide them with all that is necessary to accomplish their job. Working with other technical professionals also gives the students a sense that all will go according to the project schedule. They begin to live their career dream envisioned after graduation.

As problems begin to arise during the course of the project or task, the former student begins to get suspicious of why things are not going as well as was expected. They realize that as competent professionals, the team or group contains all of the technical expertise necessary to develop and implement solutions to the problems they will encounter. After more frustration and discouragement, the new engineer/engineering technologist begins to realize the problems encountered have very little to do with a lack of technical ability! Rather, the team's leaders and members themselves are the source of the difficulties being experienced. Leadership and management styles coupled with individual personalities and preferences lie at the root of the team's ineffectiveness which can ultimately undermine and derail the entire project.

Puzzled by the reality of the situation, the graduate quickly returns to his/her undergraduate curriculum looking for a solution in one of his/her textbooks. The graduate finds a wealth of information but unfortunately all of it is technical in nature. Nothing is encountered to help the former student solve the actual problem being experienced on the job.

With a deep sigh, he/she comes to the realization that, while more than adequate from a technical perspective, the undergraduate education received lacked a very critical element, namely, working effectively with other human beings. A quick search for the missing component reveals a need for the student to learn and develop the skills and abilities associated with becoming effective in working with a wide variety of other people. The word "leadership" finally becomes part of the former student's vocabulary and he/she begins the pursuit of learning and developing leadership ability. The graduate's mantra becomes "Lead people and manage things."

Concept Development

The Civil Engineering Technology program at the University of Pittsburgh at Johnstown (UPJ) has a Construction Management option and one of the courses offered is Engineering Management. In recent years, the emphasis from ABET¹ and ASCE², the desires of graduates, the experience from faculty who do regular consulting and the evolving understanding for the

need of leadership training for graduates fueled a redesign of the Engineering Management course to specifically address leadership. The traditional course covered the standard areas of planning, organizing, directing, coordinating and controlling the process i.e. the management of projects. The course is currently undergoing a name change to Engineering Leadership which more adequately reflects the new content taught to the students.

Research by two of the authors with extensive experience in the area of leadership served as the driving force for the major course revisions necessary to convert the course to one with primary emphasis on leadership. With leadership considered a skill, efforts focused on identifying the various components rudimentary to the study of leadership. Much of the current national attention on character and integrity necessitated teaching these subjects to the students. It was also realized these two critical areas needed to be taught at the beginning of the course to help students understand how important character and integrity are to their personal and interpersonal effectiveness. After exposing the students to this essential need, the next step in the leadership skills development process required students be given specific understanding of how to develop the leader which exists in every person. This step was crucial since the entire premise of this course revolved around leadership being a skill which can be learned and “developed by studious reflection and practice . . .”

Two excellent best selling books serve as the texts for the course. The first book is “*The Seven Habits of Highly Effective People*” by Dr. Stephen R. Covey.³ This book specifically addresses the character and integrity development desired by the instructors for the course. The second book entitled “*Developing the Leader Within You*” by Dr. John C. Maxwell⁴ became a perfect match for the objectives for this portion of the course set by the instructors. The course outline centered on these two books and is included in the Appendix.

Course Implementation

Discussion on teaching the course led the authors to build upon two models for presenting the material. It was decided the first segment involving the “*The Seven Habits of Highly Effective People*” would be presented using an interactive seminar model. Using this type of presentation exposes the students to one of the primary professional development methods they will use in their pursuit of life long learning, namely attendance at seminars which also provides opportunity for interpersonal development. This segment of the course consists of two weekly sessions with handouts developed to emphasize certain key learning and reflection points. The first half of this portion of the course deals with developing the key points essential for the “*private victory*”³ associated with personal integrity and trustworthiness.

The “*private victory*”³ centers on teaching the students three specific habits. These include the habits of “*Be Proactive*”, “*Begin with the End in Mind*”, and “*Put First Things First*”.³ The purpose of these habits has the student looking at themselves and evaluating their trustworthiness as a person. Emphasis is placed on the need for them to be true to themselves and to personally follow certain guiding principles in life in order for others to choose to follow them. This is essentially an “*examination of conscience*” coupled with reflection and insights on formulating action plans to increase their trustworthiness.

The second phase of this first part of the course then shifts to examining what are the essential elements of developing interpersonal effectiveness. Any leader without followers is just taking a walk through life and it is critical that students know how to personify those characteristics and traits for interpersonal effectiveness.³ Called the “public victory”³ by Dr. Covey, this segment focuses on three more habits. These include “*Seek Win-Win*”, “*Seek First to Understand Then to be Understood*”, and “*Synergy*.”³ Students quickly realize their effectiveness can be compounded significantly by others who choose to work cooperatively with them in the pursuit of worthwhile goals.

The final habit, “*Sharpen the Saw*,”³ addresses the need for every person to develop their multifaceted nature. Students become more aware of their physical, mental, social/emotional and spiritual dimensions and develop action plans for ensuring that they grow in each of these critical areas of their lives.

The second half of the course discusses the material in the book “*Developing the Leader Within You*” by Dr. John C. Maxwell.⁴ The model for learning this material requires the students themselves become the teacher. Students are divided into small teams of three or four individuals who collectively select a chapter in the book which they want to teach. Students develop a lesson plan, handouts and presentation methodology for their class. Each class highlights the speaking and writing enhancement desired by ABET¹ and the University. Students understand their need to prepare and present material which is similar to what they will be doing in industry. Consequently, they readily embrace this unique opportunity.

The instructors also sit through each class, taking notes and offering any additional information and insights based on their familiarity with the subject. At the end of each class a critique is presented to the student teachers. The entire class provides answers to three questions designed to help the students improve their teaching ability. These questions include “As instructors, what did you learn from teaching this class?”, “How did the instructors do in presenting this material?” and “What was missing from the instruction which, if included, would enhance the learning?” The students are primarily seniors and they exhibit tremendous excitement, energy and enthusiasm for this method of teaching and learning more about leadership.

Another major segment of the course which occurs during the second half of the term involves students’ actually experiencing leadership in action. This is done quite dramatically with students watching a movie demonstrating the leadership characteristics and traits of the main actor.⁵ Three movies used for this leadership experience include “*Braveheart*,”⁶ “*Gladiator*,”⁷ and “*The Patriot*.”⁸

Assigned to teams of three or four students, they are required to watch their chosen movie two times. Each viewing helps students visually witness the leadership effectiveness of the main character. The critical viewings are followed by the requirement to write and present a paper on the leadership traits exhibited by the central figure in the movie.⁵ Using these movies affords the students with a very dynamic, graphical and pictorial representation of three distinctly different leaders, their personal leadership style and what they did to inspire and motivate others to follow them.

Finally, there are two examinations in the course. The first occurs immediately following the “*The Seven Habits of Highly Effective People*” seminar presentation. The second test takes place immediately following the student instructor segment for “*Developing the Leader within You*.” Exams consist of true/false questions, multiple choice, and matching questions. The final grade is a composite of the two exams, the leadership analysis paper, and class participation.

Assessment of Course Effectiveness

Although no formal quantitative measurement of course effectiveness has been made, student evaluations at the conclusion of the course, as well as student comments after graduation provide an assessment of the effectiveness of the course. On course evaluations, students consistently indicate the highly stimulating nature of the course. Comments indicate students appreciate the activities for personal introspection and the resulting opportunities for personal growth. Students also comment on how the course content, learning environment and assignments help them develop their self-confidence, interpersonal skills, and leadership abilities.

Some students and graduates indicate this was the most interesting, important and useful course of their academic careers. Many find themselves using what they learned in this course in their professional and personal lives considerably more than their technical knowledge. Some of these comments have been solicited through student evaluations or letters from graduates related to faculty promotion. Other comments have been unsolicited. A recent graduate emailed the lead author regarding how topics covered in the course have become much more significant to him during his first year of employment. The student realizes how important leadership is to the success of his company and has attended training classes where the emphasis has been on leadership, motivational and communication skills, rather than the technical aspect of construction management. He added that the leadership course really changed his outlook on his career.

Conclusion

As stated in General Dwight Eisenhower’s quote at the beginning of this paper, “The one quality that can be developed by studious reflection and practice is leadership.” Understanding the principles behind effective leadership requires students to first examine themselves and their current mindset as it relates to personal and interpersonal effectiveness. Students reflect seriously on their individual trustworthiness and their ability to inspire trust in others by the example and authenticity of their lives. They quickly identify and realize the characteristics and traits of people they would chose to follow and then develop action plans to emulate these in their personal lives.

Specific and concrete examples throughout the entire course illustrate how students can greatly enhance their leadership skills by studying the underlying principles associated with effective leadership. Exposure to the leadership movies followed by an analysis of what caused the main characters to be effective affords the students ample opportunity for discussion on the principles of leadership.⁹

Since the students are at the senior level in their undergraduate education, they had the opportunity to work during the summer months. That experience provides them with contrasting examples of supervisors who are leaders and those who operate only out of positions of power.

After taking this course, they are able to specifically identify “what” and “why” these “leaders” were so effective or ineffective in the student’s opinion. Encouragement is given to the students to constantly monitor, assess, develop and implement those characteristics and traits essential for effective personal and interpersonal leadership effectiveness. Finally, student evaluations and personal comments regarding this course rank it among the very best the students have taken in their undergraduate education at the University.

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Appendix

ET 1115 – Engineering Leadership Syllabus

Text: “*The 7 Habits of Highly Effective People*” by Covey/“*Developing the Leader Within You*” by Maxwell

Class	Subject	Text Sections	Homework Assignments
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1	Course Introduction and Requirements	None	None
2	Leadership vs. Management	Handout	
3	Overview of Seven Habits	"7 Habits" Pgs. 45-62	App Exer = AE Session "0"/AE-2,3
4	Inside-Out Approach/Private Victory	Pgs. 13-45	Sess "0"/AE-4,5,6
5	Habit 1 – Be Proactive	Pgs. 63-80	Sess "1"/AE-1,2
6	Habit 1 – Circle Influence/Concern	Pgs. 81-93	Sess "1"/AE-3,4
7	Habit 2 – Begin with End in Mind	Pgs. 94-118	Sess "2"/AE-1 in class
8	Habit 2 – Identifying Your Center	Pgs. 119-128	Sess "2"/AE-2,3,4
9	Habit 2 – Personal Mission Statement	Pgs. 129-144	Continue working on previous AE's
10	Habit 3 – Putting First Things First	Pgs. 146-162	Sess "3"/AE-1
11	Habit 3 – Quadrant II/Roles and Goals	Pgs. 163-182	Sess "3"/AE-2,3
12	Habit 4 – Public Victory	Pgs. 183-204	Sess "4"/AE-1
13	Habit 4 – Seek Win/Win/6 Paradigms	Pgs. 204-215	Sess "4"/AE-2
14	Habit 4 – Five Dimensions of Win/Win	Pgs. 216-234	Sess "4"/AE-3
15	Habit 5 – Seek First to Understand/Empathy	Pgs. 235-244	Sess "5"/AE-1,2
16	Habit 5 – Four Autobiographical Res/Perceptions	Pgs. 245-260	Sess "5"/AE-3
17	Habit 5 – Empathetic Listening Exercises		Sess "5"/AE-4
18	Habit 6 – Synergize	Pgs. 261-270	Sess "6"/AE-1
19	Habit 6 – Third Alternative	Pgs. 271-277	Sess "6"/AE-2
20	Habit 6 – Valuing the Differences	Pgs. 278-284	Sess "6"/AE-3
21	Habit 7 – Physical/Spiritual Renewal	Pgs. 285-294	Sess "7"/AE-1 (P&S)
22	Habit 7 – Mental/Social-Emotional Renewal	Pgs. 295-307	Sess "7"/AE-1 (CM/SE),2
23	EXAMINATION NO. 1		
24	Revisit Leadership vs. Management	Handout	
25	Four levels of Leadership	Pgs. 1-13	UD-1
26	Leadership is Influence	Pgs. 13-16	
27	Conclusions on Influence		
28	Priorities-Key to leadership	Pgs. 19-34	UD-2
29	Time Management Matrix	Handout	
30	Integrity-Most Important Ingredient	Pgs. 35-38	UD-3
31	Credibility-Acid Test of Integrity	Pgs. 39-47	
32	Positive Change-Ultimate Test of Leadership	Pgs. 49-63	UD-4
33	Resistance to and Creating Change Climate	Pgs. 64-74	
34	Problem Solving to Gain Leadership	Pgs. 75-86	UD-5
35	Problem Solving Process	Pgs. 87-96	
36	Attitude, Attitude, Attitude	Pgs. 97-106	UD-6
37	Changing Your Attitude	Pgs. 107-112	
38	People-The Most Appreciable Asset	Pgs. 113-123	UD-7
39	Courage to Confront/People Development	Pgs. 123-137	
40	Vision – Eyes of Leaders	Pgs. 139-149	UD-8
41	Corporate Ownership of Vision	Pgs. 150-159	
42	LDR's Price Tag-Self Discipline	Pgs. 161-172	UD-9
43	Integrity and Character	Pgs. 173-178	
44	Staff Development-Leader's Zest	Pgs. 179-184	UD-10
45	Winning Teams/Picking Right People	Pgs. 185-199	
46	EXAMINATION NO. 2		