

# **An Experimental Course for First-Year Students: Leadership in Engineering**

**Mary E. Goodwin  
Iowa State University**

## **Abstract**

A first-year leadership course was created for engineering students. The purpose of the class was to develop stronger leadership skills in undergraduate engineering students early on in their college career. This was done by actively engaging students in leadership activities that gave opportunities for practicing skills while also providing classroom instruction on leadership theories, issues, and concepts. Industry has expressed a need for graduating engineering students to have stronger leadership skills and since it is believed that these skills can be learned and developed through active involvement in student organizations, this was incorporated into the overall construction of the course. Results from analyzing the journal writings of students in the class show that this course had a substantial impact on them, not only on how they viewed leadership, but also in their reported gain in self-awareness and knowledge about others in terms of personality and gender differences, communication styles, teamwork, and conflict management. While the students will be followed for the next four years to look at longitudinal data, the initial findings indicate that this can be a valuable course for first-year students.

## **Introduction**

At Iowa State University, the Engineering Industrial Advisory committee asked the college to strengthen the leadership skills of their engineering students. While the college had several leadership programs, they did not have a specific leadership development class for students. As a result, an experimental first-year leadership course was created for engineering students. The purpose of the class was to help develop leadership skills in undergraduate engineering students early on in their college career. Students were required to be actively involved in a student organization to be in the class.

Several leadership courses at different universities, including Maryland, Minnesota and Penn State, were reviewed. The University of Maryland had a couple of courses of interest: Advanced Leadership Seminar, EDCP 417, and from The James MacGregor Burns Academy of Leadership; Action, Change and Leadership in Groups, BSOS 359M. The University of Minnesota had a Leadership Minor program which included Personal Leadership in the University, EdPA 1301W/ PA, Leadership, You and Your Community, EdPA 3302W/PA 3961W, and Leadership in the World, EdPA 4303W/PA 4961W. Penn State had an Engineering Leadership Development Minor. This minor had a few courses of interest such as Leadership Principles, Engr 408, Leadership in Organizations, Engr 409 and Creativity, Innovation and

Change, STS 497B. The author narrowed the curriculum down to meet the constraints of an experimental class for first-year engineering students.

### **Student Profile**

Sixteen students initially enrolled in the class, however, one had to drop due to a severe illness. Thus, the final tally for the class consisted of ten females and five males. Of the fifteen students, there were three students who were undeclared engineers, three mechanical engineers, two industrial engineers, one aerospace engineer, two civil engineers, two computer engineers, one material science engineer, and one was a chemical engineering student. After the spring 2004 semester, two female students left the college of engineering but remained at ISU.

Of the fifteen students who stayed in the class throughout the semester, twelve had entered ISU the previous fall 2003 semester. Three of the students had entered the year prior, at the start of the fall 2002 semester (two males and one female). The overall cumulative grade point average for the students in the class at the end of the spring 2004 semester was 3.07 on an average of 52.4 credit hours. While most freshmen finish their second semester with approximately 30 credits, for the twelve students who had entered the previous semester, one had over 69 credits, another one had 56 and five had between 37 and 47 credits. Only one student finished the spring semester with less than 30 credits. This student was one of the two students who eventually transferred out of engineering. The overall ACT composite scores for the fifteen students averaged 28.9 and the ACT math scores averaged 28.7.

### **Course Delivery**

While there are many perspectives on leadership, the author chose to concentrate not on positional leadership but on leadership within. The two main texts used for this course were *Exploring Leadership: For College Students Who Want to Make a Difference*<sup>3</sup> and a supplemental text used was *Leadership: A Communication Perspective*<sup>1</sup>. Komives *et al.*<sup>3</sup>, referred to their leadership model as Relational Leadership, which in the literature on leadership most closely aligns with the transformational model of leadership.

Among the objectives listed for the course on the syllabus were the following:

- Understand the importance of self-knowledge.
- Enhance developmental and interpersonal skills.
- Explore various leadership frameworks.
- Understand gender influences in society and on leadership.
- Discover the multi-disciplinary nature of leadership studies.
- Identify and discuss ethical dilemmas in leadership.
- Develop a personal definition of what it means to lead and of the role of personal responsibility in leadership.
- Begin building a leadership portfolio that demonstrates and integrates classroom learning, leadership experiences, and personal reflections.

The class met once a week for approximately 60 to 90 minutes. Course expectations and assignments included required attendance and class participation. Journaling daily for 10 minutes

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was another assignment, but it was not checked. Most of the students reported that they found the journaling to be very difficult. Reflection papers that were at least a page in length were due each week. Reflection papers could be written about any topic from the journaling notes, from the readings or supplemental handouts, from in-class discussion, or from issues related to their leadership role in a student organization.

All students were paired with an upperclassman who served as their mentor for the semester. A final report of three to five pages summarizing the journaling and the reflection that took place throughout the whole semester was due at the end of the semester. Students were also asked to write out their personal philosophy of leadership, and their leadership action plan that included four sections: (1) how did they plan to apply certain leadership theories and concepts; (2) their observations of various leadership and participant roles that they engaged in throughout the semester (styles, differences, team and group effectiveness: what worked, what didn't work, and why); (3) their plans to use the Relational Leadership Model; and (4) their leadership development action plan for the next two years.

Each week different topics were covered and students were asked to read a chapter or two in the main text along with supplemental reading material. The first few weeks of the semester, the students covered topics such as differences in personality using the Myers-Briggs model, leadership theories, communication and conflict management. Other topics covered included critical thinking, the formation of teams, ethics, and vision. In the students' reflection papers it was remarkable to see how these topics affected the students.

### **Personality Differences**

In regards to how people can have different personalities and ways of approaching projects and deadlines, students wrote the following in their reflection papers:

- “The most striking fact I learned this semester is that people are different.”
- “I figured out why I would get upset with people wasn't because something was wrong with them it was just that we had different ways of doing things... You have to adjust to who you are working with... By understanding the personality differences of the people you are working with you can better understand why people act the way they do in dealing with different situations.”
- “However, in the few weeks of class when we looked at the Myers-Briggs personality test, I learned that leadership takes all kinds. There is no perfect personality formula for a leader. I began to see that maybe introversion wasn't a shortcoming of mine, just a trait that makes me who I am.”
- “I was very intrigued by the handout we got about the ways Myers-Briggs different personality types become stressed and react to stress... my reactions over the past two weeks are almost exactly what described for my type (ENFJ)... I become very irritable, obsessive, and self-critical. I had a tendency to be short with the other co-chairs... I'm actually pretty disappointed when I think about I felt and acted, but I think that now I realize how I let me attitude be affected by stress, I can learn to control it better.”
- “I'm one of those people that everyone else has to plan around, which is kind of nice because then it's not really me that has to make the decision, it's them... It's kind of nice

because I can easily schedule out every minute of my day, and know exactly what is going on. And the schedule is very inflexible so every day I'm 90% sure of everything that's going to happen that day. I am a pretty strong "j" so that's how I like it...Now I'm starting to see people differently, and kind of knowing how I should treat them so I can get the best output from them without making them mad...I have a suitemate...He's a pretty strong "p"...so I just presented him with the idea to think about, then I went back to him this afternoon and he'd thought it over and able to give me a definite answer...Before this class, I probably would have been in his room about every hour asking him if he'd made a decision yet! So this class is definitely paying off already!"

It appeared from their comments that just learning that people could have different personalities that lead them to approach deadlines and projects differently seemed to have a tremendously positive affect on these students as they struggled to deal with students who were "different" from them.

### **On Communication**

Communication is a critical component of any leadership course. In this course, the focus remained on the basics, however, handouts included material from the text, *Leadership, A Communication Perspective*<sup>1</sup>. A communication professor also presented twice to the students. Below are a few of the comments from students' reflection papers regarding their communication skills:

- "...How can I become a leader if some of the basic traits that a leader should have, that is, effective communication, elude me?...I have major problems in the communication area, especially with people who do not think the same way I do."
- "Another thing I need to work on is communicating with others. I am fairly introverted, so I am usually not one to start a conversation...This skill is the one that I would like to improve the most. Good communication skills are very important in a group and a leader needs to speak with the entire group and let them know what is going on."

### **Gender Schemas**

Students were all asked to write at least a page on their thoughts about the required reading in Valian's<sup>4</sup> book on gender schemas. The handout given to students on this topic consisted of chapter six titled, "Schemas that Explain Behavior" and chapter seven titled, "Evaluating Women and Men"<sup>4</sup>. The discussion of schemas can be used in many areas besides gender, but due to the disproportioned number of women in engineering and in leadership positions in our society, these chapters were chosen. Below are some of the student responses to these readings:

- "I thought that schemas only affected perception when meeting people, but this article stated that it is a perpetual lens through which we see others actions." (Female student.)
- "Gender schemas are so deeply engrained in all of our minds that we don't even realize they affect our decisions, reaction, and outlooks...Surprisingly, women are just as guilty as men of the tendency to expect men to do better than women, therefore being more critical of women." (Female student.)

- “The reading on gender schemas was, in my opinion, interesting and I picked up a lot of tidbits that I could relate back to the reality around me...One thing I found shocking is that both sexes are ready to admit that women are less capable than men, especially in a position of authority.” (Female student.)
- “I was shocked that one woman was denied a partnership because she was too masculine and instead, they suggested she attend charm school. This is not the gender blind world I thought I lived in, I would like to think that is changing but after reading these two chapters and mulling over the points made, society has a long way to go.” (Female student.)
- “I found this article to be very interesting...I was a little shocked when this article talked about the woman not getting hired for her job because she didn’t wear skirts and makeup...I actually became a little angered when I read the part about the resumes. I was also very surprised when this article explained the experiment with the four items in the room...Why would the women get more negative facial expressions than the man even by another woman? It really caught me off guard. I guess I would have at least expected the male to give the woman a negative look, but certainly not the female!” (Female student.)
- “I am an eccentric individual who thinks and communicates like the stereotypical male. That annoys women who are used to getting equal talk time with other females and do not like competitive speech. It also makes men defensive that a mere girl is trying to “win” in their conversation.” (Female student.)
- “I thought the chapters on schemas were very interesting, especially those about gender. I agree that subconsciously we make assumptions without knowing much about an individual...I like reading this topic because I had never given much thought to the reasoning behind schemas or how they were formed. I thought the studies on perception of leadership between genders to be especially interesting.” (Male student.)
- “The two chapters on schemas gave an interesting perspective to everything...The story about the professional women is interesting because I have noticed women’s suggestions being overlooked at several meetings.” (Male minority student.)
- “...I really liked this reading because I could see a lot of real world examples to fit the studies with both my mom in her CFO position and with my dad as the owner of a business.” (Male student.)

It was clear that the students were very surprised by what they read. Many of the women were especially affected by reading that the females as well as males can have “negative” schemas about women. The women students used words like “shocked”, “surprisingly”, “little angered”, “very surprised”, and, “It really caught me off guard”, when they discussed that part of the reading.

### **Main Text**

The students found the text to be easy to read and informative. Below are a few of the comments regarding the text and the assigned readings:

- “I just read chapter 10 of Exploring Leadership and I was very intrigued by the concept of the five whys. This is a great tool to explore the deepest meaning of any organization and what compels people to participate in it.”
- “I very much enjoyed the last chapter, and the emphases put on self-renewal and balance for the leader.”
- The best piece of advice I read in the book was for the need to understand yourself – strengths and weaknesses – to become a great leader.”
- “I found it interesting to read about the different leadership theories since the 1800s.”
- “It was interesting reading about the different states of group development...I never realized all the different roles people play in various groups.”
- “I think the Five Whys could be a very effective technique...The section on ethics was extremely important.”

### **Learned from the Course**

The students seemed to take away a lot from the course. Below are some comments from both the final evaluation of the course and from a few reflection papers regarding their overall thoughts on what they learned:

- “I came into this class thinking that I was already an exceptional leader and that there was not much more for me to learn. Luckily, I can admit when I am wrong. I may have been a leader, but that does not mean I was a good leader.”
- “...was how I could improve my interactions in society...Learning how to listen was another important lesson I discovered recently, and it has made working with people so much easier.”
- “The most striking fact I learned this semester is that people are different. It seems simple, but I always treated everyone I was leading with the same expectations, the same lack of feeling, and eventually, the same frustration. It took this course to tell me that this approach to people was erroneous and unreasonable.”
- “Before I took this class, I thought that being a leader meant that you were involved in as many activities and organizations as possible. In high school, I thought was a great leader...Needless to say, after taking this class, I was able to realize that there is a lot more than that in being an effective and great leader.”
- “...I am now able to realize that the main objective I need to work on is to be a great listener...From the many different leadership roles I have had, I do not think I used listening as effectively as I should have...I feel that it is best to use “Relational Leadership Model” because that is what seems to work the best.”
- “...I actually feel that I took a lot from this class. There were several downfalls that I found in myself as a leader that I can now rectify and improve. One example is listening, I feel that I am a good listener, but I tend to overtake the floor...I catch myself...now and make attempts to hold my thoughts...”
- “I was able to learn many new concepts about leadership this semester. I enjoyed using the book to read about different theories and ideas regarding leadership...I think I learned the most about working in groups and how to utilize and motivate others...sometimes I probably relied on certain people too much instead of trying to involve new people. One

thing I need to work on is realizing the different skills of all the team members and how to utilize those skills.”

## Assessment

Students were asked to assess each class period, the course objectives, the mentor component and the journaling and reflection requirements anonymously. The evaluations were overwhelmingly positive. On a Likert scale of 1-5 with five being strongly agree, all areas evaluated rated over 4.0.

On the evaluation form asking students whether or not the reflection papers were worth doing, all the students responded “yes”. Below are some of the common responses on the students’ evaluation form regarding the writing of reflection papers:

- “That’s where I focused on what I read or learned and how to apply it to my life.”
- “They provided an opportunity to look back on the past week...It helped me to collect thoughts.”
- “It forced me to think about what I was learning more so than the journal, since I had to turn it in.”
- “Very important! They help us to gather thoughts, work out ideas, and stay involved in the class.”
- “Helped me collect my thoughts from the week and think about how I viewed leadership in my experiences during the week.”
- “...putting my thoughts on paper really helped me understand myself better.”

## Conclusion

To summarize, the development and first delivery of an experimental leadership course for engineering students was achieved spring 2004. This course was well-received by the students. Overall assessment showed that students could immediately put to use the knowledge they were gaining in the class. The students reported that they felt more confident in continuing to develop their leadership skills by having taken this course. Analyses of the students’ writing showed that this course had a substantial impact on them, not only on how they viewed leadership, but also in their self-reported gain in self-awareness and knowledge about others in terms of personality and gender differences, communication styles, teamwork, and conflict management.

The initial findings indicate that this can be a valuable course for first-year engineering students. Studies will still be needed to assess the long-term impact of this course on students’ leadership development as the students near graduation. Additionally, the author would like to determine if there are any gender differences in how the students receive the course and how they may be affected by the course. Lastly, as in all of higher education, especially in engineering and in leadership studies, the intellectual development of a student is an extremely important goal. Using the King-Kitchener Reflective Judgment Model, the author would like to incorporate more ways to assess the students’ developmental level through class assignments and promote the intellectual development of these student leaders.

## References

1. Hackman, M. Z., & Johnson, C. E. (2004). *Leadership: A communication perspective*. Long Grove, IL: Waveland Press, Inc.
2. King, P. M., & Kitchener, K. S. (1994). *Developing Reflective Judgment: understanding and promoting intellectual growth and critical thinking in adolescents and adults* (1st Ed.). CA: Jossey-Bass.
3. Komives, S. R., Lucas, N., & McMahon, T. R. (1998). *Exploring Leadership: for college students who want to make a difference*. CA: Jossey-Bass.
4. Valian, V. (1998). *Why so slow: The advancement of women*. Cambridge: The MIT Press.

## Biographical Information

MARY E. GOODWIN

Directs several programs for the College of Engineering, including the following areas: academic standards, orientation, advising, transfer issues, retention and women's programs. Previously, worked nine years as an engineer in the construction industry. B.S., Industrial Engineering, M.S., Civil Engineering, Ph.D. student in Industrial Technology. Address: 110 Marston, Iowa State University, 50011. Email: goodwinm@iastate.edu