AC 2010-132: AN ON-LINE COURSE TO HELP ENGINEERS (STUDENTS AND PROFESSIONALS) DEVELOP INTERPERSONAL SKILLS – YOU'RE KIDDING, RIGHT?

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Abstract

An on-line course was developed to serve the needs of specific learners. Course material is presented using text, videos, and readings. Student interaction with the instructor is primarily through email while student-to-student interaction is facilitated using an on-line discussion board. Assessments include reflective writings, on-line tests, and quantification of participation in the discussion board. Student evaluations indicate that the course is effective at enabling students to improve interpersonal skills and meet specific ABET program criteria. Evaluations also indicate that students consider the on-line learning experience to be as good as a traditional classroom experience.

Context for the Course

The College of Engineering & Applied Science has two new programs that serve non-traditional audiences and require presentation of courses through non-traditional means. The first is a combined Bachelor of Science in an engineering discipline with a Master of Business Administration program for high achieving students and the second is a Master of Engineering program targeted to working professionals. For the combined Bachelors / MBA program, students often need to take a course while on a co-operative work assignment. Since many of these assignments are away from the university, a distance learning format is required. Likewise for working professionals, a distance learning format facilitates participation.

The course "Effectiveness in Technical Organizations" was developed to meet the content needs of these two programs. Engineering students in the combined bachelors / MBA program benefit from a course that introduces topics they will see in greater depth in the MBA program. Technical professionals in the workforce who have never had a course on organizational effectiveness can gain insights and skills through such a course, particularly one that is framed around technical organizations. While it may seem counterintuitive to provide such a course in a distance learning format, this is required to reach these student groups.

Course Description and Topics

The overarching goal of the course "Effectiveness in Technical Organizations" is to improve a technical professional's ability to contribute to a business organization through improvement in non-technical skills. The course was specifically developed to facilitate interpersonal skill development in the context of a technical organization so the examples, topics and discussions would be relevant to this specific population.

The course is presented in four distinct modules.
Module 1 - Assessment of skills and aptitude. This module includes these topics:

- Learning styles[1]

- Leadership traits
- Personal characteristics that aid or detract from interpersonal effectiveness
- Development of personal learning objectives

Students complete assessments related to these topics and write a reflective paper on the implications of these assessments. After competing a reading assignment students also develop a set of strengths, core values and areas for improvement. Students develop these into a set of personal learning objectives that are specific to their goals for the course and their skill development needs. The students are encouraged to take responsibility for meeting these learning objectives.

Module 2 – Communication. This module is organized into the following topics:

- A model of communication that describes the communication process and what can cause that process to be less than affective
- Discussion of core communication skills[2]
- Johari Window Model[3] which presents a description of our interactions with others, how to give and receive feedback, and the role communication plays in these
- Written communication framework for effectively presenting results and presenting new ideas
- A Meeting facilitation section that provides guidelines for conducting meetings that accomplish specific tasks

Material is presented as instructor developed readings, short video modules and readings from journals.

Module 3 – Enabling Others to Succeed. This module presents material intended to help develop an understanding of why people do what they do and how to direct or modify that behavior. Topics covered are:

- Three different Models of Motivation that describe behavior in terms of individuals' needs and professional development.[4,5,6]
- A model of Conscious / Competent behavior that focuses on the need for self-awareness[6]
- A Task / Relationship model that describes the balance needed for productive outcomes[6]
- A model describing appropriate use of time in a technical organization[6]

The importance of communication is reinforced in the material in all of these models. Material is presented as instructor developed readings, short video modules and readings from journals.

Module 4 – Leadership and Effectiveness presents material focused on leadership behavior rather than becoming a leader. Topics include:

- The Situational Leadership model[7]
- A model of personal effectiveness[6]
- Daniel Goleman's Emotional Intelligence Model[8]

Material is presented as instructor developed readings, short video modules and readings from journals.

Course Pedagogy

The pedagogy employed in the course varies considerably form that of most courses taken by engineering students. Traditional courses appropriately require students to master concepts and apply these to engineering-based problems. This course required some mastery of nomenclature and elements of models but these formed a small portion of the learning objectives. In most cases the teaching / learning methods employed were:

1. Provide written content to read
2. Reinforce written content with video presentation of content
3. Provide extended reading from an outside source that amplified, complemented or described implementation of the concepts
4. Require students to reflect on the content and participate in discussion related to the content
5. Have students critically reflect on the implications for the topic on their individual effectiveness

The on-line format provides a good mechanism for providing text-based and audio / video based content so that different learning preferences can be accommodated.

The on-line format and intentional structure of this course also require students to be more responsible for their learning than in most traditional courses. The course was presented in an asynchronous fashion but within the confines of the schedule of the traditional term. Students were given weekly assignments to cover content, participate in discussions and submit homework but they had significant freedom as to when these were accomplished during each week. Moreover, the development of the personal learning objectives reinforces the need for students to be responsible for what they learn and the skills they develop.

Interactions

Students' primary means of communication with the instructor is through email. Purposeful interaction between students is fostered through a discussion board. In this forum, the instructor posts a question, describes a work situation or suggests a particular point of view and then has the students respond. The topics are based on the readings for the particular module. Students are provided instructions on the time frame to respond and the measure of an appropriate response. In most cases, students are required to respond (in a thoughtful fashion) to the material posted by other students. Students are always encouraged to develop more dialogue around the topic than what is required by the grading rubric.

For each of the academic terms the course has been taught, individual students have only asked to meet with the instructor on one or two occasions. These meetings have primarily reflected the student's uncertainty in participating in an on-line course. No student has asked to meet more than once.

Assessment

There are several types of assessments used to determine student performance in the course and obtainment of learning outcomes.

Reflective Writings – students complete five to six reflective writings. These are based on specific learning objectives and tied to specific course content. A typical assignment asks students to summarize a topic in their own words, describe an individual / organization that exemplifies the topic, and evaluate their own ability regarding the topic.

On-Line Tests – two tests are given over portions of the content. The tests are not so much a measure of content mastery but rather a formal method of focusing students to obtain the stated learning objectives. The tests are time limited and typically require an explanation (short essay) of a scenario regarding a particular course concept.

Quantification of Participation – a measure of contribution to course discussions. Students are given specific instructions on the discussion board topics including the timeframe of participation and the number of expected contributions. Student grades are dependent on meeting these participation expectations.

Personal Development Plan – serves as the final assignment. Students are required to submit a plan that describes how they intend to continue to develop interpersonal skills. The plans are specific to the skills they have identified as important to their professional development.

Interpersonal Skill Development

One of the initial assignments requires students to consider various interpersonal skills, identify those they feel they have and those they need to develop, and to select five they feel are most critical to their development. For those five needed skills students are required to write a brief paper identifying:

- An individual widely recognized as having this skill
- An individual they know (in a work organization preferably) who posses this skill
- Barriers to achieving this skill
- Steps the student could take to acquire the skill

At the conclusion of the course, students are required to redo the interpersonal skills assessment indicating where they feel they have made improvements since first completing the list. In addition, the students re-evaluate the five skills they felt were most needed. For those skills the students are required to submit a paper regarding their personal plans to acquire or further develop those skills after the course is completed.

Table 1 is the list of interpersonal skills. Indicated on the table is the number of students (from the past three terms) who feel that they have made improvement in that skill through the course. A total of 43 students have taken the course in the past three terms.

There are some obvious limitations in the data, primarily the fact that these improvements are based on the students' own assessments. There are also concerns about fully understanding what constitutes having a skill and how a skill is measured.

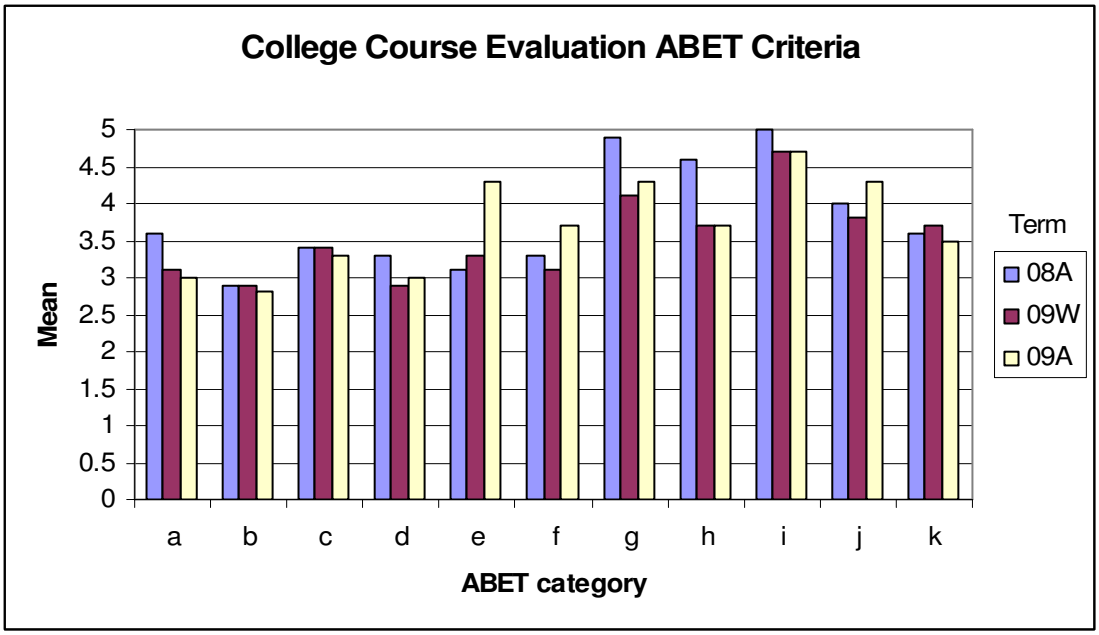
Table 1 Interpersonal Skills Improvement

Interpersonal Skill	# reporting improvement
Critically reflects on own effectiveness	22
Seeks input from others	22
Is open in communication and willing to accept feedback	20
Can write a clear, concise position paper	16
Listens better than they talk	16
Uses time as a strategic resource	16
Can talk with ease to people at all levels in the organization	15
Communicates enthusiasm and approachability	13
Communicates positive visions of the future	13
Communicates goals clearly	12
Coaches and counsels others for effectiveness	11
Faces problems and makes appropriate changes	11
Convinces others that ideas have merit and value	11
Takes responsibility	10
Leads team-based contributions	10
Positively influences others, with or without authority	9
Successfully resolves interpersonal conflicts	9
Creates work environment conducive to productivity	9
Is reliable	7
Is trusted by others	6
Is courageous	6
Makes hard decisions	6
Promotes innovation	6
Is sought as a consultant / mentor / coach	5
Takes risks appropriately	4

Student Course Evaluations

Two distinct course evaluations were administered to students; a standard evaluation used by the college and an assessment developed by the instructor to more specifically evaluate the on-line format and, to a lesser extent, the nature of the content. Both evaluations used a Likert scale with 1 indicting "strongly disagree" and 5 indicting "strongly agree". The results of the evaluations are compiled for the three terms the course has been offered.

Figure 1 shows results of the college evaluation focused on meeting ABET program requirements a- k.[9] The Term (08A, 09W, 09A) refers to the academic term the course was taught.



Engineering programs must demonstrate that their students attain:
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Figure 1 College Course Evaluation – ABET Criteria

Figure 2 illustrates general evaluation from the college. The items addressed were:

- Overall, how do you rate this course (left hand column)?
- Overall, how do you rate this professor (right hand column)?

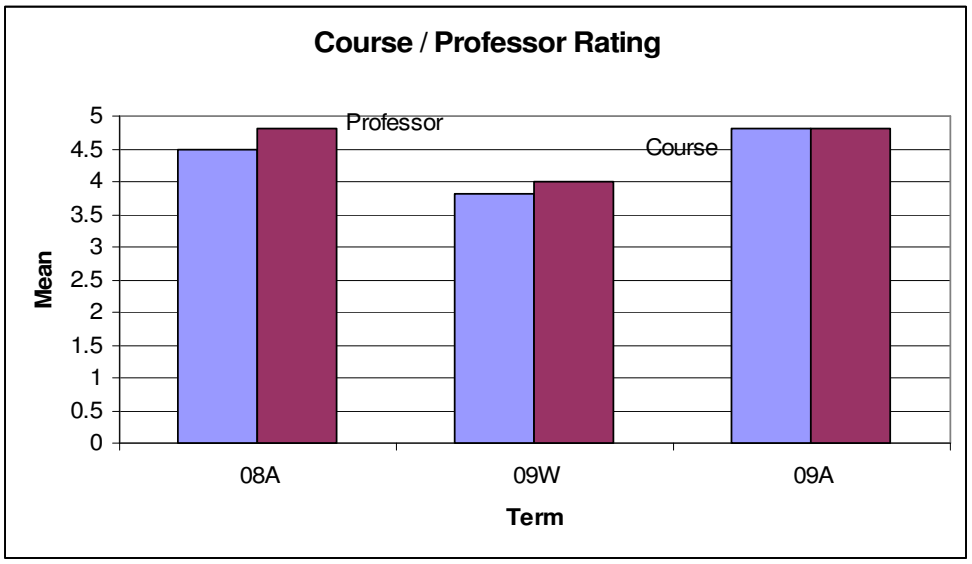


Figure 2 College Course Evaluation – General Measures

Table 2 presents selected results of the course specific evaluation that was intended to determine the effectiveness of the on-line format.

Table 2 Course Specific Evaluation

Evaluation Question	Mean
Compared to other classes I've taken, I enjoyed the online format *as much as* a traditional classroom lecture class	4.2
It was difficult to stay motivated for this course	2.3
The course (content, format and interactions) enabled me to improve my interpersonal effectiveness	4.6
Compared to other classes I've taken, the overall learning experience was *as good as* a traditional class	4.4
The class suffered by not having regular, scheduled meeting times	1.8
Lack of face-to-face communication (with other students and the instructor) was a detriment to the class	2.1
The video modules of the instructors were effective at presenting the content	4.4
The readings were an effective way to present the content	3.6
The Discussion Board was an effective means to discuss course concepts	4.2

Discussion

The results are very encouraging in that every student reports improvement in multiple areas. Moreover, given the content and structure of the course, improvements in communication (including feedback and seeking opinion of others), setting goals, and critical reflection are

expected. A surprising result is the number of students who identified improvement in "using time as a strategic resource". Perhaps the necessity of students taking responsibility for their learning facilitated this outcome.

The skill development described in Table 1 is somewhat surprising since the course does not deal with a number of the skills listed (e.g. innovation, courage, risk taking). However, for most students this is the first time they have been in a structured learning environment where they have been required to critically reflect on aspects of their effectiveness and competence regarding interpersonal skills. The fact that students are provided this opportunity leads them to consider these skills and recognize that they are important to success.

Many students take the course during the senior year when they are also heavily involved in design teams. For these students, this course provides a framework for discussing teamwork and facilitates skill development at a time when these can be immediately implemented. It is the opinion of the author that this scenario leads to reporting of skill attainment that is not specifically addressed in the course.

Communication is emphasized in the course so skill development in this area is expected. While all communication through the course is essentially written, oral and written communications are equally discussed, and feedback as an essential element of communication is also emphasized.

Regarding ABET program outcomes, it was expected that students would indicate the course helped with: f) an understanding of professional and ethical responsibility; g) an ability to communicate effectively; h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context; and j) a knowledge of contemporary issues. The evaluation that the course engendered i) a recognition of the need for, and an ability to engage in life-long learning was a pleasant surprise.

The evaluation results reported in Table 2 indicate that from the students' perspective this course can be taught effectively in an on-line format. While a few students did indicate that a lack of face-to-face interactions were detrimental, the majority of students did not. In addition most students did not feel it was difficult to stay motivated for the course despite the lack of regular meetings. The high score for "Compared to other classes I've taken, the overall learning experience was as good as a traditional class" is an encouraging indication that students can learn in an on-line environment and enjoy the experience.

Content presented through videos was more highly regarded than content presented through the readings. The course did require more reading than many students had experienced for some time and some students indicated that the quantity of reading was burdensome. However, there was no general indication that the readings were not an effective means to present the content.

The discussion board was used extensively during the course and students indicate that it is an effective means to discuss concepts. From an instructor's point of view, while the discussion was adequate, there were very few instances where students engaged in more than the required dialogue. Continuing and more robust discussion is a desired outcome that has not yet been obtained.

Conclusion

Student comments and course evaluations indicate an appreciation for the content presented in the course. Students gain both an understanding of and an appreciation for the role interpersonal skills play in enabling a successful career. While many students have an abstract idea of certain interpersonal skills, a structured learning environment provides a robust and quantifiable means to discuss and develop these types of skills.

Likewise, student comments and course evaluations indicate that individuals can develop interpersonal skills in an on-line course – no kidding.

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