

## **2006-2504: INTEGRATING TC2K INTO A MULTI-DISCIPLINARY SEMINAR COURSE: FINDING A HOOK FOR THE “SOFT” OUTCOMES**

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# Integrating TC2K into a Multi-Disciplinary Seminar Course: Finding a Hook for the “Soft” Outcomes

## Introduction

The Department of Engineering Technology at the University of North Carolina at Charlotte (UNCC) has developed and implemented a comprehensive program leading to an academic environment of continuous improvement consistent with the ABET Technology Criteria 2000 (TC2K).<sup>1</sup> This paper describes practical techniques currently employed to effectively integrate a select subset of the new TC2K accreditation criteria into a junior-level seminar course with enrollment open to electrical, mechanical, and civil engineering technology students. In particular, this paper will discuss assessment and evaluation techniques used for specific Program Outcomes generally recognized throughout the engineering technology community as those “soft” yet essential skills that allow engineers to effectively function and grow as members of the society that they serve. These outcomes are noted in Table 1 below lettered appropriately as they appear in the ABET TC2K criterion. This paper addresses and providing practical methods for implementation and assessment for each of the following outcomes in turn.

Table 1. Applicable ABET TC2K Outcomes for ETGR 3071, “Engineering Technology Professional Seminar,”

- (e) An ability to function effectively on teams.
- (g) An ability to communicate effectively.
- (h) A recognition of the need for, and an ability to engage in lifelong learning
- (i) An ability to understand professional, ethical and social responsibilities.
- (j) A respect for diversity and knowledge of contemporary professional, societal and global issues.
- (k) A commitment to quality, timeliness, and continuous improvement.

There have been many papers published in the last few years on the topic of assessment as it relates to TC2K. Experts have long debated the pros and cons of assessment at the course level versus program level assessment and the potential for linking student achievement directly

to program outcomes<sup>2,3,4,5,6</sup> This paper examines a facet of UNCC's systemic approach to assessment that links course assessment directly to ABET TC2K. Although generally considered a "non-technical" course, ETGR 3071, "Engineering Technology Professional Seminar," provides a unique perspective on integrating engineering disciplines into the classroom as a model of their future relationships in the real world. With electrical, mechanical, and civil engineering technology students, the resulting diversity served well as a precursor for examining these outcomes from different engineering perspectives and created a rich environment for sharing insights and perspectives across disciplinary boundaries. ETGR 3071 was structured to empower students in a multi-disciplined, integrated environment to explore a number of relevant topics pertinent to their success as a student and as a future practicing engineer. Presentations and class work included traditional instruction, guest speakers, group projects, extensive student writing, and student group presentations on selected topics. This paper will highlight selected innovative techniques for addressing, assessing, and evaluating the outcomes noted above and provide insights into the benefits of integrating electrical, mechanical, and civil disciplines into the same learning environment.

**Outcomes: (e) An ability to function effectively on teams;  
(g) An ability to communicate effectively; and  
(k) A commitment to quality, timeliness, and continuous improvement.**

This course was designated as one the "writing intensive" courses within the curriculum where students would make a deliberate effort to demonstrate and develop their ability to write and communicate effectively. During the course of the semester, students were required to submit nine (9) essays on a wide variety of topics. Assessment rubrics covered the expected fundamentals of good grammar and prose but also examined the students' ability to write effectively with appropriate sentence construction, formation of an appropriate theme, and the development supporting evidence. As a natural extension, concepts of quality, timeliness, and continuous improvement were aptly demonstrated and reinforced through course policies and through independent student research. All assignments were due at the beginning of class – with no exceptions. Students became aware that there existed absolute standards for timeliness of submittals that were rigidly enforced. Further as a medium for demonstrating the concept "continuous improvement," assessment on student writing skills was performed on a "sliding" scale, that is, with each successive submittal, the rubrics identified expectations and grading criteria that clearly shifted to higher levels of achievement for a comparable grade. Consequently, students practiced compliance to an environment characterized by a clear expectation of continuous improvement. Finally, students were divided into 3 or 4 person groups and required to research and prepare a formal presentation dealing with the pursuit of quality within the industry. Group presentations documented initiatives in the practicing community that contribute and /or testify to their commitment to quality, timeliness, and continuous improvement. Students became aware that quality, timeliness and continuous improvement although certainly relevant to their current academic environment, were a concept fully embraced by industry across the engineering spectrum.

**Outcome: (h) Recognition of the need for, and an ability to engage in life-long learning.**

The in-class presentation/lecture documented the evolution of science and technology over the previous fifty years and the corresponding necessity for continued learning to stay competitive in the job market and industry. As a follow on, students were required to select three practicing engineers in a field of their choice and document formal expectations by the company/corporation pertaining to continued learning through either formal educational venues or established on-the-job training. Based on their research, students submitted a short essay that detailed the need for life-long learning and subsequently their commitment to the practice as a prerequisite for success in their chosen field. Assessment indicates that students developed a keen awareness of the need for both the ambition and the requirement for life-long learning.

**Outcomes: (i) An ability to understand professional, ethical and social responsibilities and (j) A respect for diversity and a knowledge of contemporary professional, societal and global issues.**

Introducing these topics for discussion began with a related topic immediately pertinent to the students: The UNCC Code of Ethics dealing with Academic Integrity. Topics covered policies, penalties, and procedures for dealing with a variety of issues in the academic realm including

- Cheating
- Fabrication or Falsification of Information
- Multiple Submission of Academic Work
- Plagiarism
- Abuse of Academic Materials
- Complicity in Academic Dishonesty:

Assigned homework required students to create a written essay detailing the University expectations for ethics and academic honesty and the student's commitment to honoring the Code.

With their academic environment as a backdrop, the class then shifted their focus forward in time to when they would be working members in the engineering field. Students were presented seven common ethics scenarios with multiple-choice responses (see Appendix A, "Pretest"). Each scenario dealt with a different contemporary professional, societal and/or global issues including diversity matters such race and gender. However, the scenarios were brought out of the typical "generic" hypothetical and set in a practical, work-related environment. A pretest was administered to gauge student awareness and perceptions to the various situational parameters and considerations. Afterwards, discussions ensued both collectively and in small groups addressing each of the various scenarios. Finally, a posttest was administered to document any changes in the students' awareness and appreciation for acceptable ethical behavior. The data resulting from these tests is shown graphically in Figure 1 and in each case

indicates an increase in student awareness for ethical considerations. Building on in-class presentations and discussion, students submitted a short essay detailing their perceptions covering particular aspects of the wide range of professional ethical, social, and diversity issues as to their application, their validity, and their relevance to either the students current academic circumstance or their future as a practicing engineer.

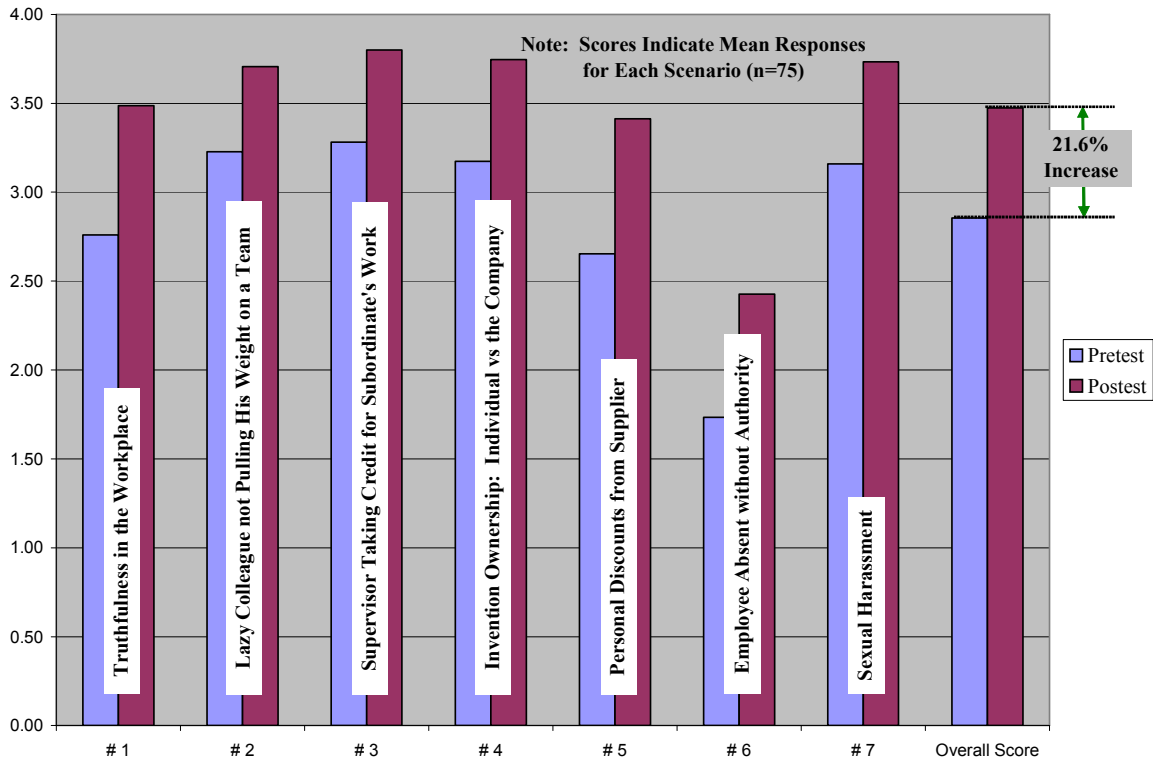


Figure 1. Ethics Class Pretest and Posttest Comparative Results Regarding Seven Ethical Scenarios.

The assignment was assessed for general compliance and support for standard accepted codes of ethics recognized within the industry similar to those noted in the ASCE Code of Ethics. Based on in-class presentations and discussion, students demonstrated a general acceptance of the Industry Code of Ethics and the University Code of Ethics. Student discussion indicated that they grasped the subtleties of ethical behavior and the inherent difficulty in applying rigid standards in a variety of real-world situations. Essays testified to the student awareness and their intent to follow commonly accepted ethical practices in the workplace.

## Conclusion

Assessment and evaluation of the TC2K Criterion 2 Program Outcomes has now been in the field for six years. Nevertheless, the engineering technology community continues to struggle at times to find appropriate opportunities, venues, and techniques to development student skills consistent with those less technical, more “soft” yet essential skills that allow

engineers to effectively function and grow as members of the society that they serve. This paper demonstrates that even a general multi-disciplined junior seminar can be a viable medium for implementing process improvement initiatives supporting these critical outcomes. Certainly, this one-hour course should not represent the complete treatment of the outcomes within the curriculum, but this paper testifies to the potential that this target of opportunity provides for the faculty member who is committed to continuous improvement of a program dedicated to produce graduates with the requisite skills and abilities for success in a ever-increasing technical and complex world.

### **Bibliography:**

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Appendix A: Ethics Questions - Pretest

Please answer the following questions by placing the letter corresponding to your choice in the blank beside the number.

- \_\_\_\_\_ 1. **You miss a day of work because you have partied too hard the night before. The following day, during a meeting, your supervisor asks why you were not in. What do you say?**
  - a. Explain to your supervisor that you were ill.
  - b. Explain to your supervisor that an emergency came up at home that entirely consumed you.
  - c. Tell your supervisor you were absent for personal reasons.
  - d. Tell your supervisor you were ill because of over-partying.
  
- \_\_\_\_\_ 2. **For several months now, one of your colleagues has been slacking off, and you are getting stuck doing the work. You think it is unfair. What do you do?**
  - a. Recognize this as an opportunity for you to demonstrate how capable you are.
  - b. Go to your supervisor and complain about the unfair workload.
  - c. Discuss it with your colleague in an attempt to solve the problem without involving others.
  - d. Discuss the problem with the human resources department.
  
- \_\_\_\_\_ 3. **In a department meeting, your supervisor takes credit for some excellent work of a colleague who is absent. What do you do?**
  - a. Put the word out to your fellow workers as to who really did the work.
  - b. Seek a private meeting with the supervisor in order to make sure your colleague gets credit, at least in the supervisor's head.
  - c. During the meeting with "the big boss" in advertently let it slip that your colleague did not get the credit he deserved on a recent project.
  - d. Inform your colleague as to what took place and let him take whatever action he desires.
  
- \_\_\_\_\_ 4. **While working for your company, you invent a device that has a potential for making you wealthy. You used the company's lab and test facilities but did the work on your own time. What do you do with your invention?**
  - a. Take it to the legal department for determination of ownership rights and appropriate disposition.
  - b. See a local attorney and have him file for a patent in your name.
  - c. Submit your invention for consideration for awards in your company's "ideas count" program.
  - d. Contact those companies who would have interest in your invention; sell it to the highest bidder.
  
- \_\_\_\_\_ 5. **You are in Production Control. Planning on adding a porch onto your house, you visit a lumberyard to get ideas and a price. During the discussion, the sales manager says, "oh, you work for XYZ Company. They buy a lot from us, so I'm going to give you a special discount." What do you do?**
  - a. Like finding a \$20 bill on the street. Take the discount, of course.
  - b. Explain to the sales manager, "I'm in production control, not purchasing at XYZ."
  - c. Ask for clarification, "Is that special discount available to all XYZ employees?"
  - d. If a deal sounds too good to be true, it probably is. Thank the salesman, but walk out.
  
- \_\_\_\_\_ 6. **A co-worker as a defense plant signed up for a training course. You know he did not attend the course but was not at work either. How do you handle the situation?**
  - a. It is not your business, so you stay out of it.
  - b. Speak to your supervisor about the co-worker's absence.
  - c. Send an anonymous letter to the company's ethics office.
  - d. Speak to your colleague about this discrepancy and see what his explanation is.
  
- \_\_\_\_\_ 7. **When a male supervisor talks to a female employee, he always addresses her as "Sweetie." You have overheard him several times. As the supervisor's manager, should you do anything?**
  - a. No, since no one has complained.
  - b. Yes talk to the supervisor and explain that, while he may have no sexual intention, his use of "Sweetie" may cause resentment among some of the employees.
  - c. Yes. Order the supervisor to call an all-hands meeting and apologize for the unintended slights.
  - d. No, because there is nothing wrong with calling a female employee "Sweetie" or other endearment.