AC 2010-2: PROFESSIONAL DEVELOPMENT BUFFET: FROM BANQUET TO À LA CARTE

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Professional Development Buffet: From Banquet to À La Carte

Abstract

Both ABET and industrial advisory boards encourage engineering departments to include instruction in “soft skills” that reflect the broader professional qualities necessary for student success in their careers. These include oral and written communication, ethics and professional behavior, resume and interviewing skills, electronic and professional etiquette, information literacy, and broader knowledge of engineering solutions in a global or societal context. While some departments dedicate one or more instructional credits to accomplish this objective, others may integrate such topics into existing core courses. This paper presents a one-credit model for a junior-level course in professional development in chemical engineering at a large public university. The topical content which has been developed may also be used “À la carte” for incorporating elements into existing engineering courses if there is not room in the curriculum for an integrated course of this type. The complete course content, including the syllabus, subject matter presentations, assignments, and relevant links, is available on a public web site for use by engineering instructors: (www.courses.ncsu.edu/che395). Course evaluations indicate that students assign high values to this required seminar.

Introduction

Engineering departments employ different strategies for introducing soft skills such as writing, oral presentation, teamwork, information literacy, and ethics. A frequently used approach is to utilize a first year course, either within the department or at the college level. Depending on the resources available on campus, departments may choose to “outsource” this material by having students taking a technical writing, public speaking class, and/or engineering ethics class through the English or Communications Departments. Some departments choose to integrate this material within existing courses, such as senior design or labs, as evidenced by “writing across the curriculum” efforts. Finally, a few departments have a dedicated course later in the curriculum, but this is not as common due to the demands of the curriculum. (Add other literature from Dave’s folder)

In this paper we describe a one unit junior/senior seminar course in professional development of a variety of soft skills. The course integrates writing and speaking opportunities in a variety of formats to address the ABET soft skills areas. The course lecture materials are found on the web site (www.courses.ncsu.edu/che395). Reading assignments appear on the website and in two books of case collections involving technology and society. Speaking opportunities include a mock job interview, a technical case history, and a memorized poem.

Course Content

The course topics, sequence and assignments appear in Table 1. The class and assignments include practice in writing (Assignments 1-4) and oral presentations (Assignments 2, 5, 6), lectures and discussions on ethics (Assignments 4, 5), case histories on technology and society (Assignment 3), and current issues in science and technology (Assignments 4 and 5), and a literature search to update a case history (Assignment 3).
### Table 1: Semester Class Schedule

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC</th>
<th>DELIVERABLES</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Semester Overview</td>
<td>Read pp. 1-10&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Career Options and Professional Registration</td>
<td>Assignment 1: Randy Pausch assignment</td>
</tr>
<tr>
<td>3</td>
<td>Interviewing Skills</td>
<td>Read pp. 355-358&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>4</td>
<td>Resumes</td>
<td>Read pp. 339-354&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>5</td>
<td>Student presentation I Mock interview with Instructor</td>
<td>Assignment 2: Mock Interview &amp; Resume Company/school summary</td>
</tr>
<tr>
<td>6</td>
<td>Information Literacy (Engineering Librarian via on-line modules)</td>
<td>Read pp. 233-253&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>7</td>
<td>Tips on Writing</td>
<td>Read pp. 361-376&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>8</td>
<td>Tips on Oral Presentations</td>
<td>Read pp. 305-321&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>9</td>
<td>Ethics I: Ethical Frameworks</td>
<td>Assignment 3: Review Article Read pp. 11-21&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>10</td>
<td>Ethics II: “What if ….” Scenarios (Student Conduct Office)</td>
<td></td>
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<tr>
<td>11</td>
<td>Graduate and Professional School</td>
<td>Assignment 4: Opinion Paper</td>
</tr>
<tr>
<td>12</td>
<td>Intellectual Property, Patents, and Standards</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Professional Behavior and Electronic Etiquette</td>
<td>Read pp. 323-331&lt;sup&gt;8&lt;/sup&gt;</td>
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<tr>
<td>14</td>
<td>Student Presentations II Issue: Pro/Con/Personal (scheduled outside of class)</td>
<td>Assignment 5: Oral Presentation Read pp. 269-290&lt;sup&gt;8&lt;/sup&gt;</td>
</tr>
<tr>
<td>15</td>
<td>(Exam Period)</td>
<td>Assignment 6: Recite a poem or excerpt from speech, essay, or poem from memory</td>
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**Addressing ABET “soft skills” in six assignments**

These topics address ABET Engineering Criterion 3 (f)-(j), the so-called “soft skills.” While treatment of these topics in any single lecture is necessarily only a brief encounter, the clear serial, weekly encounter in class, augmented by subsequent writing assignments and oral presentations, keeps each topic in students’ sights for a considerable time, thereby maximizing use of the modest time available for a one unit course.
Table 2: Relation of Assignments to ABET 2000 “soft skills”

<table>
<thead>
<tr>
<th>ABET Criteria:</th>
<th>Related Assignment:</th>
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<tbody>
<tr>
<td>(f) an understanding of professional and ethical responsibility</td>
<td>4, 5</td>
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<tr>
<td>(g) an ability to communicate effectively</td>
<td>1-6</td>
</tr>
<tr>
<td>(h) the broad education necessary to understand the impact of engineering</td>
<td>3-5</td>
</tr>
<tr>
<td>solutions in a global and societal context</td>
<td></td>
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<tr>
<td>(i) recognition of the need for, and ability to engage in life-long learning</td>
<td>3-5</td>
</tr>
<tr>
<td>(j) a knowledge of contemporary issues</td>
<td>4, 5</td>
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</tbody>
</table>

Criterion 3: Program Outcomes and Assessment: “Engineering programs must demonstrate that their graduates have…”

The course website structure appears in Table 3, which links the student to further resources in all key areas: syllabus and grading, professional development (including both industry roles and graduate schools), ethics, writing and speaking, resumes, and interviewing.
Table 3: Course website structure

<table>
<thead>
<tr>
<th>Syllabus and Grading Checklists</th>
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<tbody>
<tr>
<td>• Syllabus</td>
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<tr>
<td>• Grading checklist for written reports</td>
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<tr>
<td>• Grading checklist for oral presentation</td>
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<tr>
<td>• Grading checklist for interview</td>
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<td>• Grading checklist for resume</td>
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<tr>
<th>Professional Development</th>
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<tr>
<td>• FE/PE exam</td>
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<td>• What I like about my CHE job</td>
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<tr>
<td>• CHE job descriptions</td>
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<tr>
<td>• Electronic etiquette</td>
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<tr>
<td>• CHE grad school information, grad school contacts and graduate school rankings</td>
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<tr>
<td>• Law school tips and contacts</td>
</tr>
<tr>
<td>• Med school tips and contacts</td>
</tr>
<tr>
<td>• MBA tips and contacts</td>
</tr>
<tr>
<td>• Graduate/professional school entrance exam info</td>
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<table>
<thead>
<tr>
<th>Ethics</th>
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<tbody>
<tr>
<td>• A Framework for thinking ethically</td>
</tr>
<tr>
<td>• Engineering ethics presentation</td>
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</table>

<table>
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<tr>
<th>Writing and Speaking Material</th>
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</thead>
<tbody>
<tr>
<td>• On-line resources at the library for CHE 395 projects</td>
</tr>
<tr>
<td>• Writing technical reports</td>
</tr>
<tr>
<td>• Writing resources</td>
</tr>
<tr>
<td>• When to cite</td>
</tr>
<tr>
<td>• Effective presentations</td>
</tr>
<tr>
<td>• Seven deadly sins of presenters</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Interviewing Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sample interview questions - industry</td>
</tr>
<tr>
<td>• Sample interview questions - grad and professional school</td>
</tr>
<tr>
<td>• Interview tips</td>
</tr>
<tr>
<td>• Cheat sheet for interview preparation</td>
</tr>
<tr>
<td>• Resume tips</td>
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<tr>
<td>• Resume action verb examples</td>
</tr>
<tr>
<td>• Cover letter tips</td>
</tr>
<tr>
<td>• Recruiters’ top 10 resume pet peeves</td>
</tr>
<tr>
<td>• Tips on career fairs</td>
</tr>
<tr>
<td>• The alumni speak</td>
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<tr>
<td>• Illegal interview questions</td>
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</table>


It is convenient to discuss assignment specifics in the context of the ABET criteria. As several of the criteria involve personal ethics, responsibility, (working) relations with others, and awareness of the larger world, we logically begin with a reflective first assignment to draw out the students and remind each of their individuality and uniqueness. Here we ask the students to step back from the rush of endless lectures, homework, and tests and to consider their lives to date and their hopes for the future. The opening video lecture presentation by terminally ill Carnegie Mellon professor Randy Pausch works well to inspire the students to take a long range view of their lives. (All assignments here appear in the course syllabus as shown).

**Assignment 1: Randy Pausch assignment**

Watch “The Last Lecture” outside of class (http://www.thelastlecture.com/). (The video lasts a little over an hour).

Choose one of the following prompts and write a two-page essay on this topic:
- What were your childhood dreams? Are you on track to achieve them?
- What are the brick walls you’ve faced in your own life? How did you get over them?
- Who are the mentors you can turn to? What lessons have they taught you?
- What has been your biggest mistake, and what did you learn?

The essay should show evidence of reflection. You are telling your own story – make it personal and compelling!

The second assignment requires the student to create a resume which is consistent with a chosen job position announcement and the company/agency that offers it. The student must research the host company and write a single page summary of the company, size, location(s), employment, and main products and services. In addition, a literature and database search should identify recent activities of the company, including current business, technical and legal successes/problems. This activity prepares the students to be more active in a subsequent mock interview with the course instructor.

We position the resume/corporate profile and mock interview writing assignments early in the semester, so they aid students preparing for the Engineering Career Fair as well as corporate interviewing on campus for summer intern, co-op, and permanent positions.
Assignment 2: Mock Interview

You will have an individual 20-minute mock interview (to be scheduled outside of class). Since each student has different interests, you should choose a company/job position OR graduate/professional school OR non-profit group with which you would like to work following graduation. You should bring the following documents to the interview:

- a copy of your resume (one page maximum)
- a copy of the job description that you are interviewing for, or a short description of the graduate program you are applying for
- a one page summary of the company/school you are interviewing with, and references used to compile the information.

The interview, the resume, and the one-page summary will be graded.

Note: Footnotes are not necessary for the one page summary, but if all you’ve done is cut and paste information from company or school web site, you will get a poor grade on the summary. You should seek not only information from the company, but news articles from the business and technical literature that give additional insight into the company/school. On a second page, list a minimum of five references you used to obtain this information.

- The position you are interviewing for should be one for which you would eligible upon graduation, i.e. an “entry level” position or graduate program.
- The job description can be one that you get from ePack, a website like www.monster.com, or a short description of the graduate program to which you’re applying.
- The one page summary should contain the type of information that you might find in preparing for an interview – location(s) of the company, major products, brief history (especially if it’s a company – was it a spin-off of other companies, or bought by another company), financial status of the company (stock price history), recent news articles about the company (e.g. leadership changes, new plants built, new products, etc.) For a graduate program, you would be interested in the requirements for the degree, admission standards, specifics about their research programs (technical degree), options within the curriculum (med, law, business), recent news articles about their program, program ranking (e.g. *U.S. News and World Report* or other ranking surveys, etc.)

The ABET criterion (h) reads that each student shall have “the broad education necessary to understand the impact of engineering solutions in a global and societal context”. The next writing assignment asks each student to select an individual chapter from a technology and society text concerning case histories where technology has gone awry in some way, following the usual sequence of detected serious side effect, news
development, public alarm, institutional responses, and short and long term resolutions. The carefully researched cases in Lawless’ book, *Technology and Social Shock*, present a neutral, factual recounting of about forty examples. Students choose their individual topics, thus maximizing the initial interest of the writer and the subject. An advantage of most cases is that they have existed for a sufficient period such that the student can see the impacts of the engineering (and economic and political) solutions in a social, and at times global, context.

**Assignment 3a: CASE 1 SUMMARY**

All of the proposed cases are taken from *Technology and Social Shock*, Edwin Lawless, Rutgers University Press, NJ, 1977.

**READ:**
- “Introduction” and “About This Study” by author
- YOUR case history chapter.

**WRITE:** One-page summary
- State your issue (chapter title)
- Summarize the issue and resolution (as of 1977) in one page.

**Choose one from “Technology and Social Shock” collection, which includes:**

- Human artificial insemination
- Oral contraceptive safety hearings
- Southern corn leaf blight-a genetic engineering problem
- The great cranberry scare
- The diethylstilbestrol ban
- The cyclamate affair
- MSG and the Chinese restaurant syndrome
- Botulism and bon vivant
- The fish protein concentrate issue
- The fluoridation controversy
- Salk polio vaccine hazard
- The thalidomide tragedy
- Hexa, hexa, hexachlorophene
- Krebiozen-cancer cure
- DMSO-suppressed wonder drug
- Abuse of medical and dental X-rays
- X-radiation from color TV
- Introduction of the lampreys
- The Donora air pollution episode
- The *Torrey Canyon* disaster
- The Santa Barbara oil leak
- Mercury discharges by industry
Having set the “global and social context” stage, we turn to ABET criteria (i) and (j) devoted to life-long learning and contemporary issues. The Lawless text was published in 1977, so the next assignment demonstrates to students that using electronic searching provides a path to updating any particular technical issue, in this case via news reporting since the 1977 case summary appeared. The student must find where the issue has traveled in the intervening thirty years to 2009. If the issue continues, the update focus is the logical continuation. If the issue has become moot (fully resolved, no longer problematic), the student must find a newer “problem” related to the first, and provide a thirty-year profile, with news references, for the assignment. Details of the assignment appear below.

Assignment 3b: UPDATE (ASPECTS OF) CASE 1

Search via NCSU library website for newspaper, journal, and magazine articles which are mostly post-1980 and describe a major development of (your choice):

- Update on the exact issue/chemical, etc. which you read about, OR
- Update/new development of cases for related issues (e.g., from “particular pesticide in cranberries” to any pesticide in any other food crop) OR
- Update/new development based on a theme similar to your Case I reading (e.g., how has government vs farmer vs industry played out in a more recent, related/same crop area)
- Your analysis should address the technological life cycle that we discussed in class.
- Length: 2-3 pages, plus up to one page of references (at least six references, at least three must be non-websites, no Wikipedia).

While the first case and its update concern information generally presented in neutral context, the next challenges the student to summarize partisan views and then choose his/her own ground with justification. The source text, Taking Sides: Clashing Views on Controversial Issues in Science, Technology, and Society, provides a four-page YES and NO positions for contemporary issues, posed in the form of questions (Table 4). Here the student must be neutral in reporting the views of others, and then be partisan in summarizing a personal opinion. The student is also asked to reflect on the likely ethical framework utilized by the text protagonists and himself as well.
**Table 4: Contemporary issues with ethical implications**

**Assignment 4:** Choose one chapter from list below or your own topic


The Place of Science and Technology in Society
- Should peer review dominate decision making about science?
- Is science a faith?
- Should creationism and evolution get equal time in schools?

The Environment
- Do we face a population problem?
- Are human activities significantly changing the global climate?
- Are environmental regulations too strict?

Health
- Do cell phones cause cancer?
- Is irradiated food safe to eat?

Space
- Can humans go to Mars now?
- Does law enforcement technology threaten the fourth amendment?

The Computer Revolution
- Is it worthwhile to continue the search for extraterrestrial life?
- Should the Internet be censored?
- Will screens replace pages?
- Will it be possible to build a computer that can think?

Ethics
- Is the use of animals in research justified?
- Should genetically modified foods be banned?
- Is it ethical to sell human tissue?
- Is it ethically permissible to clone human beings?

Other ideas, or come up with your own!
- Should Merck be liable for Vioxx effects?
- Is the use of corn and other biomaterials to make biofuels really energy effective?
- Were levees in New Orleans well designed?
- Are the profits of pharmaceutical companies excessive?
- Should drilling be allowed in the Alaskan National Wildlife Refuge?
- Should stem cell research be allowed?
Peer-to-Peer Teaching on Contemporary Issues

Assignment 5 requires the student to prepare a ten minute talk (with 5 minutes of questions) to summarize the Assignment 4 paper. This exercise accomplishes two tasks. First, the student must present all views (Yes/No/Personal) in an unbiased and clear style, yet must attempt to persuade the audience on behalf of each point of view. This practice in putting on the "skin" of each stakeholder in a given issue is good training, along the lines of the old adage, "Seek first to understand, then to be understood." As a bonus, the seventeen or more issues identified in Table 4 are reported to the entire class. Thus, the class benefits as a whole through (re)visiting a substantial range of contemporary issues, again nicely addressing an ABET criterion, since each student must attend and submit questions on four presentations in addition to his own.

Informal sharing of a poem, essay, or speech

A final Assignment 6, described in Table 5, provides an informal atmosphere within which each student delivers a memorized piece of poem, essay or speech.

Table 5: Memorized delivery

<table>
<thead>
<tr>
<th>Assignment 6: Poem or Speech (last day of class)</th>
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<tr>
<td>Choose a poem or an excerpt from a speech/essay and commit it to memory. Your presentation should be between 1-2 minutes long. You should choose something that is personally meaningful to you and something which will challenge you in terms of memorization and delivery. Avoid any selections that contain profanity or offensive language. You will be graded on the level of difficulty of the material that you choose as well as the quality of your delivery.</td>
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</table>

The topic choices oftentimes reveal, and thus share, personal favorites of the students. Examples this semester included Lincoln’s Gettysburg address, a Shel Silverstein poem from *Where the Sidewalk Ends*, a poem and a national anthem from the home countries of several international students, and a poem in French (with slides in English). It was encouraging and enlightening for us as instructors to see that several of the non-native students used this opportunity to educate their US peers in aspects of non-Western cultures. With few exceptions, however, the deliveries were relatively monotone, with little dramatic effect. Perhaps we should add to the ABET criteria an ability to energize, entertain, and excite an audience?

The instructors also are a part of the last day festivities. Dr. Bullard delivered her annual rendition of “The Grinch Who Stole Christmas”, a fine piece accompanied by slides of the Seuss story pictures, but nary a word clue…truly an honest memorization. To continue the levity, Dr. Ollis recited “Arithmetic”, a short poem by (an eventual) North Carolinian, Carl Sandburg:
Arithmetic is where numbers fly like pigeons in and out of your head. Arithmetic is where you win or lose, and it can tell you how much you have if you know how much you had before you won or lost. Arithmetic is seven eleven all good children go to heaven, or five six bundle of sticks.

If you take a number and double it, and double it again and keep on doubling, it gets bigger and bigger and higher and higher, and only arithmetic can tell you what you have when you decide to quit doubling.

Arithmetic is multiplication, where you carry the multiplication table in your head and hope you don’t lose it.

Arithmetic is where you squeeze a number from your head to your hand to your pencil to the paper and hope you get the answer.

Arithmetic is where the answer is right and everything is nice and you look out the window and the sky is blue...or the answer is wrong and you have to start over again and see how it comes out next time.

If you have two animal crackers, one good and one bad, and you eat one and a striped zebra with streaks all over eats the other one, how many animal crackers will you have if some one gives you five six seven and you say no, no, no, and you say nay nay nay, and you say nix, nix, nix?

If you ask you mother for one fried egg for breakfast and she gives you two fried eggs and you eat both of them, who is better at arithmetic, you or your mother?

Course details in Syllabus

The course is taught in sections of 25 students apiece, large enough to be efficient for our demand of four to five sections per year, but small enough to allow the instructors to draw out and personally connect with a number of students in each class period. The text for the writing portion, Finkelstein’s Pocket Book of Technical Writing is written by an engineer, with humor, and covers very nicely a wider variety of writing challenges than we can engage in the course, including business and technical proposals. Finally, while we framed this article in terms of the ABET Engineering Criteria, we note that the lectures, discussions, and deliveries are consistent with the student learning objectives in the Syllabus, which are shown in Table 6:
Table 6: Student learning objectives

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<tr>
<td><strong>a)</strong> Demonstrate skills that reflect the broader professional qualities necessary for success in their careers, including</td>
<td></td>
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<td></td>
<td>• ethics and professional responsibilities</td>
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<td></td>
<td>• oral and electronic communications</td>
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<tr>
<td><strong>b)</strong> Write clear professional documents, including technical reports, summaries, and/or research papers.</td>
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<tr>
<td><strong>c)</strong> Demonstrate a broader knowledge of engineering solutions in a global or societal context.</td>
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<td><strong>d)</strong> Demonstrate information literacy appropriate for the junior level by:</td>
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<td></td>
<td>• Naming a few of the major reference books, journals and databases in their chosen field of study.</td>
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<td></td>
<td>• Performing online searches using basic Boolean logic.</td>
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<td></td>
<td>• Demonstrating a basic understanding of other types of information sources (standards, conference proceedings, patents).</td>
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While each of us has taught the course separately, there is much to be shared and learned through a co-teaching presentation. As an aside, we had not planned to become English teachers, but for this course, the task is important, and unavoidable!

**Course lectures**

The topics of weeks 1-4, 7-8, and 11 are relatively conventional. We provide extensive details for each on the web page [www.courses.ncsu/che395](http://www.courses.ncsu/che395).

The mock interview of week 5 is one of the most important topics, according to student evaluations, because (1) they will soon visit the fall or spring Engineering Career Fair, and (2) it combines use of the company profile, resume, and interview all in the same 15 minute engagement. This arrangement where the (faculty) corporate interviewer quizzes the student about experiences and expectations in light of company needs forces the student to integrate these three items into a reasonably coherent and consistent whole. It also provides the instructor with a fine one-to-one bond with each student, a familiarity which encourages discussion throughout the remainder of the course.

The section on ethics is perhaps less familiar material, but very important, so we provide considerable detail below on the week 9-10 activities involving ethics.
Ethics: Two seminars (weeks 9 and 10)

The first ethics discussion (week 9) provides a framework for thinking ethically. We begin by defining five approaches, adapted from material of the Markkula Center for Applied Ethics:

- **Utilitarian approach**: focuses on the consequences that actions or policies have on the well-being of all persons directly or indirectly affected by the action of policy. The principle states: “Of any two actions, the most ethical one will produce the greatest balances of benefits over harms.”

- **Rights approach**: Ethical action is the one that best protects and respects the moral rights of those affected. Each person has a fundamental right to be respected and treated as a free and equal rational person capable of making his or her own decisions.

- **Fairness approach**: Focuses on how fairly or unfairly our actions distribute benefits and burden among the members of a group. Fairness requires consistency in the way people are treated. The principle states: “Treat people the same unless there are morally relevant differences between them.”

- **Common Good approach**: Presents a vision of society as a community whose members are joined in a shared pursuit of values and goals they hold in common. The community is comprised of individuals whose own good is inextricably bound to the good of the whole. The principle states: “What is ethical is what advances the common good.”

- **Virtue approach**: Focuses on attitudes, dispositions, or character traits that enable us to be and to act in ways that develop our human potential. Examples: honesty, courage, faithfulness, trustworthiness, integrity, etc. The principle states: “What is ethical is what develops moral virtues in ourselves and our communities.”

We then take an empirical approach to considerations of ethics. In particular, we distribute a half dozen problem challenges to the class (Table 7) and invite student teams of two to brainstorm possible solutions for ten-fifteen minutes, then report to the class. The problems utilize situations likely to be encountered by young/new engineers. For each problem, students are urged to follow a methodical process and ask the following questions: What are the relevant facts of the case? What facts are unknown? What individuals and groups have an important stake in the outcome? Do some have a greater state because they have a special need or because we have special obligations to them? What are the options for acting? Have all the relevant persons and groups been consulted? If you showed your list of options to someone you respect, what would that person say?

By assigning each problem to three or four teams, we obtain a variety of responses; students learn that there is not a single right answer. Further, students are asked to identify which ethical approach(es) their problem responses have used, implicitly or explicitly. From this exercise, students may realize that achieving problem resolution among stakeholders in a situation requires hearing the arguments of all sides, and also the ability to perceive any differing ethical approaches represented. If they can perceive this deeper level of knowledge, they will be more successful in conflict resolution by achieving the phrase, “Seek first to understand, then to be understood.”
Table 7  
Problems in Ethics I (in class discussions)"11

Format: Six problems chosen. Divide class of 24 students into twelve teams of two; assign each problem to four teams; give students 10 min to read short problem, pair-share brainstorm, then one minute reporting out by each team. Facilitate discussions of stakeholders in each case, proposed resolution, and identification of ethics framework (s) used in proposed solution(s).

“4.3 Often engineers view the term problem solving as a process involving a mathematical solution. Propose types of problems in engineering that are not mathematical, but require an understanding of the arts and humanities.

“4.7 It is possible for an action to be legal, but unethical. Discuss this using examples.

“4.14 You have an opportunity to work for a defense contractor at an attractive salary with many of the benefits you want in a professional workplace. A problem with the position is that you will have to work on weapons systems. What ethical questions should you resolve, if any?

“4.16 You and a colleague are working on a technical paper to be presented at a national conference. Before the paper is presented, your colleague is fired from the company, and your superior wants you to give no recognition of your colleague’s contribution to the paper. Several alternatives are open to you: give the paper as the sole author, give the paper acknowledging your ex-colleague (risking your position with the company), do not present the paper, or take some other action. Discuss what you would do.

“4.21 When one rationalizes, one makes up false motives for one’s actions so there are no regrets for those actions. A consulting engineer rationalized her actions for giving a kickback as follows: It was a business decision to make the kickback; no one was injured by my actions. In fact, the public received a well-designed project that was completed on time. Plus, without the kickback I would have had to lay off some employees, who would then collect unemployment. Discuss her reasoning." 

The second ethics class (week 10) is lead by Paul Cousins, Director of Student conduct at NCSU. While the previous ethics class focused largely on the behavior of “others”, Paul brings the discussion home by asking the students directly what they would do in five scenarios which are very much “real world” for the students. The class is usually lively, once the students are pried out of their engineering shells and understand the real nature of discussion. The activities posed are very much open ended; that is, they can be continually rephrased by altering the initial circumstances (Table 8) so that each scenario represents a family of closely related problems. This class directly engages each student’s character.
**TABLE 8**
Problems in Ethics II (in class discussion)

**Discussion leader:** Paul Cousins, Director, Office of Student Conduct, NCSU

**Approach:** Create problem situation, ask for student responses. Then “up the ante” by changing the circumstances around the original question, and asking for more student responses. Repeat, so students can clarify the personal ethics involved.

**Examples** (summarized)

1. **Organization officer:** You are a student treasurer, and have $3500 in cash from a Friday night fundraiser. A friend requests $800 to respond to a Saturday emergency, to be repaid Monday morning when the banks open and you are expected to deposit your organization’s funds. What do you do?

2. **Student:** You are a student in a difficult course. Surfing the Web, you find CourseHero.com, which contains information (problems, solutions, exams) for your course posted by other students. To access the materials, you must register and upload course materials and exams from any one of your current courses. What do you do...if your materials were copyrighted?...if you had signed an honor pledge to neither give nor receive aid in your course?

3. **Shopper:** Leaving a grocery store on the weekend, you discover that the cashier has erred and given you an extra $10 in change. What will you do with the money...if you reached your car on a very rainy day before you discovered the error? ...if you did not discover the mistake until you reached your home?

4. **Job hunter:** You interviewed two companies, both with good salaries, but the first has substantial advancement opportunities vs. the second. You are told that you are the second candidate at the first. The second calls and offers a fine job on the spot saying that you are their ideal candidate, etc. You accept their offer after a bit of further negotiation. Days later, the first company calls to say their first choice declined, and you are now their top candidate. What do you do? What if you had signed an acceptance with the second company? In each case, what will each company think of you if you change your choice?

5. **First engineering job:** You are a new engineer in your first job. Months after starting, you notice another new hire taking company things home; paper and pens early, then equipment later (laptops, etc, items not necessary for his job). What do you do...if you were a veteran engineer and a new hire was on your staff? ...if you were new and the second person was your supervisor?

These examples meet the students where they live, as they move from student life, to shopping off campus, to interviewing, to the first job. As most students in the class will already have summer or co-op experience in a corporate setting, even the last circumstance is potentially within their experience. It is always interesting to see student engagement change as we move...
from the largely academic discussions of Table 7 questions to the more personally relevant (and therefore threatening) topics of Table 8!

Rubrics to assess attainment of outcomes

We have no formal assessment beyond the conventional mandated university course and instructor evaluation form used for each semester the course has been taught. However, we will execute a detailed course questionnaire to assess student learning and opinion at this semester’s end, in time to be reported in the June, 2010 ASEE meeting.

Course evaluations

In the last ten offerings of the course, the average course evaluations have been 3.9/5 (for both instructors) and the instructor evaluations have been 4.5/5 and 4.3/5 for Bullard and Ollis, respectively. Representative student comments from the end-of-course evaluations include:

- The course was organized well to provide a great overview of what to look forward to in the professional world. I really liked the interview assignment and feel like it provided great experience and practice.
- The lectures on interviews, resumes, grad school, and the FE/PE exams were important and necessary topics that we need to know.
- Everything from the course was very practical and pertinent to the current progress in our college career.
- I found this course to be useful in many different practical scenarios. Unlike other courses required for the CHE major, skills learned in this course can be applied in numerous situations, such as presentations, resumes, emailing professionals, speeches, research, and more.
- I really liked the mock interview and resume feedback. And even though I was not comfortable with it, the presentation and memorization assignment were helpful as well.
- I learned to proofread during this class.
- Excellent course – I believe that I have learned a great deal that will help me through college and afterwards.
- It became painfully obvious to me during this course that my social skills are sub par. This course was a wake-up call for me to reexamine if I can actually function as an engineer after graduation.

Acknowledgements

The website (www.courses.ncsu.edu/che395) is the construction of author Lisa Bullard. David Ollis is delighted to teach with such a fine colleague and resource in hand. Paul Cousins in the NCSU Office of Student Conduct has been a valuable resource in developing and communicating the ethical scenarios. Information literacy skills were well illustrated by Honora Eskridge and David Zwicky of the College of Textiles Library at NCSU.
References


