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Professionalism Skills: A Framework for a Positive Academic Environment and Enhanced Employment Opportunities

Abstract

Faculty members at many colleges and universities are “lamenting the rise in behavior problems in the classroom.” However the faculty in the Mechanical Engineering Technology (MET) program at the University of Maine (UMaine) has seen consistent improvement in student professionalism in the past decade since we have incorporated classroom activities, classroom management methods, and grading practices related to professionalism. Although we initiated these efforts to support a comfortable and productive classroom climate for both faculty members and students, and particularly for our few students from underrepresented groups, the benefits to students have been broader. We emphasize to students that practicing professionalism skills as undergraduates benefits them directly and immediately since employers of interns and entry level engineers strongly value these skills. The practices are introduced to first-semester students in MET 100, Introduction to Mechanical Engineering Technology, which I have taught since 2001. The skills they develop serve them well in all subsequent courses. The questions answered in this paper include, what “professionalism skills” do our employers need, how do we evaluate these skills and provide feedback for improvement, and how do we incorporate “professionalism skills” in classroom practices? This paper offers some specific methods employed in MET 100, and resulting outcomes the MET faculty members and students have observed. The framework for the methods can be broadly applied to other programs.

Introduction

Faculty members know that engineering employers place significant value on graduate professionalism. In the late 1990’s studies such as the Society of Manufacturing Engineers’ “Industry Identifies Competency Gaps Among Newly Hired Engineering Graduates” began calling for increased communication and teamwork skills in engineering graduates. Recently Norman L. Fortenberry, Executive Director of ASEE, argued in an article in Mechanical Engineering, The Magazine of ASME, that “To operate effectively, next-generation engineers will require a panoply of interpersonal and management skills, in addition to technical proficiency.” He notes that the 2003 National Academy of Engineering study, “The Engineer of 2020,” emphasizes the need for engineers to have professional skills including strong communication skills, leadership skills, and the ability to make good decisions, a strong moral compass, ethics, and cultural awareness.

Employers of UMaine MET graduates value the same skills. In 2001 the MET program responded to employer expectations by developing a new course, MET 100 Introduction to Mechanical Engineering Technology. This course gives first semester students opportunities to learn teamwork and professionalism skills they can apply in internships and in their careers. The program also increased the number of individual and team project-based curriculum elements mimicking professional tasks. For example, students in the first semester graphics class model and extract shop drawings of a miniature steam engine, then they fabricate it in a team in the second semester machine tool laboratory. In this same period the MET faculty also sought improved civility, and a spirit of inclusion, in the classroom. As a faculty we now more
consistently communicate to students that by practicing professionalism skills in the classroom students are more competitive when seeking internships and early career positions. Successful students recognize this relationship, and this student buy-in offers an improved academic environment for both students and faculty.

UMaine MET graduates are very well prepared for the workplace, both technically and professionally, as has been documented from employer and graduate surveys. The College of Engineering recently conducted a “Life After UMaine” survey of 2007-2008 graduates. Of graduates of all the programs in the College, MET graduates reported being the best prepared for employment. Eleven of twenty-one (52%) MET graduates responded to the survey. Ten were employed full-time in the career field. Nine responded that they were “Very Well” prepared for employment, and one responded being “Moderately Well” prepared for employment.

To support this preparation for employment I use the following framework to manage my classroom environment: “Having technical skills is not enough in the workplace. In an engineering environment you will be required to demonstrate strong professionalism skills as well. In this course you will learn about and engage in the attitudes and behaviors employers are looking for, and you will have practiced them so they are routine for you. You will be confident on interviews for internships or career positions that you know what is expected. I will provide you with feedback and help to develop these skills.” This framework allows me to relate productive attitudes and behaviors in the classroom directly to their short-term interests as future interns and their careers after graduation. I can frame classroom issues such as professional communication, working productively with their peers, academic honesty, respect for others, and other attitudes and behaviors directly to the professional behaviors their future employers will value and reward.

This paper does not present the results of a specific study, but gives specific examples of how the above framework can be applied in the classroom. Student and faculty observations are offered as evidence that this framework improves student professionalism and the academic environment.

Professionalism Skills Our Employers Value

How do our employers define professionalism? I offer five perspectives that have supported my framework of teaching professionalism skills.

First, Hammer offers a list of professional attitudinal characteristics sociologists developed in the 1950’s and 1960’s when they began distinguishing the professions from other occupations:

- “use of the professional organization as a major reference, i.e. using professional colleagues as the major source of professional ideas and judgments in practice
- belief in service to the public, i.e. one’s professional practice is indispensable to society and benefits the public
- belief in self-regulation, i.e. one’s peers are the best qualified to judge one’s work
- sense of calling to the field, i.e. dedication to the profession regardless of extrinsic rewards
• autonomy, i.e. one can make professional decisions without external pressures from clients, non-professionals, and employers.”

Second, the 1954 National Society of Professional Engineers Engineer’s Creed broadly defines professional behaviors:

“I pledge:
• To give the utmost of performance;
• To participate in none but honest enterprise;
• To live and work according to the laws of man and the highest standards of professional conduct;
• To place service before profit, the honor and standing of the profession before personal advantage, and the public welfare above all other considerations.”

Third, from a perspective of individual development, Daniel Goleman’s study of emotional intelligence provides a four-part rubric of emotional competencies leading to strong professionalism skills:

<table>
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<th>Self</th>
<th>Social</th>
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<td>Awareness</td>
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<td>- Emotional self-awareness</td>
<td>- Empathy</td>
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<td>- Accurate self-assessment</td>
<td>- Service orientation</td>
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<tr>
<td>- Self-confidence</td>
<td>- Organizational awareness</td>
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<td>Management</td>
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<td>- Self-control</td>
<td>- Developing others</td>
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<td>- Trustworthiness</td>
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<td>- Conscientiousness</td>
<td>- Communication</td>
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<td>- Adaptability</td>
<td>- Conflict management</td>
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<td>- Achievement drive</td>
<td>- Leadership</td>
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<td>- Initiative</td>
<td>- Change catalyst</td>
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<td></td>
<td>- Building bonds</td>
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<td></td>
<td>- Teamwork &amp; collaboration</td>
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Fourth, employers sometimes define their expected professionalism skills when advertising career opportunities. A 2011 position description for an Applications Engineer for J&L Fiber Services, a division of Precision Cast Parts Corporation, listed “Personal Skills and Attributes:”

“Strong work ethic; Strong interpersonal skills; Confidence/assertive; Detail orientation; meticulous with follow-up and documentation; Work in a team environment where the management style is one of participation and empowerment; Ability to work autonomously; Focused efforts yet maintains big picture perspective; Good presence to address groups, presentations, and one-on-one; Energy/drive; Diplomatic; Resilient, optimistic attitude; Team Player; Strong sense of values, high integrity; Desire to stay current on new technology; Flexible, adaptable to change; participate in initiation of change; Be creative and have the ability to move through roadblocks via creative approaches; Take initiative to obtain information, opinions of ideas from well-informed people; Talk persuasively to influence people tactfully; Ability to communicate from mill operator to mill manager level; Be a competent interviewer and listener.”

Finally, a student who had just completed a summer internship at Bath Iron Works, a General Dynamics Company, visited during an office hour and announced, “I realized one day that I was
using everything we learned in MET 100.” I asked him to write an email to the next class of MET 100 students about the importance of professionalism, and portions follow:

Professor Horton,

Hello! I hope your summer was well. Last semester you had asked me to write up a short list of things I learned from MET 100 and later used while working at BIW. So, without further ado, here it is:

Excel: My particular job at BIW didn’t require me to write code. However, I used Excel every day to create lists and organize very large amounts of data. Also, the ability to write macros was considered very valuable.

PowerPoint/Presentations: I used PowerPoint a lot. My biggest project involved throwing together a PowerPoint to present to the Navy. Some things to keep in mind are: Spelling – “latter” and “ladder”, “there”, “their”, and “there” all sound similar but are quite different. Also, “a lot” is two words, not one. The audience is quick to pick up on things like this, especially if they’re misused repeatedly. Format – Don’t clutter the slide show, use readable font and do not write out everything you’re going to say on the slide.

Email: Email is one of the main lines of communication. A lot of emails get forwarded to people working for the Navy or executives. You don’t want a poorly written email getting forwarded, with your name on it.

Organization: Organization is huge. I was working on several different projects at once. Consequently, I had a large stack of drawings, codes, specifications, etc. to keep track of. Nothing looks worse than not being able to find an important document or not being able to tell someone what you did two or three weeks ago because your files aren’t organized. I kept organized, so I never had this problem. However, there were numerous professionals who were not so organized and could not tell me right off whether they had done work on a certain project or not. They would have to hunt around through their files for a considerable amount of time before giving me an answer. The more organized people I worked with looked much more professional.

Be on time. People are busy. They don’t like waiting for you. An easy way to make friends is to be on time. Co-workers also take notice if you are late coming in every day. This includes the boss.

Be Polite. It’s amazing how rude some people can be. I think that most of the time this is unintentional. However, simple things like “Please”, “Thank you”, “Sir” and “Ma’am” go incredibly far.

Dress Well. While I was working at BIW I had several people come up and ask me if I was a new engineering supervisor, simply because of the way I dressed. I also got a higher paying job this summer because I was polite and well dressed. I went into the
This student has provided excellent advice, both affirming the importance of the professionalism skills in an internship, and the success he had in applying them when seeking a position.

Professionalism and Civility

One of our goals has been to improve classroom civility, particularly regarding respectful speech and respect for diversity.

The above perspectives of professionalism incorporate aspects of civility. The University of Maine Employee Assistance Program (EAP) Messenger bulletin titled “Civility: The Key to Successful Interactions with Others” defines civility with four key points:

- “Civility has to do with courtesy, politeness and good manners.
- Civility is complex. The root of the word may help illuminate this. Civility is related to civilization; as such it is both an outgrowth of and a necessary ingredient to being a member of society.
- Civility belongs in the realm of ethics. Mutual respect and concern for others is the foundation. The capacity for empathy is an integral element.
- Civility is good, i.e. it is desirable, both for the individual and for the society at large.”

Companies value workplace civility. For example, Cummins Engine is a diverse, world-wide corporation which identifies civility through its policies, and I have used its policies as class examples. In 1998 a Cummins Engine policy titled “Treatment of each other at work – policy” stated “One of the responsibilities of each member of Cummins is to treat each other with dignity and respect. Without that base, we will not succeed.” The policy goes on to define what that means. The current Cummins Engine “Statement of Ethical Principles” similarly states, “We will embrace diverse perspectives and backgrounds, and treat all people with dignity and respect.”

Classroom civility is important to support underrepresented groups, including women. From the 2010 Census Maine’s population is 95% white. Since typically three-quarters of our students are from Maine, few students from underrepresented ethnic groups enroll in the MET program. The program also has fewer than 5% female students, and some graduating classes in the past ten years have had no women.

In the 2011 report “Stemming the Tide: Why Women Leave Engineering” authors Fouad and Romila recommend that colleges of engineering “create climates that have zero tolerance for incivility.” The authors report that of the women studied who never entered the engineering career field after completing the rigorous undergraduate program, “A third said it was because of their perceptions of engineering as being inflexible or the engineering workplace culture as being non-supportive of women.” Civility affects workplace retention of women engineers. Of those who left the career, “a third left because they did not like the workplace climate, their boss or the culture.” Of the women who stayed, those “who were treated in a condescending, patronizing
manner, and were belittled and undermined by their supervisors and co-workers were most likely
to want to leave their organizations.”

A “zero tolerance” approach regarding civility is consistent with the requirement that students
demonstrate professional behaviors in the classroom.

The University of Maine MET Program

Every university program is affected by its size and resources, and this section describes the
relevant elements of our institution. The University of Maine is a comprehensive land-grant
university with 11,200 undergraduate and graduate students. It is located in the small town of
Orono, Maine, a few miles from the small city of Bangor. The MET program currently enrolls
181 students. It is accredited by the Technology Accreditation Commission of ABET
(TAC/ABET). Six MET faculty members hold 100% teaching appointments and advise about
30 students each. MET faculty members teach required courses in both the lower and upper
divisions, and typical students take more than one course with each MET faculty member. MET
is one of four undergraduate programs offered in the School of Engineering Technology (SET).
SET is organized under the College of Engineering, and with 492 students it serves nearly a third
of the 1563 undergraduate students in the college.

Based on regular MET faculty meetings and informal discussions, we know that faculty
members in MET generally have similar attendance and homework policies, similar expectations
of workload for a class, and similar expectations of classroom behavior. In part this has emerged
over the years from our discussions about professionalism. Grading standards also tend to be
similar, with the average GPA of MET students consistently between 2.6 and 2.7 of 4.0.
Significantly, the faculty does not view students as customers. Baker et al note that treating
students as customers can be harmful because it can contribute to “an emphasis on self-esteem
rather than character building, a dilution of standards and an inflation of grades, and (last, but not
least) classroom incivility.”

The MET program is relatively small. Machine Tool Laboratory classes have been limited to 12
or 15 students; computer and measurement laboratory classes are typically 24; since lecture are
taught once per year and accommodate all enrolled MET students classes vary from 30 to 50
students depending on cohort size. Each semester at least one course incorporates either a
managed team project or a cooperating laboratory group. Students studying MET together tend
to form strong cohorts, and we often observe small groups of students developing in the first year
and remaining together in any self-selected group activities through the senior year.

The MET program uses most of the space in one historic building, the Machine Tool Laboratory,
offering a common location for students to gather. In addition to the shop, students enjoy a
computer classroom, a capstone project workshop, a laboratory/classroom, and two additional
laboratory spaces. Three faculty members have offices in the building, including the machine
tool laboratory instructor who also serves as building manager. One of our primary goals in the
past ten years has been to continuously improve the space so that it presents a professional
manufacturing environment. These improvements have included interior and exterior painting,
and new floor finishes and window coverings. Students have performed much of the painting
and cleaning during our annual public service day each May. We have improved space usage by removing unwanted items and reorganizing laboratories. Students now have access to more project space and equipment for independent work. We have invested in new laboratory equipment and machine tools. We have tightened expectations of students to demonstrate cleanliness and safety procedures. In the past ten years we have seen a growth in the student sense of ownership and community in the building. Students tend to gather in the building to work on homework together and to use their computers. Equipment pilfering is significantly reduced, and students are leaving the laboratories in a cleaner condition when they work evenings. We view these trends as evidence of improved professionalism.

Framing the Practice of Professionalism skills in MET 100, Introduction to Mechanical Engineering Technology

Evidence from student work in MET 100 is used to support demonstrated student mastery of the following TAC/ABET accreditation outcomes:

- an ability to function effectively on teams
- a recognition of the need for, and an ability to engage in lifelong learning
- an ability to understand professional, ethical and social responsibilities
- a respect for diversity and a knowledge of contemporary professional, societal and global issues

The outcomes of MET 100 are evident in the second semester. In MET 107 Machine Tool Laboratory I students work in teams to fabricate working miniature steam engines and the instructor relies on a basic level of professionalism and teamwork skills in the students. The faculty member has commented that he is pleased with the level of responsibility students take in the laboratory after they have taken MET 100. For the first time in fall 2011 the MET program offered MET 107 to first semester students also enrolled in MET 100. He has stated that these students were unprepared to work together to achieve a goal, to the point that for the first time in six years one team did not complete a working steam engine. Based on his input, we do not plan to offer MET 107 to first semester students again.

In order to support the evaluation of these outcomes MET 100 assignments or classroom observations directly related to professionalism skills are reviewed including:

- Teamwork skills including effective team contracts defining team grading
- Library skills including identifying trustworthy web sources, knowledge of appropriate print sources including access to on-line journals, full-text articles, and government documents (that is, sources in which content is not commercial and peer-reviewed)
- Understanding of basic issues related to inclusion of diversity in the workplace
- Ability to relate economic, environmental and social relevance to a technical topic through a library research

Students practice additional professionalism skills which are evaluated including:

- Emails suitable as workplace records,
- Time management planning
- Regular attendance and arriving on time
- Regular participation in assignments, both in and out of class
• Respectful speech (which includes as subsets unbiased speech, acceptance of differences including place of origin, sexual orientation, sex of colleague)
• Behavior in classrooms comparable to technical training and meetings in the workplace: no eating, routine participation both in attentiveness and in responsiveness, no “multi-tasking” such as email, texting, phone calls
• Creating spreadsheets including programming engineering calculations
• Resume elements describing how the outcomes they achieved in MET 100 respond to a specific internship position description

At the beginning of discussion or lecture classes I often address those behaviors most likely to occur that I would respond to: “The classroom is comparable to a professional training activity in the workplace. If you are multi-tasking please put away your electronic devices or close your computer. If you think you will need to leave the classroom before the end of the lecture please do so now as there are always students present who find movement in the classroom very distracting, and have difficulty getting back on task if students leave and come back. If you are eating please finish up and put the rest away for later.” Again, students who require intervention, if repeated, receive written warning or notice that their professionalism grade will be reduced.

I articulate basic professional courtesy in an early lecture in MET 100 and other courses as “Professional Skills I for Business Meetings and Training:”

Your supervisors and peers expect you to:
• Attend every session if possible
• Arrive on time
• Email prior to each session if you are not able to attend (I excuse class work and homework)
• Remain seated any time one person is presenting
• Drink beverages if you choose, but not eat
• Be attentive
• Participate appropriately, and always with respect for all other individuals, whether they are in the room or not
• Remain quiet if another person is speaking

Everyone makes professionalism blunders
• By not knowing the professional social norms
• By not knowing the professional social norms are in effect
• By choosing not to adhere to the professional social norms
• Example:
  – putting your head down during a meeting or training

How will I respond to blunders?
• I might make a quiet, humorous remark to bring to your attention the behavior – it means I noticed it and please stop
• I might tell you individually after class not to do it again
• I might just ask you at the moment not to do it again
For example, if you get up in class to get a drink I might just say “please don’t get up during class”

I take attendance and use it in grading. Students’ absences will be excused, and they may hand homework in the next day, if they send me an email stating that they cannot make it to class. I do not state a specific number of absences that would be excessive, although such a number might support employer needs for regular attendance. My experience has been that students who are legitimately gone (illness, legal problems, transportation disruptions, unexpected changes in living situations, etc.) generally let me know the problem and would rather be in class. Those who do not attend, but who could attend, rarely email in advance.

Defining civil behavior as a subset of professionalism skills offers an easily understood context for a faculty member to interrupt behaviors that are disruptive of the educational process. It also offers a platform to remind students of the expectations on a routine basis. I now address all issues related to interpersonal interactions in the academic environment as professionalism skills. From emails to eating in class, all behaviors can now be commended as professional, or even very professional, or appropriately criticized as not professional, or not acceptable in a professional environment. In comments in student evaluations many students accept that employers seek professionalism skills in new employees, and that they are benefitted by practicing those skills daily so that they become “normal” for them before they begin to interview for their first positions in the profession.

The grading rubric for professionalism below is included in the syllabus, and 10% of the grade is based on this assessment. I submit this completed rubric to each student after the middle of the term. This type of feedback is possible only because of our small class size. The bulk of this grade is determined by their attendance and the percentage of homework assignments they submit (as separate from their actual homework grade). The rubric and the resulting feedback clarifies for students that in fact I do notice student behaviors and that they are important – as would be true in a typical engineering workplace.

<table>
<thead>
<tr>
<th>Attendance</th>
<th>Does not meet expectations</th>
<th>As expected</th>
<th>Exceeds expectations</th>
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<tbody>
<tr>
<td>Unexcused absences</td>
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<tr>
<td>Tardiness</td>
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<tr>
<td>Homework participation (percentage of assignments assigned that are submitted)</td>
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<tr>
<td>“Cheating--the act or attempted act of deception by which a student seeks to misrepresent that he/she has mastered information on an academic exercise that he/she has not mastered.”</td>
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<tr>
<td>Demonstrates attentiveness</td>
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<tr>
<td>Participates through questions and answers</td>
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<tr>
<td>Uses appropriate language</td>
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<tr>
<td>Respectful of others – both in the room and not</td>
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<tr>
<td>Messages and emails appropriate and professional</td>
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<tr>
<td>Multitasks such as phone or texting, ear buds</td>
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<tr>
<td>Uses computer without clear relationship to class</td>
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<tr>
<td>Leaves classroom</td>
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<tr>
<td>Eats in class</td>
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When discussing professionalism I emphasize the roles of the faculty members and students as part of a broader team with the same goals: full employment of graduates. I emphasize that
student success is faculty success, particularly at maintaining the program in the face of budget cuts. I frame student behaviors as indicative of future workplace behaviors with slides incorporating the following information:

Professionalism Begins in the Classroom

• Your future employers repeatedly tell us that they need strong demonstrated professionalism skills from graduates
• Professional attitudes related to the classroom:
  – Acceptance that the goal of the MET faculty members is full employment at graduation and excellent career opportunities for our graduates
  – Acceptance that the course goals support full employment and excellent career opportunities for you
  – Full participation in the course activities
  – Recognition that your behaviors in the classroom, and related to the course, affect everyone in the course
• Similar attitudes necessary for success in the workplace.

IF you hold professional attitudes:
• You will be motivated to behave professionally – including by engaging vigorously in homework and lab work
• You will expect professional behavior from your peers and you will not support unprofessional behavior
• If you or your peers make a blunder you will accept tactful correction

Of course not every first semester student is motivated by thinking ahead to a professional position. In that case, the question becomes, can we increase this motivation in students? The EAP Messenger titled “Motivation” addresses the question: “How do you help others feel more motivated to do what they are asked to do?” The author describes three factors:
1. “People carry out a behavior because it is modeled or valued by a significant other to whom they feel related – or want to feel related.” Teamwork in class offers an opportunity for students to feel related.
2. “A sense of competence influences internalization.” Students receive positive verbal feedback regarding their in-class professionalism when they are on task and effective.
3. “We can provide “autonomy – opportunities to choose a course of action.” To support this factor the presentation and feedback are less frequently given as directives, and more frequently given as descriptions of workplace standards. For example, if students in a laboratory or working session setting make remarks about someone that would not be acceptable in the workplace, rather than directing a comment toward the individual student (“you need to be respectful”) feedback is given regarding the standard (“in this classroom we always speak respectfully of others”). While this defines the standard expected it does not actually direct the individual. If repetition is necessary a student can be counseled that continued inappropriate remarks will result in the loss of professionalism points in the grade.

Most of our first-semester students are “Millenials” born between 1982 and 2000. Baker et al identify some characteristics of this group that could impact their response to a standards-based approach to professionalism development: “Six of these characteristics are particularly relevant
to classroom behavior: (1) Family and Community Ties, (2) Peer-centrism, (3) Conventionality, (4) Achievement, (5) Digitalism, and (6) Consumer Orientation.” 1 We can help students focus on positive peer approval of behaviors meeting professional conventions, and acquiring those skills as a source of achievement. Unfortunately peer-centrism and digitalism can challenge these students since some falsely believe that they can multi-task (that is, communicate using electronic devices) while in class and still benefit fully from lecture or discussion. Emphasizing professionalism in the classroom can help respond to false beliefs regarding a consumer orientation of education.

I address general professional ethics and integrity in a section of lecture I refer to as “Professional Skills II for Business Meetings and Training:”

Your supervisors and peers expect you to:
- Demonstrate integrity and honesty
- Demonstrate individual initiative
- Be a self-starter – not “high maintenance”
- Make sure you understand what you have been assigned to do and what resources you can use
- Ask questions until you understand
- Work hard to complete your assigned work completely, on time, to the specified level of quality and detail

Academic Honesty
- Students are expected to display professional and ethical behavior consistent with the student conduct code at [http://www.UMaine.edu/handbook/](http://www.UMaine.edu/handbook/) and industrial standards.
- “Students of the university are expected to be honest and forthright in their academic endeavors. To falsify the results of one's research, to steal the words or ideas of another, or to cheat on an examination corrupts the essential process by which knowledge is advanced. Such plagiarism, the submission of another's work as one's own without adequate attribution, and cheating are violations of the University of Maine Student Conduct Code.”
- In this course, working together during the process of completing an assignment is acceptable; however, each team or individual must submit a unique product.

Specific Practices and Assessments for Teamwork Skills, as Related to Professionalism

ABET implemented teamwork requirements in its accreditation criteria for engineering programs in 2000 and TAC followed in 2004. In preparation for and since the application of these criteria many articles have been written about teamwork and team development in engineering and engineering technology programs. In the ASEE Proceedings data base alone, since 1998, 67 articles appear with the word “teamwork” in the title.

Edmonson and Summers write about the Engineering Technology Department at the University of Dayton, “The ability to work on teams is a very important business skill. Some educators choose to call it a “soft skill.” However, our Industrial Advisory Committee members and the businesses hiring our graduates choose to call it a “critical skill”.”15 They focus both on team
dynamics and individual characteristics using personality types and Tuckman’s model. They also address negotiating, time management, and effective meetings.

Freeman states “In order for a team to operate at a high level of performance it has to have a clear understanding of the mission and goals of the team. They must also develop a simultaneous commitment to the collaborative team concept as well as a commitment to results. Having high standards and being results driven may be necessary attributes for a high performance team, but they are not sufficient. Being on a team is not the same as believing in the team or being prepared to utilize its strength. Moving from a group of individuals to a functioning team requires good communication and trust. Ultimately, the enduring success of a team depends on the quality of the relationships developed within the team.”

Not every student is convinced, even upon leaving MET 100, that teamwork is a necessary skill, as evidenced by the following email exchange at the beginning of the second semester between a student and the MET 107 faculty member. This high-performing student wanted to fabricate his machine tool laboratory project individually, rather than as part of a team. The faculty member backed up the message of MET 100:

Student: “As far as the "team" aspect of this project goes, I am not paying to come here so I can learn how to work in a group.”

Faculty: “Actually, you are. If you check the syllabus, it clearly lays out the team aspects of the course. It further lists the ABET requirements, which includes teamwork.”

Student: “Not all occupations require that you can work closely with others,”…

Faculty: “Engineering isn't one of them.”

Student: “…and when you do, it's with people who love their jobs just as much as you do. I can imagine that this "teamwork" bull arises from Karen Horton. If it does, maybe I should be talking to her.”

Faculty: “Actually, the teamwork requirements come from a variety of places. Teamwork is at the top of the list for every employer on our Industrial Advisory Committee. This committee is comprised of leaders from industry that meet with MET faculty once a semester to keep us appraised of current industry needs. They also tend to be the companies that hire our MET graduates. The other source is from the ABET requirements. ABET is the accrediting agency for SET. You may not want to work in teams, but it is what industry wants. There will be many things in MET you don't want to do, but have to in order to meet requirements, pass, and more importantly be prepared to enter industry. You will learn from working in a team, even when some of the experience may feel negative. I would encourage you to discuss this with Professor Horton. You should know, that, as faculty, we have all agreed to follow the ABET and IAC requirements/suggestions. We are all aware of the extreme importance of teamwork and have incorporated it in many of your MET courses.”

This student did complete his machine tool laboratory project as part of a team, and was a successful team member in the remainder of his studies. Students have experienced virtually no team in-fighting since we established MET 100 and the follow-on team project in MET 107. In
the third semester students complete more team-based projects in MET 270 Manufacturing Technology. The 2011 MET 270 faculty member noted students referring back to team processes they had used in MET 100 the year before. In other second and third year courses students are assigned to groups as diverse as laboratory groups, writing groups in our intensive-writing course and team seminars presentation groups in an elective. In our two-semester capstone sequence in the senior year, the faculty member reports that there have been no significant team problems since students have started developing teamwork skills in MET 100. Previously, typically one of six or so capstone project teams would experience significant interpersonal stress, sometimes resulting in the team fracturing.

The teamwork training I engage in with students consists of the following activities to build professional interactions and positive team relationships:
1. 2-hour outdoor low elements challenge course, or in bad weather indoor team-building skills
2. 1-hour discussion in which the class selects its three most important team values
3. Student submittal of available times to meet with a team and faculty assignment of teams based on available meeting times
4. 1-hour discussion of models of team development
5. Assignment to develop a Team Contract
6. Completion of a small team project
7. Debriefing and rewriting, as required, of team contracts
8. Completion of a larger team project
9. Celebration of success

My training and experience as an elementary and high school teacher, as well as my participation in a 1998 in the Midwest Center for Advanced Technology Education “Team Development” training informed me when designing MET 100 teamwork training that students need guided team activities to practice team behaviors, and they require feedback. The University of Maine Campus Recreation program offers two-hour sessions on the Challenge Course with trained facilitators from the Maine Bound program to develop team skills. During the second laboratory session the students in MET 100 meet with the Maine Bound facilitators to engage in team-building activities through field games and low ropes and elements. The facilitator debriefs each group at the end of the session and elicits several realizations such as: teams need leaders and cooperation of all members, cooperation requires listening and communication, and students rely on each other for support and help when completing a degree program. Students leave knowing a few other students’ names, and with some basic team experiences that we can go back to during the course. The course is paid for with funds from departmental course fees.

In a later discussion class I challenge the students to identify in a 5-minute writing the three things they most value in a team or in team members. Students are asked to exchange these writings several times so that each student has a random writing. I then ask them to read what is on the paper in front of them and we list these attributes on the board. We spend some time distilling them into a shorter list of the three attributes that particular class most values.

Meanwhile students have submitted a short survey of the times they have available to work on team activities, and I have sorted them into teams of 4-6 (depending on class size) based on those available times. While I do ask if there are people they prefer to work with or not to work with,
and I will respect those wishes by putting together pairs or separating individuals, my overall goal is randomly mixed groups that have a clearly identifiable common time to meet. Students report to me informally that they enjoy getting to know a few other students in the course and that this opportunity strengthens their attachment to the program.

In a following class discussion class I present two frameworks for thinking about developing teamwork skills: Goleman’s concepts of individual emotional intelligence in the workplace, as noted in the first section, and Tuckman’s Model of team development: forming, storming, norming and performing.

At that point they gather into their assigned teams and complete a team contract based on another EAP Messenger titled “Team-building,” which notes that the requirements of a high performance team are

1. “Group norms
2. Clearly defined form of leadership
3. Communication
4. Each member must take responsibility (accountability)”

Team members must discuss and write a contract addressing each of these four areas. The contract is graded based on whether their contract is likely to result in full engagement and participation. For example, in order to earn a satisfactory grade on the contract they must minimally address how far in advance they can call a meeting (timeliness for member planning), and acceptable excused absences such as illness or emergency.

They must also address how they will assess individual performance since the team can assign members different individual percentages of the team grade, with some members getting higher than the team grade and others getting lower. The total of the percentages assigned, divided by the number of team members, must equal 100. I give the following example as if the team grade were 88.

<table>
<thead>
<tr>
<th>Name</th>
<th>Percent</th>
<th>Initials</th>
<th>Assigned Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jack</td>
<td>95%</td>
<td></td>
<td>95% x 88 = 84</td>
</tr>
<tr>
<td>Jill</td>
<td>100%</td>
<td></td>
<td>100% x 88 = 88</td>
</tr>
<tr>
<td>Dick</td>
<td>100%</td>
<td></td>
<td>100% x 88 = 88</td>
</tr>
<tr>
<td>Jane</td>
<td>105%</td>
<td></td>
<td>105% x 88 = 92</td>
</tr>
<tr>
<td>Total</td>
<td>400%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Jane worked particularly hard on the project and her work resulted in a better grade for everyone, so she was rewarded with 105% of the team grade, resulting in an individual grade of 92. Jack wasn’t available for all of the team activities and his lack of participation hurt the team grade, so he was penalized with only 95% of the team grade, for an individual grade of 84. All agreed with the team assessment of their performance and initialed the team grading.

After the teams submit contracts they are assigned to build a portion of the model bridge published in the West Point Bridge Designer publication “Designing and Building File Folder Bridges.” They receive the necessary materials, and the instructions including the web site URL. They are assigned to bring the project to the discussion class two weeks later. At that class they measure (for evaluation purposes) the bridges submitted by another team and fill out a form regarding their measurements and observations. I grade these projects.
After this first project experience I return their graded team contract with written feedback. I meet with each team for a verbal team debriefing and a coaching session based on their project experience and on what they feel the sticking points in the contract were. I also look at the points assigned to each team member and intervene if required. If they assigned members variable points I review with them the reasons. Often students assign different points based on their perception of attitude, and I clarify that points are awarded based on objective level of effort, or at least on observable contributions but not assumed feelings or attitudes. They may resubmit a stronger team contract for grade replacement. I retain copies of the graded team contracts as evidence under the TAC/ABET accreditation process, demonstrating their ability to function effectively on teams.

Concurrent with the teamwork training students have been developing an Excel spreadsheet (to learn Excel skills) that predicts the load developed in each member of a file folder bike frame. They are assigned as a team to design and build from file folders a model bike frame to be tested to failure. They apply data from West Point Bridge Designer about the strength of file folder bars in tension and tubes in compression. They apply their spreadsheet to size the members of their bike frame, and to predict the applied load at which they expect it to fail. They complete this team project applying their new contract and grading procedures. It is evaluated similarly to the bridge project.

Students have an opportunity to celebrate their teamwork in a very engineering fashion: destructive testing of their model bike frames. The frames rest on the “wheel” locations in a small load frame which applies a load to the “seat” location. We compare the breaking load to the predicted maximum load, and the teams with the best correlations are awarded additional points. Of course, most students enjoy watching the frames endure the final crushing.

Concluding Remarks

The UMaine MET faculty is dedicated to providing students with the skills necessary to succeed in their careers. Beginning in the first semester the program emphasizes professionalism skills, including civility, written communication, respectful speech, attentiveness, time-on-task, and teamwork. These skills are emphasized throughout the program.

Recent graduates have enjoyed strong hiring even in the weak economy. The student who was selected to intern at Bath Iron Works stated that the phone interview included questions about his teamwork experiences and the interviewer was impressed with the number of team projects he could describe. Recently a student told me that he had interviewed for a New England firm, and his educational experience was compared favorably against a competing student from a very well-known and well-established New England MET program. The UMaine emphasis on professionalism and teamwork training, and the opportunities to work in managed team projects throughout the program, serve our graduates and employers well.

I offer observations regarding this process related to evaluations of teaching. Student responses to professionalism and teamwork vary widely among students within a class, and from year to year. Based on signed student evaluations, non-traditional students, those with military
experience or training, and students with prior team training or employment tend to be more consistently positive about this experience than traditional students just leaving high school. While the course has been effective at improving academic climate, the course goals themselves are viewed negatively by a portion of students each year. This effect grew in 2011 when the class size grew from 50 to 70 students and the teams received less direct coaching time. Faculty effectiveness was evaluated by 2010 students, with 38 respondents, as 1.7 (1 is “very effective;” typically 2.4 is average for the unit) but in 2011 with 54 respondents was evaluated as only 2.8. This variation is common and appears, from comments, to result from what students expect to learn in the program. Student comments on 2010 evaluations of teaching are noted; those without attribution are from traditional-aged male students:

“Didn’t care for working in groups but understand the purpose of it.” (unsigned)
“Very planned out activities all great for team building.”
“A lot of good teamwork took place.”
“I believe that Prof. Horton addressed professionalism adequately and I think it’s very important to do so.” (unsigned)
“I feel as if everyone is old enough and mature enough to not have to discuss professionalism.”
“Really cares about the students and our success.”
“I learned a lot about professionalism and working in a team.” (traditional-aged male from Jr. ROTC program)
“I think a good amount of my professional skills were improved upon.” (nontraditional male with a 2-year business degree and work experience)
“Using Excel and being professional and using teamwork skills were all very important and the focus of the assignments.” (traditional-aged female)

Student comments from the larger class were less positive. I am interested in the possible effect of greater anonymity on student perceptions of this teamwork training process.

“Handled the class in a professional way.” (National Guard male)
“…She also has little control over the class.”
“From speaking with upper class students, professional engineers, and reviewing job postings I feel that this class was very effective at introducing and preparing students for our future challenges/skills required to succeed.” (signed but illegible)
“Focus less on “professionalism,” it is a classroom, not a workplace, even if we’re training.”
“Gave us a great awareness of our futures within the engineering field. I feel a lot more prepared due to her teaching skills.” (unsigned)
“The instructor was very hypocritical [sic] in the way she spoke about professionalism and all materials seem unnecessary.”

This range is typical. In discussions the faculty consensus has been that the students who are most negative are those who need to improve their skills the most; I am interested in future study of this observation.
UMaine MET student teamwork and classroom civility has improved significantly as the faculty has increased attention and included grading practices related to demonstrated professionalism. As we have come to expect greater civility from students, we are more likely to respond to behavior that does not meet the standard of “zero tolerance for incivility.” This change has improved the classroom environment for students and faculty members.

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