

# Work in Progress: Modeling Employer Assessments

## *Using Professionalism in Computer Science Courses*

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**Abstract**—This paper outlines a grading system designed to replicate a manager’s perception of an employee’s reputation which starts out high and sinks with the employee’s unprofessional behavior. By modeling this perception, our program has begun to increase the number of seniors who can successfully complete their capstone projects on time. This program stands out from other similar attempts increase consistent effort and conscientiousness because it increases the impact of unprofessional behaviors on a student’s overall grade. Results from the senior capstone course inspired the use of professionalism grades in our freshman lab courses as a way to help students understand how the demands of college are different from the demands of high school and to help them take responsibility for their academic success. **Keywords**—*professionalism; senior capstone; CSI*

### I. BACKGROUND

There is consensus that teaching professionalism should be part of all computer science curricula as evidenced by its inclusion as a core topic in the ACM’s 2008 Curriculum Update [1]. That standard defines professionalism to include “care, attention and discipline, fiduciary responsibility, and mentoring.” The 2008 Update is an interim revision of the 2001 standard [2] that specifies that aspects of professionalism should be addressed in introductory and intermediate courses and as part of a senior capstone experience. Fuller et al. [3] acknowledge that assessment of professionalism requires different techniques than assessing computer science content in the curriculum. In fact, their work reveals a “lack of alignment between learning outcomes and assessment practice in the area of professionalism.” They advocate for addressing “students’ lack of commitment to good engineering principles” by specifically evaluating that commitment through the use of self, peer, and instructor assessment of affective characteristics including professional attitudes and values.

There are a number of existing strategies for assessing professionalism in students. Clark [4] runs a team project course in which professionalism is assessed three ways: the instructor evaluates the team’s professionalism, the team’s customer assesses their professionalism three times throughout the project, and, finally, self and peer evaluations are completed four times in the semester. All of these assessments are combined and become 10% of the student’s grade. Sabin [4] runs a similar course with similar levels of assessment (self and peer, instructor, customer, and external evaluator). These assessments were weighted and combined as 12% of the course grade. In general, when characteristics related to professionalism are directly assessed and given as feedback to

students, the grading strategy is to use that assessment as a small portion (5-15%) of the final grade.

### II. MOTIVATION

#### *A. Professionalism in the Senior Capstone Course*

In recent years, we detected a trend developing in the capstone course: a significant minority of students was unable to successfully complete the course and graduate on time. As an isolated incident, this might have been dismissed; however, this pattern repeated itself for several years running and seemed resistant to incremental changes made to the course.

The core of this problem does not appear to be in the technical skills of our students. Instead, most projects failed because students did not pursue them consistently throughout the term. As one student said, “April seemed so far away in January.” During this trend, only the standard grading strategies for assessing the professionalism of the student were used. Specifically, up to 10% of a student’s grade resulted from status reports and meeting commitments.

#### *B. Professionalism in CSI Labs*

In AY 2011, we added a freshmen seminar that was designed to help our students develop the general survival skills needed to transition from high school to college. This course was an ideal place to include a professionalism component to the grade. By grading the professionalism of the freshmen, we helped reinforce the expectations of college classes and prepare them for what was to come in their senior capstone.

### III. MODELLING EMPLOYER ASSESSMENT WITH A PROFESSIONALISM GRADE

Based on discussions with members of the department’s Industrial Advisory Council, an employer’s overall perception of an employee’s professionalism has two main characteristics. First, it starts high and generally goes down, requiring a dramatic event or a long period of time to raise it. Second, unprofessional behavior taints the perception of the quality of the employee’s work. We wanted to model how professionalism affects perceptions of quality, so final grades are calculated based on two major grades, the professionalism grade and the quality grade. The quality grade is the traditional portion of the grade; it starts at 0% and builds up over the course of the semester based on the student’s deliverables. The professionalism grade starts at 100% and can only go down; when a student fails to perform in a professional way, her professionalism grade is reduced. The final grade the student

receives is the *product* of the quality and professionalism grades. If the quality grade is on a border, a small reduction in professionalism can lower the letter grade, and, even if the quality is perfect, the maximum grade that the student can achieve is the professionalism grade.

This was a radical shift in grading scheme, and so every effort was made to make this change clear to students. The syllabus spelled out the grading scheme and explained what behaviors were considered unprofessional and what the consequences of such behavior were (*i.e.* -5% professionalism for an unexcused absence). On the first day of class, the slide presentation that covered the syllabus used music and arresting imagery to grab student attention. After the syllabus was discussed, students were asked to sign an agreement stating that they understood the grading policy and the effects of not passing the course. Finally, the grade sheet was posted on the course website that tracked the professionalism grade and the quality grade and showed the estimated final grade. Daily updates to the grade sheet gave students real time feedback on how their professionalism influenced their final grade.

#### IV. PROFESSIONALISM FOR SENIORS

The Shippensburg University Computer Science program requires an individual senior capstone project that is completed in two semesters. The first semester includes content on research methods and requires the student to complete a literature summary and to plan and propose a project. In the second semester, students implement and complete their projects.

Students who graduate from our program should be ready for the workplace or graduate school. Failing to complete the senior research project delays graduation by a year. We set two goals for the most recent revision of the course. First, we wanted to reduce the number of course failures and incompletes. Second, if failure seemed likely, we wanted to make that clear to the student as early as possible.

#### V. PROFESSIONALISM FOR FRESHMEN

We used the professionalism grading scheme to help students quickly understand differences between the expectations of high school and college. In AY 2011, the 4-credit CS1 course was restructured to accommodate a first year seminar for computer science majors, packaging conceptual material into a traditional 3-credit lecture and adding a small-sized 1-credit lab focusing on active learning material. The labs met for three continuous hours a week with two hours dedicated to lab exercises and a third hour nicknamed “boot camp”.

The boot camp material addresses the “soft skills” that our freshmen lack and helps students develop a graduation plan. In AY 2011, topics included: professionalism, new skill acquisition, time management, study skills, and awareness of campus resources [6].

In order to accommodate for the fact that this was the first semester for most students, a small change was made to the professionalism grade: there were a few opportunities for students to earn back professionalism points. These opportunities involved pursuing the seminar topics above and

beyond the required assignments, and they were always focused on improving a student’s college skills.

The overarching goal of the boot camp for computer science majors was to help them understand and adjust quickly to the expectations of the program. Professionalism was used to help students develop good self-management habits.

### VI. RESULTS

#### A. Senior Capstone Results

Table 1 shows the grade distribution for the second semester of Sr. Research since AY 2007. Failing and incomplete grades are presented as a single group to control for changes in course policies. The professionalism component of the grade was instituted in AY 2010. Of necessity, this study has a small sample, making it difficult to draw statistically significant conclusions from the results; however, the initial results are promising. The same instructor has taught the course from AY 2009 through AY 2011. The academic content has been the same throughout that period.

**Table 1:** Grade Distributions for the 2<sup>nd</sup> Capstone Semester

|                | A   | B   | C   | D  | F / I | Total Students |
|----------------|-----|-----|-----|----|-------|----------------|
| <b>AY 2007</b> | 18% | 36% | 5%  | 9% | 32%   | <b>22</b>      |
| <b>AY 2008</b> | 50% | 14% | 7%  | 0% | 29%   | <b>14</b>      |
| <b>AY 2009</b> | 12% | 35% | 12% | 0% | 42%   | <b>26</b>      |
| <b>AY 2010</b> | 60% | 12% | 0%  | 0% | 28%   | <b>25</b>      |
| <b>AY 2011</b> | 55% | 22% | 4%  | 4% | 17%   | <b>23</b>      |

AY 2010 and 2011 show improvement over the previous years. The AY 2008 class was significantly smaller than the other years, and so it is difficult to know how well the AY 2010 numbers really compare with that year. Table 1 also shows that there was a significant increase in the number of As and Bs starting in AY 2010, but it is difficult to identify the source of this change as opportunities to earn extra credit were also included in the grading policy. The extra credit may account for higher passing grades in AY 2010 and AY 2011, but extra credit could not be used to save a student from failing; therefore, the evidence suggests that the lower number of Fs and Incompletes was due to the professionalism grading scheme.

#### B. CS1 Results

The long-term goals of the changes we made to CS1 include increased retention and early voluntary attrition. While it is not the intention of the department to “weed out” students, it is important that students settle on a major as soon as possible to maximize their chances for long-term success. Both long-term goals will be measured over the next several years to assess the impact of the first year seminar.

The effect of the professionalism grading system on CS1 lab grades was noticeable, but not catastrophic; no student lost more than one letter grade as a result of professionalism. We will continue to monitor the attrition and success rates of students who have passed CS1 as they move towards graduation. Currently, there is no clear impact on CS2 grades.

## REFERENCES

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