OFFERING AN UNDERGRADUATE COMPUTER SCIENCE COLLOQUIUM

Barbara M. Anthony
Southwestern University, 1001 E. University Ave., Georgetown, TX 78626
512-863-1448
anthonyb@southwestern.edu

ABSTRACT

An undergraduate computer science colloquium is presented that can enhance the educational opportunities for students at a small liberal arts college while providing an additional community-building venue for majors at various stages of their college careers. Presentation skills are a key component of this one-credit course, and the pass/fail grading system can alleviate some student concerns about their performance and allow them to focus on improving in this critical area. Additionally, though the number of electives offered at a small college may be small, a colloquium provides the means for exposure to a greater breadth of computer science topics, potentially helping students develop new interests within the discipline. After being piloted as a special topics course in Spring 2011, Southwestern University has now added the undergraduate colloquium to the regular spring course offerings.

INTRODUCTION

While a large research institution may have the resources and demand to have courses that span the breadth of computer science, small colleges are limited in what electives they can offer and how frequently. At the same time, students are well served by being exposed to a variety of subfields. This paper reports on the offering of an undergraduate computer science colloquium at a small liberal arts college. The academic goals of the course were two-fold: improve student presentation skills throughout the years (not just in the senior seminar), and expose students to broader areas of computer science while exploring their own interests. Additionally, the course provided another setting for meaningful faculty-student interactions as well as promoting a sense of community among computer science majors in different years.

Students are aware that not only are technical skills needed for getting hired in the software industry, but so-called soft skills are important as well [3]. Yet a 2004 study indicates that less than half of the respondents reported "students were required to present in two classes per semester for an average of 10 minutes" [1]. Recognizing the need for these skills, many departments have developed courses specifically aimed at such skills [2]. Some programs have modified existing courses, with a communications-intensive CS1 [6], a sophomore-level data structures course [7], or a senior seminar [8], while others try to include components throughout the curriculum [4].

Seeking to both expose students to topics that are not regularly covered in the curriculum, due to limited elective offerings, and to offer students more structured presentation experiences (prior to the required senior seminar), this one-credit, seminar-style course was offered for the first time in the spring of 2011. Most weeks were devoted to presentations, either by the instructor, the students, or guest lecturers (faculty or students).

THE COURSE

Currently, the undergraduate colloquium is a one-credit course that does not count for the major or any broader university requirements. Given the limited number of electives the department can require, department members do not feel that taking the colloquium multiple times should satisfy that requirement. There are no broader university designations that are appropriate that are not already satisfied by required courses in computer science. The department already offers a one-credit course in the fall that is designed primarily as a means of preparation for the regional International Collegiate Programming Contest (and also does not count for the major). Thus, having an analogously structured course available in the spring balances the offerings and helps students complete comparable numbers of credits each semester.

The colloquium is graded Pass/D/Fail. From an instructor perspective, it is much easier to differentiate between a satisfactory and an unacceptable presentation than it may be to characterize it as a B+ as opposed to a B, even with a good rubric. Likewise, it encourages students who may benefit the most from the class to take it, knowing that they are expected to improve their presentation skills. In addition, just as pass/fail grading has been shown to reduce stress and increase group cohesion for medical students [9], it may also help provide a supportive, collaborative environment for computer science students.

While in some ways it would be desirable to make this a required course for all students, logistically that poses some challenges, particularly in ensuring that all students are able to take the course despite scheduling conflicts including study abroad and athletic travel. The number of computer science majors in each graduating class at Southwestern University is typically in the single digits, so the colloquium provides the opportunity for a substantial number of them to take the course at least once. Requiring it, however, would have different implications. Additionally, it seems desirable to allow students to repeat the course for credit, which also encourages enrollment by students at various stages in the major. Due to the presentation time required, this course does not currently scale well to a substantially larger size. While multiple sections could be offered, staffing is a necessary consideration. The course does not currently count towards faculty load.

The prerequisite for this course was prior or concurrent enrollment in CS II, which is offered every semester. Having a low requirement means that first-years through seniors are able to enroll in the course. That was viewed as a benefit, in part because it facilitated student interaction with peers that they may not meet in other courses because of the natural prerequisite order of many computer science courses, helping to form cohesion among the students majoring in computer science. In addition, students may take the colloquium while still choosing a major, and exploring more of the breadth of the discipline may make computer science more appealing, or allow them to delve into additional interdisciplinary options. Students were reminded periodically of the diverse background of their classmates, and to keep that in mind when developing their presentation, just as they should consider the audience for any presentation. Recruiting students to the first offering of the course was easy. Publicity was limited to mailings to the departmental listserv, in-class announcements, and word of mouth. Students were advised that attendance was mandatory and the colloquium would not be appropriate for students who anticipated missing multiple classes, as the work generally cannot be adequately made up at another time.

The Presentations

Each student was required to select a (different) approved topic, and was responsible for presenting it on a specified week, referencing several scholarly articles and/or advanced undergraduate/graduate level texts. Students knew that in many cases their fellow classmates (and sometimes the instructor) would know little to nothing about the topic, and it was their responsibility to independently research the topic, synthesizing the information for their peers. Students were encouraged to select topics that were meaningful to them, and for which they could find appropriate resources. The choice of topics was deliberately broad, permitting almost anything in computer science not covered in depth in the regular curriculum. While a short list of potential topics was provided as a potential starting point, students generally came up with their own selection (see Table 1 for the complete list of presentations). To encourage work early in the semester, regardless of a student's presentation date, students had to meet with the instructor in person to discuss their proposed topic and some resources they had found, and have it approved in the first three weeks of the semester.

Computational Biology	Computer Vision	*Artificial Intelligence: IBM's Watson*
Computational Linguistics	**Cloud Computing**	**Android Development**
CS in Sports	Performance Modeling	**XNA Game Design/Development**
Technological Singularity	*Meshing Smooth Curves*	**Ruby and Rails**

Table 1: Presentation Topics in 2011. The typeface indicates the presenter type: bold for students in the course, italicized for guest lecturers (faculty and student), and plain text for the instructor.

Each student was required to create at least twenty substantial slides, and provide them electronically to the instructor a week in advance of the student's presentation. The instructor then reviewed the student's slides and provided feedback and suggestions so that the student could update the slides before the presentation. While most used PowerPoint, one student used Prezi, providing the additional benefit of introducing his classmates to a newer and unfamiliar presentation format. The first class involved discussion about the expectations for the content and quality of the slides, and students were provided with additional resources and handouts about citing references and effectively using slides in a presentation. In addition, the instructor modeled her expectations for slides with her talks, making those slides available to students.

Though many of the students had previously done one or more presentations in other courses (not necessarily computer science courses), those presentations were usually ten to fifteen minutes long, so the forty-five minute expectation for their presentation was a new experience for most of them. Since nerves often seem to increase the speed of a presentation, more often the result was a forty minute presentation followed by ten minutes of questions and answers. Students often were surprised at this phenomenon, insisting that when they practiced their talk it was forty-five minutes, while others were skeptical that the required twenty slides could in fact be sufficient. As the semester progressed, they began to see that timing, in either direction, was a pervasive issue for many of their classmates. The syllabus stated that 'While a polished talk is ideal, the talk at a minimum must clearly have a plan and have been practiced.'

Students were allowed to use note cards, but could not merely read straight from the cards or their slides for the majority of the presentation.

While there was time for brief discussion immediately after the presentation, students and instructor also used Moodle (the learning management system in use at Southwestern) to continue the discussion after class. Though students are often attentive during their peers' presentations, knowing they would be participating in an ongoing conversation provided additional incentive to remain engaged. The presenter was responsible for posting one or two additional pieces of information about the topic and a question or two for the class to consider, within 24 hours after the presentation. Each student then had to respond meaningfully to at least one thing said by the presenter, and one thing said by another participant, within a week of the presentation. In-class discussion outlined that meaningful responses had to be at least 50 words (not merely an indication of agreement) and that respect for each other, informed/thoughtful comments, and proper grammar and spelling were expected. The presenter then had an additional week to respond to all student comments and post a brief summary of the topic and discussions.

Instructor Considerations

The course met weekly throughout the semester, with most class periods dedicated to presentations. On the first day of class, students indicated which days they would prefer to present (or not present). Since the course met on Wednesdays only, by the first meeting students had the syllabi for most if not all of their other courses and could plan accordingly around exams and other major assignments. Many students indicated a preference for presentation slots later in the semester. It is important when planning the schedule to allow for some flexibility, so that in the event of illness of a presenter or class cancellation due to weather, there are ample slots remaining for presentation, either at the standard time or in a make-up session. Despite the additional work involved, instructors may be well served to have a 'backup' presentation ready to give themselves in the event of a last-minute cancellation or drop by a student.

Having the course be graded Pass/D/Fail made it substantially easier to evaluate and give constructive feedback on the presentations. Students were informed that successful completion of the presentation, discussions, and providing evaluative feedback of the presentations, and at most one absence would earn a passing grade. Poor contributions to the Moodle discussions overall and a successful presentation would earn the student a D, provided he or she has missed at most two classes. In-class discussions helped clarify that a student presentation could be satisfactory without being perfect and polished, but that there were certain required components and expectations, many of which would naturally result from timely topic selection, submitting slides and updating in response to feedback, and practicing the presentation in advance.

Though this course was fun and rewarding for the instructor, its workload was non-negligible. At a minimum, for each student presentation, there is at least one meeting about the topic, and time devoted to reviewing the slides the student submits in advance. Depending upon the student, there may be additional meetings to help the student research the material and develop their presentation. In some ways, this course was like conducting a miniature independent study with each student, staggered throughout the semester, while allowing the instructor to work with as many as ten to twelve students in the current course configuration, rather than the typically smaller numbers of independent study students/topics per semester.

The preparation required for each class depends greatly on who is presenting. When hearing a student presentation, having already discussed the topic with the student and reviewed the slides, the instructor is freer to focus on the presentation and interaction with the audience. If a colleague or visitor is available to present, the instructor may merely have to show up and introduce the guest lecturer. Other weeks the instructor may be the presenter, perhaps showcasing her own research. Another timesaving method that the instructor can employ is to use existing slides from other researchers, with full attribution. Many academics publish slides from their talks online. While an instructor may not have recently worked in a particular area, such slides and videos can serve as a refresher or update on the current state of the art, and can greatly increase the breadth of topics an instructor is comfortable presenting.

One possibly overlooked benefit of this course is that it provides ample opportunities for the instructor to guide students in terms of appropriate attribution and acceptable use, something which students seem to benefit from hearing repeatedly. Southwestern University has an Honor Code, and this course provides an ideal opportunity to teach students what proper attribution means in technical computer science presentations. That there will be additional discussion of the material by the entire class in an online forum may provide an additional incentive for students to act with integrity. Note that it is especially important to discuss these issues early and often if the instructor will be using slides from others for some presentations. Having a colleague guest lecture early on and discussing the references slide after the presentation can help reinforce that appropriately citing sources is a global responsibility, not merely a class requirement.

FEEDBACK AND FUTURE PLANS

Along with the standard university-designed course evaluations, students were asked to anonymously complete a survey with some course-specific questions on the last day of class. Both forms of evaluation were universally positive. All students indicated a desire to take the course again; students have approached us in the intervening years asking when it will be offered again. Most students thought the course should remain as a Pass/D/Fail course, in part because it reduces the stress, but one pointed out that it could be nice to have it as a grade with a potentially positive effect on the GPA. Students felt like the course had developed into a nice community, and appreciated having students from multiple years and backgrounds in the course.

With the asynchronous nature of the postings, many students felt that the Moodle discussions were lacking. Students did participate as required, and it was clear that they were following not only the letter but the spirit of the guidelines. For example, in response to the presentation on computer vision, a student shared the link to the now-defunct Google Image Labeler, and informal conversations indicated that many students played the game with a new appreciation for some of the computational and human challenges it posed. Different formats for the discussion component are under consideration for the future. Southwestern University's recent switch to Google Apps for Education may provide a different means for online conversation that is more integrated into students' daily lives, and thus more desirable. In addition, students who are unable to physically attend class on a given day (due to illness or excused absences) may be able to participate virtually via a Google Hangout.

From one offering of this course to a small group, no meaningful conclusions can be made about its implications for retention, but a lack of a sense of community can hurt student

retention [5], so the colloquium may ultimately be beneficial in that regard. All students in the course have graduated, all but one with a major in computer science. There may be potential for this course to help the gender imbalance; despite Southwestern University having significantly more female than male students overall, typically the department has many more male computer science majors than female, consistent with national trends. In Spring 2011, the colloquium had a higher percentage of female students than did most classes in the major that year.

After a successful first offering, the department unanimously supported adding it to the regular spring course offerings (though faculty leaves mean it is next scheduled for Spring 2014). As beneficial as this course is, it is important to remember that developing strong presentation skills takes practice. Ideally students would give numerous presentations of different lengths and styles throughout college, both within their major discipline and in other areas. The existence of this course should not eliminate the requirement of presentations elsewhere in the curriculum.

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