4-17-2015

Public Debate Format for the Development of Soft Skill Competency in Computer Science Curricula

Christopher S. Stuetzle
Merrimack College, stuetzlec@merrimack.edu

PUBLIC DEBATE FORMAT FOR THE DEVELOPMENT OF SOFT SKILL COMPETENCY IN COMPUTER SCIENCE CURRICULA

Christopher Stuetzle
Department of Computer Science
Merrimack College
North Andover, MA 01845
978-837-5000
stuetzlec@merrimack.edu

ABSTRACT

We present a method for incorporating soft skill development into a traditional computer science curriculum through the use of a public debate format. The debate format forces participants to practice public speaking, active listening, teamwork, research and preparation, and critical thinking, as well as having the less obvious benefit of contextualizing the material taught in the classroom by introducing contemporary, real-world debate topics. This work presents an example of the incorporation of public debates in an upper-level human-computer interaction class, including a discussion of student feedback, and suggestions for adopting the debate format to other upper-level courses and its perceived benefits.

INTRODUCTION

It has been long recognized that there exists core “transferable” discipline-independent soft skills that are developed during an undergraduate curriculum, such as oral and verbal communication, critical thinking, ethics analysis, community-engaged learning, and cooperative learning. These skills are important enough that they are included in ABET's expected Student Outcomes [1], and in IEEE and ACM's guidelines for undergraduate computer science (CS) curricula [2]. A strong general education program can be relied upon for much of this development, though a discipline-specific context facilitates continued professional development

While some disciplines work in soft skill development organically, it is often a challenge in CS. Simmons and Simmons [8] found that there was a perception among industry professionals that CS graduates were lacking time management, negotiation, and cultural skills. One solution is to dedicate entire courses to student core skill development, such as a privacy and ethics or a technical writing course. There are many ways in which this issue is addressed. Havill and Lewis [5] present a special lab component integrated into Denison University's undergraduate curriculum, designed for the development of oral communication skills while simultaneously building skills in math and programming. Michaud [7] describes how Merrimack College has incorporated an interactive seminar component into its artificial

intelligence class in which the instructor works with students to contextualize common A.I. issues within a broader cultural and ethical perspective.

While many faculty are working on finding interesting and successful ways for students to engage in soft skill development, no single technique seems to fulfill the need. Incorporating public-style debates into upper-level courses can provide a substantial step forward in this arena.

The contributions of this paper are

1. a description of the incorporation of classroom debates in an upper-level human-computer interaction class and a discussion of student feedback.
2. suggestions for adoption of debates in other upper-level classes.

Benefits of the Public Debate Format

Engaging students in active debate has several obvious benefits with regard to the development of soft skills. Incorporating debate into an undergraduate curriculum has been shown by Bellon [3] to help students actively construct knowledge, a key component in learning. Inherent in a debate structure is an outlet for public speaking in which students present facts in the form of a narrowly focused, coherent argument in front of a group of their peers, and must do so within strict time constraints. Successful debate technique requires the on-the-fly critical analysis of an opposing viewpoint, enhanced by research and preparation involving critical thinking in anticipation of the points the opposing side will raise. Audience participation encourages active listening and internalization of all arguments.

Having students take part in debates over contemporary issues in the field exposes them to applications of the discipline beyond the classroom, as well as contextualizes the curriculum topics discussed in lecture and seminar. There are measurable gains in terms of improved performance in the classroom and deeper understanding of the course material [4]. As an additional benefit, Lewis et al. [6] noted that the inclusion of soft skill development raises student affinity for the discipline, improving retention. A debate format in which students are placed on teams reinforces their teamwork skills, as well, and having students engage in an interactive and fun activity during class time is usually met with positive reactions.

DEBATE STRUCTURE – INITIAL TRIAL

The debates were administered during class time of an upper-level (sophomore- through senior-level) human-computer interaction course. Three debates took place during a single Spring semester, each taking approximately one hour. Students in the class were broken into teams, and each team was assigned one of the opposing sides in the debate. In our trial run, the first debate had two sides of four

students each and debates two and three had three sides of three students each. In each debate, the course's instructor acted as the moderator, narrowing the focus of the debate, asking questions of the participants, and guiding audience questions.

The following rules of the debates were provided to the students:

- Each side was allowed a 3-minute opening statement to make an overall case. Once this was complete, each side was allowed a 1-minute rebuttal period to refute anything the opposing side said during its opening statement.
- The moderator then asked a series of questions for all sides. Each side was allowed 2 minutes to answer (as a group), and then the opposition was allowed 1 minute to rebut. The moderator then allowed a cycle of 1 minute rebuttals, continuing until the moderator felt the point had been exhausted.
- The audience was then allowed questions using the same format.
- Each side was then allowed a 3-minute closing statement to end the debate.

For each debate, the students were provided with the topic (each of which was designed with a different pedagogical goal in mind according to the class's learning outcome goals), the possible sides they were to take, and several key points (noted on the debate specification as “things to consider”) meant as jumping-off points for their individual pre-debate research. Below are topics, corresponding sides, example “things to consider,” and target learning outcomes.

- **Debate 1: Has the growing influence of social media (Twitter, Facebook, Imgur) negatively or positively affected society's ability to communicate?**
  - Side 1: Social Media is negatively affecting society's ability to communicate.
    - Thing to consider: How dependent are we on information from online communities? How reliable do we, as a culture, feel information from social media like Twitter is, when presented in 140 character chunks?
  - Side 2: Social Media is positively affecting society's ability to communicate.
    - Thing to consider: Does social media's reliance on concise messages enhance our ability to effectively communicate ideas with brevity?
  - Learning Outcome Goal: Understanding the effects of target populations on product design, and the effects of product design on its target populations. Understanding ethical implications of product design choices.
- **Debate 2: If you were a wealthy investor, in what facet of HCI development should you invest if you wanted to have**

the biggest impact on its future?
  - Side 1: The future lies in future technologies research
    - Thing to consider: What advancements in interaction hardware have been instrumental in each phase of the computer revolution?
  - Side 2: The future lies in new software techniques and technologies
    - Thing to consider: How have the user interfaces of mobile devices allowed them to become ubiquitous in our lives?
  - Side 3: The future lies in artistic and interesting UI designs
    - Thing to consider: How have the accomplishments in design led to our current crop of user-centric UIs?
  - Learning Outcome Goal: Understanding and measuring product usability.
- **Debate 3: Which is the best mobile operating system?**
  - Side 1: iOS
    - Thing to consider: How has Apple guided the mobile market since releasing the iPhone?
  - Side 2: Android
    - Thing to consider: How has Android's designed allowed it compete directly with iOS?
  - Side 3: Windows 8 Mobile
    - Thing to consider: What is the most pressing issue holding Windows 8 Mobile back in the global marketplace?
  - Learning Outcome Goal: Understanding and measuring product usability.

Grading and Logistics

Grades were assigned to students based on preparation, participation, and presentation. In addition to his usual responsibilities, in-class debates require that the moderator coax the quieter students to participate and not be overshadowed by the more aggressive students, whom the debate format is naturally geared towards. In the author's course, this was accomplished primarily by incorporating participation into the grade, as well as adding a guideline stating that each student on each team must participate in opening and closing statements .

The rubric was skewed heavily toward rebuttals (preparation) and participation. In other words, the more convincingly the students were able to reply to the opponents' point with one of their own, the higher the resulting grade. This was made very clear before the first debate, and required a good deal of preparation of not only their own side but of their oppositions' as well, making for a well-rounded

learning experience. To facilitate this preparation, each student in the class (including those in the audience) was provided the same set of “things to consider” for each debate side.

The debates were scattered throughout the semester, aligning themselves with topics discussed during lecture portions of the course. For instance, debate three was the last debate, and took place immediately following a series of lessons on UI considerations when designing (and designing for) mobile devices, and debate one took place immediately following a lesson on how computers communicate with users.

RESULTS

The feedback from students was overwhelmingly positive. An informal survey of the class was conducted two weeks from the end of the semester. 18 of 27 students mentioned that the debates were their favorite aspect of the class, while 1 out of 27 noted the debates as his/her least favorite aspect of the class. In our formal course evaluations (for which the instructor received very positive scores), 24 students provided comments. Of the student responses, all were positive and several mentioned the debates specifically. Grades assigned for the debates were good overall, though long term student outcomes are impossible to judge without studies beyond the scope of this paper.

While direct learning outcome assessment was not the primary goal of the debates at this time, the outcome goals will be altered for future iterations of the course to provide more focus the debates, and the author of this work suggests this practice repeated for any adopters of this technique. Direct assessment of this learning outcome may be achieved with exit surveys, post-semester surveys, or direct assessment through essays and examination questions geared toward the results of the debates.

Adaptation to Other Courses

Adapting the moderated debate format to other courses is straightforward. Almost all course subjects deal with current issues with opposing sides. The challenge, of course, is identifying them. What follows is a list of suggested debate topics for upper-level computer science courses.

- **Network Security**
  - What should the government's role be in protecting privacy with regard to network transactions such as e-commerce?
  - Is the cloud safe?
- **Software Engineering**
  - Is the agile development cycle superior to traditional models?
  - Should there be a unified industry-wide coding standard?

    - Should comments become obsolete, forcing code to be written well enough so that it “comments itself”?
- **Programming Languages**
    - Interpreted vs. compiled languages, which are more useful?
    - Why has Python become so popular in introductory-level courses?

CONCLUSION

Debates force students to examine issues from multiple sides, keep them current, allow for the contextualization of what is being taught in the classroom, and enhance soft skills such as communication competence, critical analysis, and teamwork. In classroom trials, students have responded positively, and the format is applicable in almost any course curriculum. It is often challenging to incorporate context-sensitive soft skill development in a computer science curriculum, but the debate format provides a means to do so in a natural way with many added benefits.

REFERENCES

[1] ABET Criteria for Acrediting Computing Programs, 2012-2013. Retrieved November 1, 2014 from http://www.abet.org/DisplayTemplates/DocsHandbook.aspx?id=3142

[2] ACM/IEEE-CS 2013 Joint Task Force on Computing Curricula. (2012, November). Computer Science Curricula 2013 Ironman Draft Version 0.8. Retrieved November 1, 2014 from http://www.acm.org/education/CS2013-final-report.pdf

[3] Bello, Joe. A research-based justification for debate across the curriculum. *Argumentation & Advocacy*, Winter 2000, Vol. 36 Issue 3, p161-175.

[4] Dauber, C. 1989. Debate as empowerment. Journal of the American Forensic Association, 25, 205-207.

[5] Havill, Jessen and Ludwig, Lewis. Technically speaking: fostering the communication skills of computer science and mathematics students. *SIGCSE Bull.* 39, 1 (March 2007), 185-189.

[6] Lewis, Tracy L. et al. Are technical and soft skills required?: the use of structural equation modeling to examine factors leading to retention in the cs major. In *Proceedings of the Fourth international Workshop on Computing Education Research* (ICER '08). ACM, New York, NY, USA, 91-100.

[7] Michaud, Lisa N. (2014). Evil Robots and Helpful Droids: A Seminar for a Junior/Senior Artificial Intelligence Course. *Journal of Computing Sciences in Colleges*.

[8] Simmons, Chris and Simmons, Lakisha. Gaps in the computer science curriculum: an exploratory study of industry professionals. *J. Comput. Small Coll.* 25, 5 (May 2010), 60-65.