

Teaching Statement

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Education is fundamental to our intellectual existence and progress. Students better educated in our classrooms increase the productivity potential of the department, the university, and the society as a whole. As quality instruction witnesses a global increase in demand, particularly with the growing popularity of online education, supplying this demand is not only vital to student recruitment but also to raising the bar on teaching and education, and as a result, our collective intelligence.

My goal as a Computer Science instructor is to ensure that my students learn a breadth of fundamental concepts in enough depth to be able to apply them to model and solve a wide range of problems. I believe the best way to accomplish this is to entice students to take an active role in their education and feel responsible for the material and in some cases even rediscover it. While this objective remains the same for the entire class, the path to achieving it is different with each student.

Students in computer science programs, especially ones taking introductory graduate courses come from diverse technical backgrounds. In particular, their exposure to abstraction and comfort levels with rigor vary greatly. Besides their varying technical backgrounds, students sign up for courses with different objectives, whether it be learning various tools to apply to their own work, doing research in the subject matter of the course, or increasing their hirability. When teaching entry-level courses, I expose students to a diverse set of problems and exercises in order to narrow the gap between their backgrounds. We take the time in class to cover in great detail carefully chosen material in order to make sure that they become familiarized with looking at the world from a computational lens. In addition to the core material of the course, I find it invaluable to include optional content in the course based on students' interests. This causes the course to be more inclusive as more students become more engaged in the course.

Perhaps the most significant kind of diversity among students is their learning styles. The traditional once or twice a week lecture format does not provide the flexibility or the support for adequately accommodating many of these styles. Even the students who are the most interested in the course are distracted by the urgency of various deadlines throughout the semester. Most students do not pragmatically have the incentive to review the material between lectures which are a week apart from one another for graduate courses. As a result, once they leave the classroom, the next time they think about the material is often one week later. Besides being a lost opportunity to utilize the week long period between lectures, this affects the lectures themselves as students have to be reminded of previous week's discussion followed by the preliminary material for the current week, leaving little time to cover anything beyond the basics of the topic at hand. Especially for introductory courses where there is plenty of material to cover and students need the most guidance, compressing a high volume of content into one lecture followed by a week long inactivity does not yield the most effective format for students to learn.

In order to combat this issue in my Foundations of Computer Science course taken by most incoming graduate students, I run a flipped lecture and require students to prepare for the lectures by reading the related material from the textbook or other sources before coming to class. In order to ensure that students are properly incentivized to do the preparation, they are assigned homework on the topic of the lecture which is due before the lecture. With the students coming to class prepared, I am able to utilize class time more effectively, reiterate important concepts, spend more time discussing common pitfalls, point out connections to other topics, view the material in alternate perspectives, and solve more problems in class, all without sacrificing the breadth of the syllabus. During the second half of the course which features more challenging material, we spend plenty of time in class solving problems where students split up into small teams and work on solutions together. Participation is a part of the overall grade; students are required to actively

participate not only in class but also on online discussion boards throughout the week. This format causes the time and effort students spend on the course to be spread more evenly throughout the week as opposed to being concentrated to a few consecutive hours on the day of the lecture. It gives students the incentive to self-study and prepare before class which narrows the gap between their technical backgrounds before the start of each lecture. More importantly, coming to class prepared, they are able to build on their existing knowledge, hone their understanding, and ask targeted questions rather than being exposed to the material for the first time. In turn, this allows me to cover the material in greater depth, focus on solving problems in class that are not too basic and boring, and provide more challenging optional exercises as extra credit. Solving problems together gives the students a chance to interact with classmates and work collaboratively in a team. In particular, working in teams enables them to help each other if any team member is stuck on a basic concept or makes a small mistake, which helps me identify and correct more serious mistakes efficiently and clarify topics the entire team may have difficulty grasping. In addition, working in teams during the lecture causes the more introverted students to contribute to online discussions throughout the week, even if they remain less active in class.

A significant factor in ensuring that students are engaged in class is being mindful of their cultural backgrounds which often heavily influences a student's interaction with the instructor and other classmates as well as their overall attitude towards the class. In particular, if any of the students are having a hard time effectively participating in class, paying more attention to them and placing them in small teams generally helps increase their participation and productivity. Exposing students to a positive class environment, where they are encouraged to feel comfortable making mistakes, to ask questions, and to actively interact with the instructor and their teammates turns even the most introverted students, who would have otherwise remained quiet throughout the entire semester, into active participants. In an unofficial survey of my students from the Spring 2014 semester, 92 percent of the respondents found solving problems in class useful to their education and 88 percent of them preferred solving problems as a team (6 percent were neutral and 6 percent disagreed). When asked what their favorite part of the course, 80 percent of the respondents pointed to solving problems in teams (another 7.5 percent said it was the flipped format).

In addition to customizing my teaching style for each course, I find it essential to adjust my teaching methods from one semester to another for any given particular course in order to address the evolving needs of the changing student body. For example, since creating and implementing a new syllabus for the Foundations of Computer Science course in Fall 2013, I have collaborated with the course coordinator to further tune the course to meet students needs and maintained uniform standards among the parallel sections of the course taught by other instructors. Currently featuring over 500 graded problems, the course is still going through a continual improvement process.

Lastly, I believe that improving any course in vacuum has limited benefits and it is essential to design courses by considering how well they fit the curriculum and the department's vision. Carefully designing courses and course sequences can help route students through the curriculum robustly, minimize overlaps and gaps in material, and ensure students and courses are matched fittingly leading to an improved curriculum overall, better educated graduates, and perhaps even improved job placement opportunities which in turn would help with student recruitment efforts.

Sincerely,



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