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Teaching Statement
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I am passionate about Computer Science: I love learning how existing systems work and leveraging that knowledge to create new systems. This passion extends to sharing the knowledge that I have gained with those just starting out; be they graduate students, undergraduates, or even non-students. I understand that the focus of an Assistant Professor is on building a productive research group that innovates technically—as opposed to innovating in the classroom. Research is my passion, but I also want to be an effective educator so that I can spread this passion to others, which is why I took this year off from research to build myself as an educator. Doing this has given me the opportunity to teach both a large introductory class with predominately first year, non-engineering students and a medium-sized class focused on Security to fourth year Computer Science students. The large class was a challenge administratively, while the advanced class was a challenge conceptually. My stint as a Lecturer afforded me the time to think deeply about these challenges, leading to the development of a set of processes and a teaching philosophy.

1 Teaching Experience

While a graduate student at the University of Illinois, I had the opportunity to act as a graduate student instructor for a graduate-level Operating Systems course. This gave me a chance to practice guiding small group discussions and explain complex concepts to students of different backgrounds. In conjunction with being a graduate student instructor, I also attended a weekly seminar focused on acquainting new graduate student instructors with the latest in pedagogy research and getting them thinking about the fundamentals of teaching and the best ways to meet that goal. After completing my PhD and two years of postdoctoral research, I decided to explore teaching more deeply—because I understand that as an Assistant Professor, my focus will be on ramping-up a research group, but I still want to be an effective educator. My first class was an 800-student introductory programming course (C++ and Python) targeted at non-engineers. This experience taught me a lot about efficiency and managing almost 30 staff members. In the following semester, I taught Michigan's undergraduate Security course, targeted at Junior and Senior-level Computer Science students. The class has gone from 100 students a year to 300 students a semester—twice a year. The challenges with this class are preparation, staff turnover due to graduation, and managing complex assignments. Aside from these challenges, teaching a Security-focused class allowed me to combine my research with teaching—there are now two lectures on hardware security—and provided me with incentive to investigate other sub-areas of Security.

2 Teaching Philosophy

While I have just started my journey as a professional educator, I have had several opportunities to hone my teaching skills and develop the foundation of a teaching philosophy. Parts of my teaching philosophy were developed during a semester-long course for new graduate teaching assistants while a PhD student at the University of Illinois. During that course, we were taught to be more reflective on our purpose as educators and exposed to the latest in pedagogy research. Three years later, I put those initial ideas to the test as a Lecturer. Below are the core ideals of my current teaching philosophy, followed by issues that I am still working to incorporate into it.

- **Focus on learning objectives:** I realized very quickly that students are focused on grades and, by extension, points. This myopia inevitably rubs off on the instructor. I believe that the foundation of a course is the topics that students are supposed to be introduced to (and hopefully master) by taking the course. Putting this belief into action starts with creating a topic-based rubric (on the syllabus) that lists, for each grade, the topics and level of mastery required. From this, I construct the course schedule to ensure that all the topics are covered, in a logical order, and in proportion to expected mastery. I also use this rubric as a base for determining the number and difficulty of questions on the exams. I believe that re-focusing both the students and the staff on topics—rather than points—highlights that the true achievement of the course is learning something new.
- **Course schedules need empty space:** Focusing on topic mastery requires time to backtrack and cover topics that evaluations show were not covered well enough for the average student to understand. Since the aforementioned topic-based rubric serves as a contract, it means that I need to ensure that I am upholding my end and adequately covering topics. Courses are often overflowing with material. By focusing on topics, it is possible to strategically reduce content to allow for adding material in response to evaluation feedback.

- **Evolution rather than revolution:** It is very tempting to look at existing course material and think that you can do it better: maybe the projects are stale, the topics are in the wrong order, the lecture slides are sub-standard, or you have staff members very passionate about adding new features to the course. I have witnessed every one of these issues while teaching; I have also seen how trying to effect large changes mid-semester causes havoc for both students and staff. Seeing this, I concluded that it is better to systematically deploy change—where it has the greatest likelihood of success and student impact. One method that I use to reign in the urge to change is to limit significant changes to the course to between semesters; that means that if a change is not ready by the time the semester starts, we revert to the original—a good motivator for passionate staff to stay passionate about their change until it is complete. This affords enough time to vet new ideas using staff as Guinea pigs—not students.
- **Passion transfer:** Reviewing my teaching evaluations makes it clear that the biggest impact on students comes from my passion about the subject matter. Students can tell if you think the material is interesting or not; if they sense that you think the material is boring, then there is little chance that they will find passion. For example, one common feedback statement is, "Even though the lecture is at 8:30 in the morning, Professor Hicks's excitement about the material makes it impossible to not pay attention." Thus, I believe it is critical to find ways to be passionate about course material; then get out of the way. Two methods that I use to maintain passion are working my research into lectures and spending small amounts of lecture time "going deep", i.e., talking about how things work in the real-world, historical retrospectives, or societal impact.
- **Keep students engaged:** Filling lectures with passion is futile if students do not show up. Thus, a mechanism is required to make sure that students prioritize going to lecture—even as the semester trudges along and their outside commitments increase. One technique that I employ in my introductory course is interactive question and answer opportunities (i.e., low-risk in-class evaluations). I try to incorporate 10 of these into each 90-minute lecture, split between harder questions on material covered in previous lectures and easier questions on the new material. Besides getting more students to attend lecture, these evaluations expose misunderstandings early, making corrections less costly.
- **Increase student time with concepts:** I believe that the more time students spend thinking about and practicing concepts, the deeper their understanding. Instead of assigning more work or having more evaluations, I employ gamification strategies to increase student agency; the goal is to incorporate subtle mechanisms that encourage students to spend an extra 10% to 20% more time with course concepts.

Becoming an effective educator is a continual process; I am always seeking to enhance my teaching philosophy and how I implement it. Below are some challenges that I am currently wrestling with:

- **Help vs. handholding:** One thing that shocked me is how easy help transforms into handholding. To concretize the effect of this, preliminary data from my courses' internal office hours application shows that the students who rely on office hours the most tend to do much worse than average on exams. Ideally, students who attend more office hours should have a better understanding of course concepts.
- **Create a community atmosphere:** Whether it be office hours or on our online discussion forum, students help other students at a disappointingly low level. Instead, students wait—sometime 24 hours—for the instructor to help them. I want to shift the culture of my courses to one where students are expected and eager to help other students. Research shows that this is not only beneficial for those being helped, but more so for those helping. In addition, many students struggle with the same concepts, making it more efficient to help an entire group of students at the same time.
- **Non-linear mastery:** I believe that the core of any course is a set of concepts and level of mastery. Therefore, I want to find a way for students to demonstrate mastery over a semester, instead of at arbitrary points dictated by exams.

3 Possible Courses

My research spans many areas including Security, Embedded Systems, Architecture, and Operating Systems. I am interested in teaching courses that touch on any of these general areas. Additionally, since a key outcome of my research is the production of physical artifacts, I am interested in teaching courses aimed at building physical systems that incorporate both hardware and software.