

## Teaching and Advising

My interest in teaching comes from my own curiosity about the world around me. In my desire to better understand the outside world, I have always been eager to learn more. As a teacher, my role is to elicit a similar enthusiasm toward learning among my students and help them to understand that knowledge can provide them with powerful tools to solve complex problems.

Toward that end, my teaching philosophy is grounded in teaching a sound theoretical basis supported with concrete examples. These examples are aimed at bringing theories to life by showing how they can be used to understand and analyze real-life problems. They also are important to illustrate practical limitations of theories. Going beyond the classroom, I see the design tradition of “Learning by Doing” as a key part of a human computer interaction curriculum. It lets students acquire the basic skills to rapidly prototype, implement and evaluate their work. In that context, I see myself as an amplifier of student inspirations best illustrated by this quote from one of my class evaluations:

*“The biggest thing I learned in this class [is] that the key to success was just to quit whining and do it, and the lab materials available to us allowed us to do that. There was nothing impeding my success in the course except myself.”*

## Course development

### Introduction to HCI

To familiarize students with iterative design techniques, I developed an **Introduction to HCI** course around the conceptualization of the design process used by IDEO, a leading industrial design firm. Their seven steps approach (Accept, Analyze, Define, Ideate, Select, Implement, Evaluate) provides a natural framework to introduce key elements of the HCI curriculum including: capturing user requirements; brainstorming possible solutions; selecting the best solutions based on our understanding of human behavior; quickly creating a prototype, and finally conducting a sound evaluation. To re-enforce the intrinsically iterative nature of the design process, the main class project is designed to cycle at least twice through the 7 steps. This is admittedly a very demanding course, yet it provides a solid foundation on which students can draw as they approach real-life problems. This point is illustrated by the unsolicited feedback I received from this senior 6 months after taking the class:

*“It's funny, I definitely felt like a lot of the work I did in your class with respect to the hard homework assignments and the KLM diagrams would not be much use. I was very wrong, even though I am not making KLM diagrams and long design descriptions, the stuff that I learned from those assignments ha[s] definitely helped a lot with the things I am doing on my job. Thanks for a great class.”*

### Physical computing

With the rise of ubiquitous computing, the focus of HCI is moving from desktop applications to a wide variety of devices. As a result, the ability to build hardware prototypes has gained in importance. At the same time, rapid prototyping tools such laser cutters, 3D printers, and the Arduino hardware platforms have made it possible, even for non-technical students, to build their own prototypes. With this in mind, I developed a class on **Physical Computing** (INFO 4320) to introduce students from a wide variety of non-technical backgrounds to rapid prototyping techniques. Each student is provided with a Physical Computing kit including an Arduino Board as well as everything needed to learn how to use sensors, displays, and actuators. Through hands-on experiences during class periods, students acquire basic skills and learn to build a range of typical circuits.

Along with basic skill acquisition, students are involved in a semester-long group assignment in which they develop a complex project from start to finish. Students are encouraged to quickly arrive at a working prototype at which point they can fine-tune their project through testing. Past projects included: a gesture controlled remote-control car; several musical instruments, a robotic table sweeper, and an ambient display for monitoring household energy use.

In combination, these teaching strategies have been very successful in increasing technical efficacy of non-technical students. This is illustrated by this unsolicited feedback from one of the students:

*"I just wanted to tell you how much I enjoyed your class this past semester. While challenging at times, I really was proud of our project at the end. I felt like I really learned and accomplished a lot over the course of a few months. The class taught me things that I have not learned before in any other Information Science class. I was also really impressed with your willingness to help us and unending patience. I wish all professors could be as dedicated as you!"*

*Thanks again for everything. I really am very glad I ended up taking your course as I feel that my overall undergraduate education is more complete now."*

Several groups from INFO 4320 presented their projects at Cornell's *Bits On Our Minds* undergraduate showcase with one group being awarded a prize. We were also lucky to secure industrial sponsorship to ensure that students do not have to bear the cost of their final project. We are also working with the ScienCenter Museum as a venue to publicly present our projects. In fact, the format of this class has been so successful that I am planning to adapt it to INFO 3450, the basic introduction to HCI, here at Cornell.

### **Empirical evaluations skills at the graduate level**

The success of graduate students in the field of HCI depends on their ability to critically evaluate their own work. In collaboration with the software engineering group at UMD, I developed a graduate-level class on **Empirical Research Methods for Computer Science**. This class covers all aspects of conducting a successful experiment, including sound measurement methods, experimental design, and a refresher of statistical methods commonly used to analyze empirical data. To complement the provision of theoretical knowledge, the curriculum relies heavily on hands-on experiences focusing on the replication of known experiments as well as the development of new experimental protocols in a semester-long project. In the past, this course was very well received by students.

## **Advising**

Advising students is a key aspect of professorial life. Both at the graduate and undergraduate level, my focus is on providing a safe scaffolding in which students can learn by doing, challenge themselves to reach their full potential, and understand the consequences of their decisions, yet avoid costly mistakes.

### **Undergraduate level**

I take my role as an academic advisor very seriously. Scheduling bi-yearly meetings with advisees allows me to quickly respond to problems and help students plan a curriculum that allows them to challenge themselves and aspire to reach their dreams. This is best illustrated by this unsolicited feedback:

*"I just wanted to thank you for all you've done for me as an advisor (and a teacher). I have so many friends who have complained about their advisor—how they never helped them with classes, never helped them with post graduation plans, never have even talked to them—and each time I think of how lucky I am to have had you as my advisor. Without your urging I highly doubt I would have made the effort I did in pursuing a design career..."*

I am a strong supporter of undergraduate research involvement (e.g. via the NSF REU) and have supervised many successful research projects and honors theses. Kevin Conroy, for example, was awarded the J.R. Dorfman Prize for Undergraduate Research in UMD for his work on paper augmented digital documents, and Morgan Dixon presented his work on ExperiScope at CHI'07 before beginning graduate studies at the University of Washington.

**Graduate level**

At the graduate level, I strongly believe in the need for students to find their own voice as a researcher and encourage them to quickly establish a research project they can call their own. In addition to providing conceptual guidance, I make sure to be readily available and to provide timely feedback to limit interruptions to students' work flow.

In the past, this framework has been very successful. My graduate students regularly publish at leading ACM conferences—some as early as their second year of graduate school. I believe that this early exposure to the highest standards is key to a successful career in academia: My first student, Chunyan Liao, is now a productive researcher at FXPal, and Hyunyoung Soung, who is about to graduate at the end of the year, received an offer from Microsoft Research - Asia, and is about to interview at KAIST in South Korea.