The Innovative Instructor

Center for Educational Resources

Pedagogy Forum

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Lectures On Demand

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The Issue

Applied science programming courses (e.g., *Simulations of Materials and Biological Systems*) typically involve the instructor writing examples of code during class as students follow along at their computers. Students may occasionally work through simple examples on their own, but they spend most of class passively watching the instructor.

The Challenge

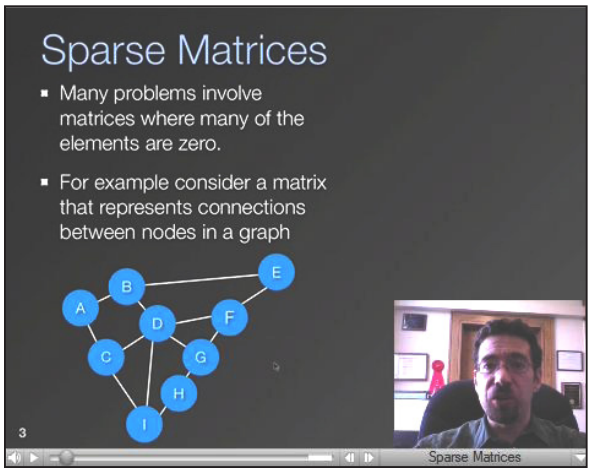
Students don't really learn a programming concept until they try to program a solution to an assigned problem. Typically, their attempts occur through homework and projects completed outside of class, when the instructor is not readily available. While self-paced, independent learning is an important step in mastering the content, active learning experiences during class provide an opportunity to challenge students in a collaborative, supportive environment with the instructor and peers available to help. Incorporating these active learning strategies into class, however, reduces the time available for the instructor to teach new content.

Faculty Solution

I restructured the course to make time for more in-class learning exercises, including taking full advantage of the computerized classroom we were using. First, I created video podcasts so students could watch the lecture before class. I used a program called ScreenFlow* to create the lectures by recording audio and video synchronized with my PowerPoint slides.

Because students watched my lectures before coming to class, I could assign exercises for them to work on during class time. While they tried to solve these problems, I floated around the room to offer help. I tried to set up the problems so they contained multiple, discrete tasks.

It was not always clear to me what aspects would be most problematic for the students. By watching them work, I could identify the students' conceptual problems. I stopped the class, from time to time, at opportune moments, to talk about aspects of the problems that appear to be most challenging for the whole class.



Screenshot of recorded lecture

Results

I've identified various advantages and challenges with the video podcasts, and will change some of them the next time I implement the course. However, the greatest challenge isn't making the video podcasts. I'm happy to put the time in, because I will not have to make them every year, and the students have reported that they like them. They watch the videos at their own pace, and they can review difficult topics as often as they want.

What this is

The Innovative Instructor is a forum that publishes articles related to teaching excellence at Johns Hopkins

About the CER

The Center for Educational Resources partners with faculty and graduate students to extend instructional impact by connecting innovative teaching strategies and instructional technologies

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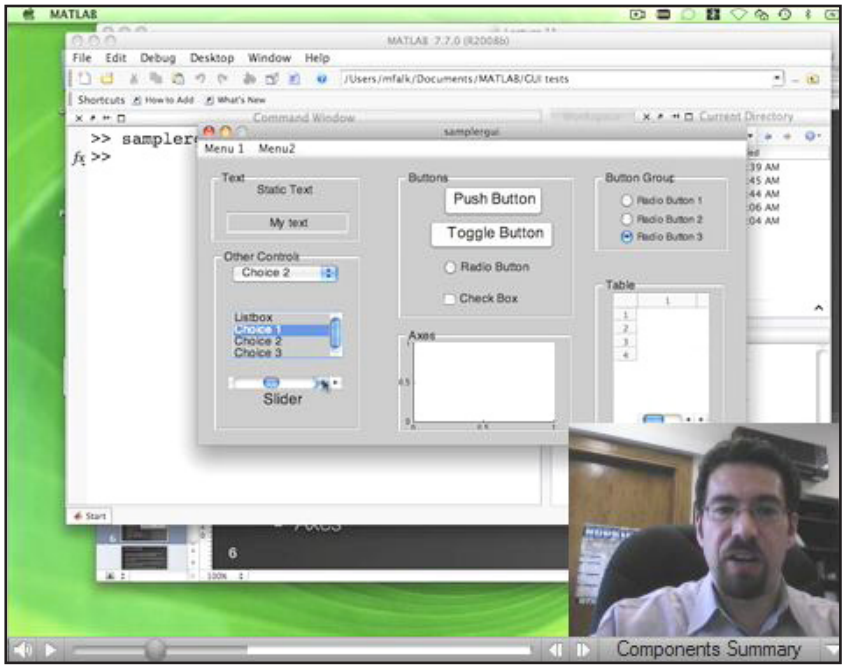
It turned out that designing the interactive activities was the bigger challenge. To figure out which activities would be effective, I had to accurately anticipate the skills students brought to the course. In addition, it's not always evident which conceptual issues will arise the first time you teach a course.

The Center for Educational Resources (CER) conducted focus groups with the students to collect feedback from the class. That's one way in which I am gauging students' reaction to the non-traditional class format. The results also helped me identify the challenges. They haven't necessarily always been where I expected. I have also used the standard ways to evaluate the course approach, such as tracking students' exam performance and directly soliciting comments from students.

Based on the student feedback, I'm breaking in-class activities into shorter segments, and including more of them. This gives me additional opportunities to stop and evaluate students' performance during the course of an exercise. It will also allow me to teach particular concepts sequentially, as opposed to using one or two activities that cover several topics. I'm also considering pairing students in the class since they have varying levels of experience and skill. In this way, the more experienced students can share their knowledge with the beginning programmers and can practice explaining what they know.



The video lecture allows students to review couse materials anytime

Other Thoughts

Former students offered these comments on Prof. Falk's new approach to teaching *Simulations of Materials and Biological Systems*.

"I like the format of the class - coming to class and working on programming rather than listening to a lecture and watching him do the work."

"We like this class very much!"

"This is the best programming class I've had!"

Additional Resources

- **Screenflow** is a screencasting software faculty can use to used to develop pre-recorded online lectures. It can capture a computer's desktop activity and synchronize it with the computer's video camera, microphone and audio inputs.
  http://www.telestream.net/screen-flow/overview.htm
- **Adobe Connect** is a IT@JH-sponsored collaboration tool that includes video conferencing, application sharing, live polling, chat, whiteboards, and presentations. Faculty can use their computer to host online classes or research meetings
  http://help.sset.jhu.edu/display/Connect
- **Impatica** can be used to convert PowerPoint files into narrated online presentations. It is a simple way to pre-record lectures online.
  http://www.impatica.com

Author's Background

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I am an associate professor of Material Sciences and Engineering. In addition to *Simulations of Materials and Biological Systems*, I also teach *Thermodynamics of Materials* for engineering graduate students. I am one of the faculty actively involved with the NSF-funded IGERT on Modeling Complex Systems.