

Instructional Technology in Computer Science Education

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Introduction

Computer science instructors – aren't they the disheveled-looking ones sporting thick glasses held together with white athletic tape, pocket protector with a myriad of writing instruments, inadvertently spiked hair, white socks, wrinkled shirt, and a far-away look in their eyes? You know – the geek, computer-nerd-type professor that loves to be in his office hacking away. His office hours are midnight to 3 AM, because he's awake anyway and most productive then.

Why should that instructor consider the integration of technology into their teaching? They create technology and systems. They train the students who in turn create and program technological systems in all kinds of environments including business, industry, health and allied fields, and education.

Well, you may not actually know any computer professors who fit the above description, but perhaps you might be interested how one such "prof" tries to integrate the appropriate use of technology into classroom teaching.

I teach computer science at Grove City College. The courses that I teach (or have taught) include Computer Programming I, Database Management Systems, Systems Analysis, Data Communications & Networking, Computer Architecture & Organization, Visual Basic .NET, Web Programming Technologies, Software Engineering, & Technologies of Instruction. As I write that list of courses, I realize that one of the reasons that I use technology to help me is that I need help all the help that I can get!

Here are some of the strategies that I have used over the years to help me do a better job of teaching, to augment and enrich courses, to appeal to different kinds of learners, to engage the learner in and out of the classroom. Certainly you have used some of these ideas. I trust that one or two will be novel to you and will give you an idea that you can use. (Perhaps if you attend my presentation you'll share one of YOUR ideas.)

Intranet -- Syllabus

Let us start with an idea that I am sure many also have implemented – the Web-based syllabus. I do not hand out hard-copy. My syllabus is available only on our campus network as a Web page. When the class and I first look at the syllabus, we view it using the classroom digital projector. If students need a printed copy, they may certainly do so, but I warn them that the syllabus is dy-

namic – a living document. All of my lectures outlines are illustrated with Microsoft PowerPoint and are subsequently hyperlinked in the syllabus.

The folder that contains the syllabus also contains handouts, assignments, sample code, etc. that students need.

Intranet – Inbox

How do you collect your assignments from students? Hard copy? For a time I collected some assignments via email, but with the advent of spam, I decided to keep my email to a minimum. Besides, collecting source code for a program via email still required exporting it so that I could compile the code as part of the grading process – or forwarding it to a student grader.

My current strategy is to have an “Inbox” in the class folder, a subfolder for each student in the class. The folder security for each student folder is such that only that student-owner of the folder can Read&Execute, List Folder Contents, Read, and Write to that folder. Thus a student may drag and drop an assignment into his/her folder. They cannot view the contents of any other student folder, nor can they remove files from their own folder. The advantage of this is that an assignment is time-stamped when it is handed in – no questions, no “slipping the assignment under the door,” etc. I can give the Inbox to a grader via CD or USB flash drive. The downside is that time is required at the beginning of the semester to setup the Inbox. I do it manually. I create each folder, removing unwanted access, adding individual and modify owner access. Let me know if you have a method for automating that process. (Where is a VAX/VMS batch file when I need one?)

Intranet – Papers

I require papers and/or writing-intensive assignments in several courses: Data Communications & Networking, Software Engineering, and Systems Analysis. Who reads the paper and assignments? Traditionally only the instructor and the student read the paper. The student reads his/her paper while creating it (hopefully) and the instructor reads it while grading it. Why not allow (or force) other students to read each others’ work? All paper and writing assignments in my classes are done as “Web papers” and posted in student Web space on the Intranet. The capabilities of Microsoft Office enable HTML documents to be easily created. FrontPage is easy for students to use as well. (I confess that I have a few students who will only use Notepad and pure HTML, perhaps yielding to a CSS file here and there.)

My Web programming class MUST create an HTML table (itself an assignment) in which each row represents an assignment for the class. Each row includes due date, assignment description with hyperlink to my HTML assignment document, description of what they used/did to complete the assignment, and a hyperlink to the student document. The students email the URL of this table to me and I build a table of hyperlinks to all of the students’ work. This makes reference convenient for any assignment for any student. It is also useful for “show & tell” in the class. We devote time now and then for volunteers to demonstrate what they have done. Final project demonstrations are mandatory using PowerPoint and the Web.

Anyone else see a student's assignment? Why not use the PC lab and let students do some peer evaluation? Give them a hard copy of the rubric used for grading a program, and have students demonstrate their programs in pairs while you go around and observe. Review what they are looking for. Let them see what other students are doing. (I pair them up in pairs of students who do not know one another.) This can't be done with any regularity, but it is a useful exercise for at least one assignment. All they need is the PC lab and their own network space. We use our notebook computers, one of the benefits of a mobile computing initiative.

Intranet – Independent Study and Honors

Our curriculum is lean and mean, and our faculty is small – lean and mean as well! Thus we have students who on occasion want to conduct independent study with a faculty member on a topic not offered by a formal class. When I am asked to sponsor someone, I require that the student create his/her own Web syllabus and then create/maintain a Web journal of their study. The journal takes a form similar to the Web assignment table previously mentioned. Learning is described; outcomes are hyperlinked and available. Thus other students can benefit from what each independent study student has done.

Intranet – Image Editing

In two courses, Web Programming Technologies and Technologies of Instruction we study image manipulation using Photoshop Elements 2. Students are required to create photo galleries of the “before” and “after” of the images altered. The photo gallery utilities of Photoshop Elements and FrontPage make that task easy. Students post these assignments on the Web for all to view.

Course Management System – Blackboard

Blackboard (Web CT, Jenzabar's LMS) is a course management system that may function as a communication center for a course of instruction. I use it for email lists and unofficial grade book, but one of my favorite utilities is the Discussion Board (or Forum in some systems.)

I require my Data Communications & Networking students to peruse the net, the library, and trade journals for articles relevant to class, summarizing them in the Discussion Board of Blackboard. Students are then able to read one another's summaries, and, when appropriate, reply or react. I build in incentives to do so. We have had some healthy discussions.

Some group assignments are posted in the Discussion Board also when the answers are open ended or issues are discussed. Students benefit from viewing other approaches to solving a problem. For example, I use this approach for a set of problems where students read a scenario and then suggest and defend media selection for a LAN.

Blackboard's Web Sites is also useful for collecting and utilizing Web sites with tutorials that augment and enrich the class activities.

Conclusion

The Web, the Internet, the intranet and associated resources, campus computer labs, smart classrooms, course management systems, and a plethora of software packages all offer opportunities for every classroom instructor to enrich in-class and out-of-class activities. What are you doing that is novel? Have you shared what you are doing with anyone? I would encourage you to do so.