Digitally Enhanced Learning?

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I happen to be married to a professor of computer science, a natural-born teacher, who has some strong opinions about teaching. We recently had a conversation about the use of pervasive computing in the college classroom.

TEACHING... HIGH-TECH OR LOW-TECH?

Perhaps the most pervasive technology used in the college classroom is presentation software, such as Power-Point or Keynote. I remember receiving photocopies of lecture notes when I was in college (I won't say how many years ago), and my college-aged son tells me that at least 50 percent of his professors (at the most amazing college you've never heard of) use presentation software in their classrooms.

I suspect it would shock many of our academic readers to learn that my husband rarely uses presentation charts in his teaching. He's not exactly a fan of the pervasive use of presentation software in the classroom, and he explains why in his blog, "Why I Don't Use PowerPoint for Teaching."[1] I won't go into his reasoning here (because although presentation software might be pervasive, it isn't pervasive in our sense of the meaning), but I do wonder whether he missed another problem with using presentations to teach: what if using presentations in teaching is comparable to taking photos to remember a vacation?

As noted in my last "From the Editor in Chief" column,[2] where I discussed NPR's "Bored and Brilliant" series, it turns out that taking photos might impact your ability to remember what you see.[3] So, does using pre-prepared lecture notes provided in the form of presentation charts affect our ability to remember the broader meaning of the lecture or to engage in the conversation? If so, perhaps there's more value in taking your own notes—in the process of taking the spoken and visual information in, processing it, and summarizing it into a note in your own handwriting. It's certainly something to consider.

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But what about other technologies? You know, pervasive ones?

What about the use of smart boards (see http://education.smarttech.com) in the classroom? Some of the interactive demonstrations I have seen showing schoolchildren collaborating on math problems and vocabulary lessons seem very promising. But, to the extent that these boards revert into hardware on which to project presentations, they aren't really living up to their promise.

In my husband's experience, these boards are painful to use because the students and professors have (largely) not been trained in their use, and charts advance or reverse seemingly randomly when a naïve user accidentally touches the board in the wrong spot. Do college classrooms achieve the active learning goals possible in the elementary-school classroom?

What about the use of clickers (see www.engaging-technologies.com/classroom-clickers.html) in the classroom? This technology seems so simple and powerful. Imagine being able to throw pop quizzes to test students' understanding in real time, right in the middle of a lesson. When I asked my husband about this, he admitted that he's never had the opportunity to use this technology, but that he would like to try it sometime. (I told him there's probably an app for that!)

What about the use of smart pens (see www.engaging-technologies.com/smartpens.html) in the classroom? These pens record audio while the user is taking notes. The obvious application is for students to take notes during a lecture (the need for which might have already been obviated by the use of chart handouts),

but my husband tried a different use case. He used the Livescribe technology a couple of years ago to record short lessons that the students could play back at their convenience. The lack of editing capability and flexibility on how the notes were presented created challenges at that time. He's hoping that waiting a few years will allow better support for the use case he envisions.

What about tablets and smartphones? My husband reports that many of his students take photos of the white/chalk boards with their tablets or smartphones. As of this year, all of his students have tablets, so we'll have to wait and see whether he finds a use for the tablets. Some of the available apps seem useful, such as Anki (http://ankisrs.net), which uses spaced repetition and active recall testing to support learning.

Pervasive computing seems to provide such a high potential in an educational setting. However, we have to be careful in how we apply it to ensure that we don't lose our perspective. Our goal should ensure that we use pervasive computing technologies to digitally enhance student *learning*—not to digitally enhance *education*. We need to take great care in how we apply this technology effectively, how we train teachers and students in its use, and how we measure the impact that technology has on learning.

IN THIS ISSUE

The theme for this issue goes beyond using technology to enhance learning—it's about enhancing all aspects of our lives. Nigel Davies, Marc Langheinrich, and Mark Billinghurst serve as guest editors of the special issue, which focuses on the ways in which pervasive computing can enhance our everyday reality. The topics discussed range from wearable personal assistants for surgeons to smart eyeglasses. I thank Davies, Langheinrich, and Billinghurst for putting together this special issue!

PERVASIVE BORED AND BRILLIANT CHALLENGE

Before I get to this issue's challenge, let me give you an update on one of the last issue's challenges about not constantly taking photos during a vacation. I tried this in March when we went on a family cruise to the Bahamas. Overall, it was nice not to have a camera (or phone) with me all the time. It was one less thing to worry about. I find that I do have many memories of our activities. The one difference compared to most of our vacations is that we had a number of family portraits taken by the on-board photographers. I wonder if those portraits will serve to remind me of all the other activities we did that we don't have photos of... only time will tell. I must admit that I have mixed feelings about the experiment. On the one hand, I am a bit saddened by the fact that I will not be able to make a photo memory book of our experiences; on the other hand, I haven't finished a number of other photo memory books from previous vacations, so it is a relief to not add another one to the list!

Now for the current challenge. Smartphones clearly distract drivers. You need only look at the statistics relating to texting while driving (see www.textinganddriving-safety.com/texting-and-driving-stats). Or, even better, watch a video of people trying to pass their drivers test while texting (www.youtube.com/watch?v=HbjSWDwJILs). It's safe to say that texting is a distraction!

But have you considered the distraction smartphones cause during meals? Have you ever tried to carry on a conversation with someone engrossed in their phone? My challenge for you this issue is to make a "no phones at dinner" rule. Observe how the conversation and the interactions change. (It helps if the kids put their phones out of earshot so that they can't hear the "ting" or "buzz" of a newly arrived message.) Leave the digital world behind for dinner! This has been a rule in our house for years, much to the displeasure of the local teenaged inhabitants. However, on the occasions when the phone doesn't get left elsewhere, I really notice the phone's impact on our dinner conversation! I'm thus looking forward to the availability of Dolmio's Pepper Hacker (www.youtube.com/watch?v=HUgv5MDF0cQ). Too bad it is still in the early concept phase; otherwise, it would be perfect for this challenge!

This issue also includes two feature articles. In "Pervasive Computing as a Classroom-Based Course," Dan Chalmers gives an overview of a course on pervasive computing taught at the University of Sussex. He positions the course in the context of the students and degree program and thoroughly discusses the topics covered and mechanisms of coverage. This article should be of interest to readers who teach, or expect to teach, a similar course.

Dian Tjondronegoro and his colleagues discuss an app for helping groups of women support one another during a "night on the town" in their article, "Designing a Mobile Social Tool that Moderates Drinking." They designed, built, and evaluated a smartphone app that lets groups plan a girls' night out and then execute that event in ways that support the safety of the individuals in the group.

It helps individuals monitor their own drinking and their friends' whereabouts. The authors conducted focus groups to evaluate the proposed tool and later performed a small field trial to learn how well the tool worked in practice. Interestingly, the tool was designed with a focus on female users, a fact that comes out in the features it offers.

Our Conferences department, written by Christos Efstratiou, Kiran Rachuri, and Sajal Das, gives a great overview of the 2015 IEEE International Conference on Pervasive Computing and Communications, held this past March. They provide highlights from the conference and help those unable to attend in person find the papers that are most interesting.

In our Notes from the Community department, by Mary Baker and Justin Manweiler, we learn about a whole range of ideas. I really enjoyed learning

about the acoustruments technology that supports gestures using acoustic manipulation and the Umati Project's vending machine that dispenses candy in exchange for grading exams, though I do wonder about the quality of the grading received for a bag of candy. More than anything though, I cringed when I read about Mattel's new "Hello Barbie" doll. I really wish Barbie would just stay out of the media spotlight for a while (www.youtube.com/watch?v=NO0cvqT1tAE).[4] Do we really need Barbie listening in on kids' play dates? Do we trust her? I, for one, certainly do not.

In our Innovations in Ubicomp Products department, Albrecht Schmidt discusses the challenges that pervasive computing researchers face when taking a research concept from the prototype stage to an actual product. He describes the opportunity enabled by crowdfunding sites, such as Kickstarter or Indiegogo. He also interviews two researchers from our community, Amanda Williams and Khai Truong, who have experienced the productization process first hand through successful crowdfunded projects. I think you will enjoy the war stories and lessons learned along the way.

Our Smartphones department, written by Căˇlin Casˇcaval, Pablo Montesinos Ortego, Behnam Robatmili, and Darío Suárez Gracia, looks at how multicore processing can be exploited to speed up Web browsers on mobile phones. In particular, they examine how to use HTML prescanning, CSS prefetching, and parallel processing of JavaScript to reduce the page load times experienced by smartphone users. Readers who live on the edge of systems and mobility will particularly enjoy this article.

In our Health department, Venet Osmani looks at using smartphones to detect the switch of states for patients with bipolar disorder. The use of smartphones to detect changes in a person's mental health status seems to be a promising new area for early intervention. I'm excited to see what will become of this area of research in the coming decade!

In closing, digitally enhanced reality is an exciting area. Applications in manufacturing and in supporting an aging population are quite motivating, but I'm still most intrigued by how technology can enhance our educational system. ⚏

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