

Paper-Based Computing

Another new technology demands we work together to plan the future—or be caught unprepared when the inevitable issues arise

By **Charles Hannon**

Faculty have a great deal of control over their lectures, lecture notes, and slides. A coming wave of recording devices and other classroom technologies—this time wielded by the students—will test this control and force serious conversations about how we can best help students learn, what it means to own an idea, and what we mean when we talk about developing a community of learners on campus.

The harbinger of this wave is the Livescribe Pulse smart pen, created by an MIT engineer and initially aimed directly at the college student market. The smart pen points a tiny camera at specially marked paper,¹ captures what is written, and converts the writing to PDF files and plain text in what is being called paper-based computing. The pen comes with microphones that capture audio and software that synchronizes it with the written notes. A student can replay an entire lecture at a later time, either by interacting with the written notes or through a computer. The pen's software also makes it easy to share recorded class sessions with other students at the Livescribe website or through Facebook.

How different is the functionality of the smart pen from existing technologies? It certainly is not the first recording device to turn up in the classroom—students have been asking permission to use recorders for years. The concept of electronic notes that can be shared among peers also is not new; students have been bringing their laptops to class for over a decade, and few faculty proscribe the sharing of notes. At many colleges, the floodgates appear to be already open, with faculty making their course materials available electronically, from post-

ing simplified notes to a course website to streaming video and slides of every moment of the class meeting.

Because it is so easy to create, reproduce, and distribute digital content, new technologies such as the smart pen will bring to the foreground issues that have always existed just under the surface of our everyday practice. It is one thing for faculty to provide students a copy of their PowerPoint slides or allow them to share notes or record a lecture. It is altogether different for students to create word-for-word digital text and audio transcriptions of a semester-long course. It can be heartening to see a small group of students pooling their notes and meeting to discuss difficult concepts, but imagine a top student posting a highly accurate digital transcript of a semester's worth of intellectual work to a Facebook page. The realities of digital content, combined with the popularity of social networking sites, make this new environment one that we need to shape with clearly thought-out and articulated policies.

Ownership of Intellectual Property

Some legal ambiguity persists over whether faculty or their colleges and universities own the intellectual property produced for and in the classroom. Historically, universities have been more interested in claiming rights over patentable inventions than over copyrightable lecture materials. As more of the latter have become digitized for distance learning programs especially, individual cases have been decided on such questions as whether the intellectual property can be considered work for hire or whether it was created by specific request of the

college and supported with specifically designated resources.² In practice, faculty believe they own the academic material they generate. Even ideas that faculty develop extemporaneously during classroom discussions belong to them when later published under their names. But the new wave of digital technologies should renew our efforts to clarify the policies on our own campuses, and these discussions must include all stakeholders: faculty, academic affairs and advising administrators, and students.

It is easy enough for faculty to add a statement to their syllabi that prohibits electronic recording of any kind or the sharing of notes outside the enrolled class of students. This would stem the tide, except for those students with auditory processing disabilities who require the accommodation of recorded or transcribed class lectures. These students can be asked to sign a contract that prohibits them from sharing their digital notes. Certainly, the smart pen's ability to move all students through a review of their notes in a nonlinear fashion will come as welcome progress: current recording technologies require such a cumbersome linear process that few students avail themselves of the accommodation even if granted it. And policies can be written that protect faculty or institutional intellectual property interests. Middlebury College's policy on accommodating student disabilities captures both the ambiguity of current intellectual property law and the need to be explicit about restrictions on content reproduction and distribution:

Where a particular accommodation results in a verbatim transcription

of a classroom lecture or presentation, students should recognize that such lectures or presentations are the intellectual property of the individual professor, Middlebury College, and/or both, and that the copying, publication, or distribution of transcripts to anyone, without prior written approval of the College and the professor, is prohibited.³

Still to be addressed, however, are the intellectual property and privacy rights of other students, whose extemporaneous contribution to class discussions we often encourage. The possibility that such thinking out loud might be captured and shared with hundreds of “friends” on Facebook could discourage the intellectual give-and-take that defines much of what faculty and students do in the classroom.

But why draw the line at those students who require an accommodation for a learning disability? Surely the capabilities of the smart pen have something to offer all students, who can benefit from its support of multiple learning modalities. The introduction of such devices should renew our discussions with all students about what it means to take notes effectively. Is a verbatim transcription really best? What about simple outlining? Perhaps a skilled note taker should be designated (they sometimes are as an accommodation for dysgraphia), and students, regardless of learning ability, should be left to engage with the lecture and discussion, knowing they can replay the experience through text, image, and audio afterward.

New Doesn't Mean Perfect

Many faculty will view that last scenario as naïve, for they have seen new technologies cause students to become still more passive about their learning. This is the biggest concern we should have with something new like the smart pen. It is the latest in a long line of technologies that promise academic and intellectual results with seemingly little effort.

It is no coincidence that the smart pen comes from the same inventor who created the Leap Frog learning tools that parents and relatives purchase in such

great numbers for preschool children. These products, although innovative and educational, cannot be considered a substitute for the effort required to understand fundamental concepts and process complicated relationships. Such products succeed best when they remove obstacles that stand in the way of the joy of learning. The Leap Pad products fail this test when the technology behind them gets in the way: when a child forgets to tap the New Page button that synchronizes text and audio; when a new book isn't recognized by the device; or when weakening batteries degrade the overall experience. To the extent that the smart pen can avoid these kinds of mundane difficulties and allow students to focus on the content of their courses, it could advance our collective conversations about student learning.

IT support groups have an important role to play in these conversations. Smart pens will almost certainly take their place among the many learning technologies that deliver something less than they initially seem to promise. With such devices it is always important to have a realistic sense of how long the rechargeable battery will last; how well the voice-to-text translation will work; how difficult the synching software will be to use and understand. All of these issues can become compounded for those with learning disabilities: the number-one rule for assistive technologies is that they first do no harm. As soon as students start using these devices, we can be sure they will seek on-campus support for the difficulties they encounter.

It is difficult to predict how much demand there will be for smart pens. Livescribe began shipping pre-orders in late March 2008, with a three-to-four-week delivery estimate. It appears that the company's marketing campaign (the pen was reviewed by the *New York Times*, the *Wall Street Journal*, *Sports Illustrated*, and every major technology and computing magazine) attracted interest beyond their initial manufacturing capabilities. The company CEO, Jim Marggraff, admitted as much in an e-mail to frustrated early adopters, comparing the limited supplies of the pen to Amazon's experience with the Kindle and Nintendo's

shortage of Wii systems.⁴ The mismatch between marketing and production also suggests that the company did not want to miss the 2008 high school graduation season—a time when family and friends often look to college-ready technologies for gifts. The over 7,000 “fans” of the Livescribe Facebook group might be another indication of the pen's receptive market.

More Change Ahead

This new class of smart pen represents a new paradigm: paper (rather than pen) based computing, auguring significant change regardless of the fate of the Livescribe device. Technophiles will imagine a host of uses for the technology, from solutions to the electronic medical records problem to “sketch” prototyping environments that result in functional applications after synchronization.

In higher education, we will see applications of the technology that far exceed the simple note taking that dominates Livescribe's initial marketing campaign. As with all breakthroughs, we can see change is coming, and it is up to us to work with colleagues across our campuses to manage it effectively. *C*

Endnotes

1. Livescribe provides specially marked paper that it calls Interactive Dot Enabled Paper with Dot Positioning System. For complete specs, see <http://www.livescribe.com/smartpen/techspecs.html>.
2. For a brief overview, see Glenda Morgan, “Faculty Ownership and Control of Digital Course Materials,” *Teaching with Technology Today*, vol. 5, no. 4 (January 25, 2000), <http://www.uwsa.edu/ttt/facown.htm>.
3. Middlebury College, “Americans with Disabilities Act Policy,” http://www.middlebury.edu/about/handbook/appendices/Americans_with_Disabilities_Act_Policy.htm.
4. “3/28 Update from CEO Jim Marggraff,” *Livescribe Blog*, <http://www.livescribe.com/blog/2008/03/28/328-update-from-ceo-jim-marggraff/>.

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