Emerging Technologies for Learning

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How to teach with technology: keeping both teachers and students comfortable in an era of exponential change

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The twenty-first century will be characterised by enormous, exponential technological change. Our so-called 'Digital Native' generation (that is, our students) is already embracing these changes, creating in the process an 'emerging online digital life' that I have written about extensively.[1]

For education, this explosion of technological change has enormous implications, and is already raising several issues. Technologies such as mobile phones and digital cameras are being banned by many schools. Schools are moving towards one-to-one computing at radically different speeds. In general, students are learning, adopting, and using technology at a much more rapid pace than their teachers, and many teachers are highly fearful of the technologies that the students take for granted. While some teachers do embrace the kids' technological world, those teachers who are fearful of being unable to engage a generation of students used to technological advances often attribute their own failures, such as the loss of control implied in integrating tools that they know relatively little about, to untruths such as lack of attention span and Attention Deficit Disorder on the part of students.

In exchange, students observe their teachers' lack of fluency with modern tools, and view them as 'illiterate' in the very domain the kids know they will need for their future – technology. The very concept of an 'education' is changing for many kids, as they experience self-directed learning, mostly out of school, about things that interest them, and they see how different this kind of learning is from the 'push it on you' and 'test you to death' methods of formal schooling.

I love to listen carefully to what students say, "There is so much difference between how teachers think and how students think," explained a 16-year-old female high school student recently (2006). Today's students see teachers as being from the 'olden days' when you 'actually had to memorise phone numbers' (15-year-old girl, 2006). They see these now useless bits of information as representative of all the knowledge their teachers have that is useless for their future. And the two groups have trouble communicating: "You really have to slow down when you talk to teachers" said a 14-year-old in Liverpool (2005).

Better strategies, please

But this divide, growing larger every day, does not, in fact, have to prevent us from educating our students effectively. There *are* strategies for teaching with technology that can make both students and teachers comfortable, while allowing the students to go as far as they can with the technologies that characterise their age and that they love to use, and that prepare them for their twenty-first century future as well.

In the past five to ten years, we have seen the appearance of scores of new technologies that have strong potential uses in education. They include email, search, texting and instant messaging, blogs, wikis, the Wikipedia, podcasting, polling devices, peer-to-peer (P2P), complex computer and video games, networking, augmented reality, social and community building tools, digital cameras/videocams, phone-based cameras/videocams, GPS, speed enhancers, interactive whiteboards, DVDs, wireless technologies and many
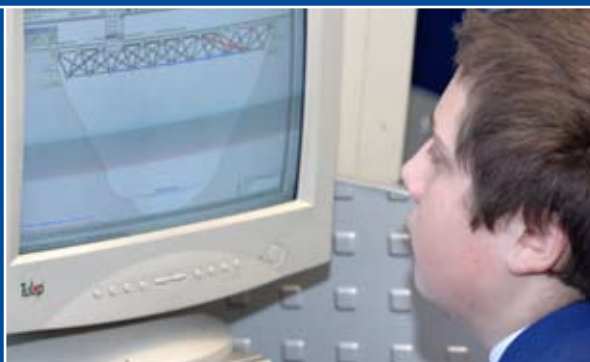
others. We have also seen older technologies (such as pagers and most wires) increasingly being replaced and leave the field. Given that our technology will continue to roughly double in power every year, based on a combination of Moore's Law for processors, increases in transmission speeds, storage capacity, and other developments, there is every reason to assume that in the next 5 to 10 years we will see even more new technologies appear than we saw in the last decade.

Too fast to master

The key point is that new technologies for education are arriving and changing really fast – too fast for even teachers who *want* to learn to use all of them to effectively do so. (And, of course, there are many teachers who *don't* want to use new technologies at all.) Yet our students are clamouring for these technologies to be used as part of their education, in part because they are things that the students have already mastered and use in their daily lives, and in part because they realise just how useful they can be.

So what should we educators do? Teachers often ask for 'training' in using these various tools, but is that really the answer? I think not, if only because of the speed with which the tools are coming and going. Though we rarely ask our students" opinions, when we do ask about this the students' message to teachers is clear: "Don't even try to keep up with technology – you can't. You'll only look stupid" (High school girl, 2006). I don't imagine any teacher actually wants to look stupid in front of his or her class.

Lest you think I exaggerate, here's an example. Many of our teachers think they have finally 'mastered' Microsoft's PowerPoint. These teachers have worked hard, in many cases, to put their class notes and lectures into the new format, assuming that their students are sure to appreciate their effort to keep up with the technology.

But what do the students say? "Teachers make a PowerPoint and they think they're so awesome," says a high school girl (2006), typically. "Teachers make PowerPoints and think we're so excited to see them," says another in middle school (2006), "but it's just like writing on the blackboard." "And then they read them to us" says a third (2006). "Why should I have to go to hear it read?"

What teachers need to learn

There are, of course, teachers who are passionate about using technology, who strive to learn and keep up, and who are using technology creatively in their classrooms. Some of these enthusiasts have mastered on their own the technologies they use, but the smartest among them have partnered with their students, who are eager to teach them. "Just ask us," says a 15-year-old, "We're happy to help." (2006)

A star among British teachers who use technology creatively is the Becta award-winner Tim Rylands of Chew Magna primary school near Bristol, who uses the Myst, Riven and Exile series of games to inspire creative and descriptive writing in his students. I know of many language teachers who make podcasts for their students. Other teachers are posting homework assignments and accepting student submissions online, which the students love. I have nothing but praise for these teachers, who work hard to keep up with their students' technology preferences. But such teachers are the exceptions.

And, in a sense, that is how it *should* be. Teachers (unless they have a special passion for technology) rarely benefit from learning to *use* (that is, create examples of) the emerging technologies themselves. The reason is simple: excepting a great deal of passion and time devoted, they will always be behind the curve in the use of the technologies – and most importantly, behind their own students, 'looking stupid'.

The fact is that today's students know more – and will always know more – than their teachers about technology and how to manipulate it. This may be hard for many teachers to accept, because it means letting go of whatever control comes from being 'the only one in the room who knows'. But this really *shouldn't* be so hard, because teachers, being adults, still do have an edge. Our edge is that we understand what the students generally don't – the learning objectives that determine *why* we are using whatever the technology happens to be.

To retain the respect of our students who know more than we do technologically (and to therefore look 'smart'), what we teachers really need to learn to do, I submit, is to 'divide the labour' of learning, to the benefit of all. The answer to 'How do I teach using tools that are unfamiliar to me, tools that I can't fully master, or, even, in many cases, use myself?' is actually simple: Let's each do what we do best.

And how, you many ask, can I, an ordinary teacher, one not ahead of the curve in – or even necessarily attracted to – technology, do this?

My answer – different from the advice of many – is that such teachers don't need to waste even a minute of their limited and precious time learning to use and master any of the new technologies. Why? Because their students can do this – and they want to. What we should do is let them.

If you are a teacher who wants to learn to use new technology tools, go right ahead. Just be sure to get help from your students so you don't 'look stupid'.

But what *all* teachers should learn to do comfortably, though, are those things we can do *without* 'looking stupid'. This (we certainly hope!) is to *evaluate* their students' uses of the new technologies, and *teach our students the important lessons about* those technologies. Teachers can and should be able to understand and teach *where and how new technologies can add value* in learning.

To do this, teachers must learn what these technologies are and can do, and understand them, but without necessarily becoming proficient in their use. (And by 'use' I mean creating with the technologies, not just 'accessing' them.)

Teachers must do this because there are lessons about technology that even the most technologically proficient kids can't learn well on their own. These include evaluating and comparing various uses of the new technologies, as well as specific lessons one doesn't necessarily learn from 'just doing'.

So there needs to be a 'useful division of labour' around the emerging technologies. Teachers need to work with students to understand how the technologies work, what they offer, and to understand how to include them in assignments. Students need to do the work of actually producing things in these technologies and media. Then teachers and students need to work together to create evaluation criteria and rubrics, and to make and understand the distinctions that relate to quality. Teachers also need to help students apply technologies wisely to real problems, and to reflect and search for the deeper issues that the technologies raise, and to bring up and discuss these issues with the students.

Four examples

To illustrate what I mean by a 'useful division of labour' around emerging technologies, let me use four of them as examples. Out of the larger list above, I have picked four 'technologies' as illustrations, choosing them, to some extent because they have been among the most controversial. These are the technologies of The Wikipedia, podcasting, Instant Messaging, and phone-based cameras.

The Wikipedia

The Wikipedia is an online, collaborative encyclopedia to which anyone who wants to can contribute. Wikipedia is a technology – or more precisely a product enabled by a collaborative technology known as wiki – that has become a thorny problem for many teachers and school librarians. The concern of these people is that students may (and do) use Wikipedia as their sole source of information when doing research, and that the information – not necessarily written by recognised, paid 'experts' – will be wrong. In the most unfortunate and extreme cases, this concern leads educators to ban students from using the technology at all. To me, that 'solution' is just silly, because even medical school professors claim that the Wikipedia is full of useful information not easily found anywhere else. Recently a Harvard Medical School professor wrote in the *New York Times* about being stung by a jellyfish. Everything people did made the pain worse, until he was able to find the 'right' answer – Australian researchers had shown that hot water worked best to alleviate the pain – in under two minutes on Wikipedia. (Jerry Avorn, 'The Sting of Ignorance', *The New York Times*, September 16, 2006)

Let me suggest a different way to approach the issues that the Wikipedia raises. First, we need to let the kids use the Wikipedia (it's useful, and they'll do it anyway.) But we should make them use it not just for searching, but also make our students become contributors, writing articles about, say, local activities, places, or traditions that the Wikipedia does not already contain. (Of course, if students wish, they can contribute to other articles as well.) Teachers can then work with their students to evaluate those contributions. Are they effective? Well written? Do they communicate well? Are they examples of good journalism? Why, or why not? There is a lot of learning here for our students, in a real-life context that is visible to the whole world.

This is what 'using' a technology means to today's kids – not just finding something, but putting something of their own in.

In addition, and very importantly, the teacher can and should raise with students, and discuss with them, some key lessons surrounding the Wikipedia. The biggest of these is the issue of 'search versus research'. What I mean by this is that the Wikipedia is a perfectly valid source when you are 'searching', but using Wikipedia (or anything else) as your sole source when you are doing 'research' is wrong. Research, in an academic setting, comprises a set of tools and traditions that have evolved over thousands of years. One of its primary tenets is consulting multiple sources (yes, that's the 're' in research!)

A second issue for teachers to raise and discuss around the Wikipedia is the concept of Intellectual Property, including the ideas of plagiarism and 'fair use'. Here a teacher's deepest skills are required, because we don't want to only shallowly tell our students that 'plagiarism is wrong', but rather to discuss with them the broad concepts and meaning of intellectual property. Clearly, with the introduction of 'Copyleft', Intellectual Commons and other modern ideas, society's concepts of intellectual property and fair use are evolving rapidly, and need continual re-examination in a time when cut and paste is so easy a first-grader can do it.

So the teacher's job becomes, in fact, far more interesting in our time of emerging technology – not just handing out rules and how-to's, but rather providing evaluation, context and nuance to help the kids truly understand what they are so able to technically do.

Podcasting

Podcasting is the technology of creating audio (usually MP3) or video files that are then distributed over the internet for others to hear and watch (either directly online or by downloading to personal devices). While teachers often ask for 'a course' to understand how to do this, it's something most high school kids – and even many elementary and middle school kids – already know how to do, or could learn from their peers in under 10 minutes.

So without being taught, or asking a student for help (the easiest way but something that many teachers are reluctant to do), how can teachers use podcasting in their teaching? Simple: treat making a podcast as an assignment. Podcasts can be assigned to individuals, or to a whole class working in teams (which allows those who don't know how to make them to learn from their peers), or they can be allowed as an alternative way to do written assignments.

What does the teacher have to do? Nothing more than use a skill that hopefully they are already good at: listening. Teachers should listen to the podcasts with the students, and help the students decide on the criteria for evaluation, and evaluate how well their own work and other students' submissions meet those criteria.

And what is a deeper issue to 'teach' regarding podcasting? I'd suggest oral versus written communication – how do the two forms differ and why?

Instant Messaging

Instant Messaging (IM) is something many kids do so well and easily – and most teachers do so poorly – that it has effectively opened a private communication channel, both between the kids in the class and between the kids and the world. Obviously the knee-jerk educational response has been to just close the channel off. But what it we were to ask instead 'How can this be useful in our teaching?'

After hearing one of my talks about using mobile phones in education, a teacher actually put this question to her primary school class, and, in one class period, they came up with several useful ideas. These included interviewing experts using standard English, practising business etiquette and conversational skills, doing research on the health risks of mobile phones, text messaging ideas such as to speakers while they are debating, reviewing silently for quizzes, and taking pictures of notes and assignments on the board.

I submit it is *always* better to get the ideas for how to use new technologies from the students, and to assign the use of the technologies to them. If we don't do this, and if we don't teach the kids to use these technologies responsibly, they will just use them to beat us. "I can look you right in the eye and still be texting," said one student.

So what if we *allowed* the use of mobile phones and IM to collect information during exams, redefining such activity from 'cheating' to 'using our tools and including the world in our knowledge base'? Our kids already see this on television. "You can use a lifeline to win $1 million," said one. "Why not to pass a stupid test?"

I have begun advocating the use of 'open phone' tests similar to the 'open book' tests I often had in college, in which being able to find and apply the right information becomes more important that having it all in your head. Teachers who have implemented such tests report an added benefit as well: once the students have a bigger information base to draw from, teachers can ask harder questions. Of course, as usual, the students are way ahead of us. "The truth is that all our tests are 'open phone,'" said a high school senior to me recently. "It's just that the teachers don't know it."

Once we accept IM as having educational value, then we can, as above, begin to search for, discuss and evaluate with the students the most effective procedures, the most interesting methods and ideas, and the most

creative thinking for using it. And we can address and teach the key stumbling block about IM for many teachers – the issue of spelling. The lesson students should be taught is not that IM destroys spelling, but rather that IM is an informal language, and has its own rules, which are different from those of formal writing. Students need to learn both, and use each when appropriate.

Mobile phone cameras

Except for the research possibilities of the internet, it is hard for me to imagine a tool better able to help education than each student having in their hand a camera, especially one that can transmit the pictures they take anywhere. Students can collect evidence and scientific data, do photojournalism, visually express ideas, identify things and people, and do hundreds of other useful learning tasks, depending only on the imagination of the students and the teachers. The pictures students take can, in addition, be manipulated by them with photo editing software or other programs, creating even more expressive and useful possibilities.

But what typically happens in our schools? A student takes a picture in the girls' locker room and posts it, and, before you have time to turn around, or have time to talk about it, this incredibly useful tool is banned from use forever. From the point of view of education, this is insane. Do we ban skirts because some are too short? No, we teach kids to act appropriately. It is our job to teach responsibility and the responsible use of tools.

Just think, for a minute, of everywhere in education a camera could be useful. It could be used in English classes for creating (and later writing about) expressive images. It could be used in literature classes for collecting potential illustrations of word images and ideas. The camera's usefulness in science classes goes without saying. In maths kids could seek out and photograph mathematical principles in nature. In rhetoric, photos (and videos) can allow us to see ourselves as we are when we talk, and get useful feedback. Photo contests, photo-editing contests, caption contests, and other picture-based educational activities already exist all over the Web. They engage kids terrifically. They could and should be part of every class.

And the key issues to be teaching here? Words versus images. Responsible use. Truth versus manipulation.

You get it.

Whenever I hear pundits opine that earlier technologies that were initially touted with great fanfare for their potential for changing education, such as television, didn't change much at all, I truly bristle. All these technologies – especially television – did change education radically. Just not in our schools.

It would be foolish of us to let the same thing happen with all the newly emerging digital technologies. This time the learning is much more direct and important, and the kids already know it. Perhaps the main educational battle of our time will be between 'School' (the keeper of the credentials, yet with past-oriented learning and fear of new tools and methods) and 'After-School' (a catch-all term for all the ways kids are learning today using technology). In my view school will have to fight very hard to win this battle, as formal learning becomes, in a time of hyper-rapid change, more and more irrelevant to our students' preferences and needs for the future. If teachers do not focus on teaching the students the key lessons necessary for our future technology users to know –quality, meaning, value, relevance – school has very little chance. And if IT stands in the way of technology use rather than facilitating it, school's chances will be even worse.

Remember, technology tools are coming at us at enormous speed, and they will only come faster in the future. 'Email Is For Old People' cried a recent headline in the *Chronicle of Higher Education* (Volume 53 Issue 7, October 6, 2006). YouTube videos, hot today, will be replaced by something even better tomorrow. Our kids are already moving beyond MySpace. Flash, the programming language of the moment, will be a 'flash in the pan' as soon as something better is invented. The futuristic GPS, gyroscopes, motion sensors and other haptics of our latest game consoles will seem old in a few years. More appropriately engineered materials will be invented to replace the largely 'found' materials of today. The use of our senses of smell and taste for learning have hardly begun to be explored. And although we still know relatively little about how the brain works (for learning or anything else), technologies for direct mind control of objects are already in use.

For technology and our kids, it is absolutely a New World ("Brave" remains to be seen). And while it is a huge one-time leap from the analogue world of our past to the digital world of our hyper-changing future, because of the speed of continuous change, future teachers will *always* be behind the technological know-how of their students. And the gap will always be greatest in the lower grades.

But whatever the technologies of the future turn out to be, creative, intelligent use of them, in service of real, important societal goals such as communication, education, and greater understanding, will still remain the thing that counts. And in those realms good teachers – whatever the technology – should be able to help and add value.

In my view, the only way our schools will ever adopt and benefit from the *new* technologies that the students want and need is if everyone, students and teachers, remains comfortable (or at least reasonably comfortable) in the process. That can only happen when each group acknowledges the strengths of the other, requiring from them that they employ their strengths as fully as possible, while learning simultaneously and gradually about the areas where they are weaker.

Our students' strengths lie in their ability to quickly master, use and apply technology, and in their fearlessness to try new things. Our teachers' strengths lie (or should lie) in their ability to distil and teach lessons about and with technology, and to engage their students in discussions that help them see and understand issues that they are likely to miss on their own. In order to figure out ways to use the technologies in service of learning, both groups must work together, because today the 'right answers' and 'best practices' exist only as ideas and experiments, or do not exist at all.

To use the twenty-first century's rapidly emerging technology effectively for education, we must invent best practices together. In an era whose often unbelievable technological changes we are all struggling with, the mantra – for both educators and students -- must be this:

> ## We are all learners. We are all teachers.

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