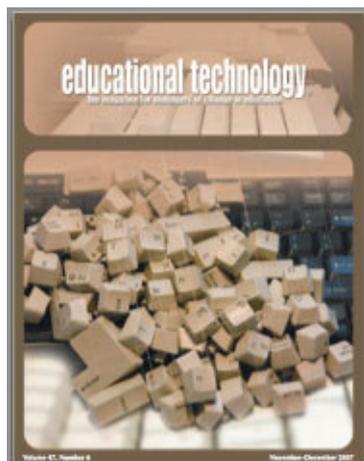**EDUCATIONAL TECHNOLOGY Magazine, November–December 2007**

About This Issue: A special issue of *Educational Technology* on

opening educational resources
Judy Breck Guest Editor

Judy Breck writes about OER and mobile learning on her blogs, *GoldenSwamp.com* and *Learnodes.com*, for Howard Rheingold's blog *SmartMobs.com* and at *iCommons.org*. Working to advance OER for the past decade, she was recognized by the *Industry Standard* for leadership (1997– 2001) at *HomeworkCentral.com*, an open content learning Website, with 35,000 study subjects that received 4 million monthly page views in 2000. Coauthored with David Smith, Director of ICT at St Paul's (Barnes, London), her fifth book about Internet learning is: *Intertwingled: A Compelling Story of the Joys of Being Connected in the Digital World of the Future. Intertwingled* will be available in 2008 from future-text, London (e-mail: jbreck@nyc.rr.com; Website: *http:// goldenswamp.com/*).

When Educational Resources Are Open

Judy Breck
Author/Blogger

This article is a partial look at what the future of education might be if educational resources become open online. Intertwingularity is discussed as a general term for what open educatonal resources (OER) will do online. Predictions about an open education future are based on nine quotations from books by popular writers about our networked age. When the network mechanisms described become a reality for education, "intertwingularity will enable knowledge," as David Weinberger writes in *Everything Is Miscellaneous*. OER will allow knowledge to be formed, ideas to emerge, and understanding to be shared.

Few would claim that in 2007 educational resources are essentially open. They are not. As this magazine issue comes to its close, my article will leave you with some glimpses of what we might expect for education when it opens its resources online, joining other major sectors of human enterprise where the laws of open networks apply. Each glimpse is based on a quotation from a popular writer about our networked age. What follows is a partial look at what could happen in the future of education. None of us know what that will be for sure. I hope the following will be useful to you in your role as a shaper of that future.

Intertwingle

We begin—as we will close—with Ted Nelson's wonderful word *intertwingle*. Theodor Holm Nelson was one of the first to see that digital networking made it possible for human ideas to be organized in bountiful new ways. Here is how his insights are summarized in Wikipedia:

Intertwingularity is a term coined by Ted Nelson to express the complexity of interrelations in human knowledge. Nelson wrote in *Computer Lib/Dream Machines* (Nelson, 1974, p. DM45): "EVERYTHING IS DEEPLY INTERTWINGLED. In an important sense there are no 'subjects' at all; there is only all knowledge, since the cross-connections among the myriad topics of this world simply cannot be divided up neatly."

Nelson added the following comment in the revised edition (Nelson, 1987, p. DM31):

> Hierarchical and sequential structures, especially popular since Gutenberg, are usually forced and artificial. Intertwingularity is not generally acknowledged—people keep pretending they can make things hierarchical, categorizable, and sequential when they can't."[1]

In contrast to what Nelson calls intertwingularity, education remains deeply hierarchical, categorized, and sequential. Subjects are shaped into trees (quintessential hierarchies) and taught in hierarchical order of difficulty. Curricula, subjects, and standards are categorized. Grade levels and assessment are sequential.

When educational resources become open into the natural intertwingularity of the Internet, their hierarchical tree forms, boxing into categories, and ordered sequences quickly break down. A passerby will add a tag to a link. Another will put that link onto a page, echoing its ideas in her Website. Already the visitors have related the open link to new places. A cluster is born. A little piece of a pattern for an idea has been made available. The links have intertwingled.

Decentralized Sources

The Starfish and the Spider, *by Ori Brafman and Rod A. Beckstrom:* "Decentralization has been lying dormant for thousands of years. But the advent of the Internet has unleashed this force, knocking down traditional businesses, altering entire industries, affecting how we relate to each other, and influencing world politics. The absence of structure, leadership, and formal organization, once considered a weakness, has become a major asset. Seemingly chaotic groups have challenged and defeated established institutions. The rules of the game have changed."[2]

When I was in school, I made A in almost every subject, because I gamed the system. It was obvious to me that if I learned the answer to every question in the back of the textbook chapter the class was studying, I would do well on the next test. In a system like that, students lose who do not have or understand the right textbook chapter or, as I did, who could have learned more and understood better if I had done more than memorize practice questions. "[2]

Opening educational resources online will decentralize learning materials. Answers for everything will be online, and answers to this will richly connect to answers to that and that and that—so every answer to anything will be in the network. If your educator's instinct is telling you that the kids will not be able to find what they need, you are correct about an analog world where things are physical and can be connected in only one way. But ideas in networks connect in every relevant way, making them easier to find than when all we had were books. Think about how quickly you can find even odd ball things on Google.

The point of the title of the book quoted above is, as its jacket says: "If you cut off a spider's head, it dies; but if you cut off a starfish's leg, it grows a new one, and that leg can grow into an entirely new starfish." Opening educational resources into the online world will cause a global starfish of digital learning materials to form. When educational resources are openly positioned online, they will interconnect, emerge, and fill every cognitive niche. If any piece decays, it will be quickly replaced, starfish fashion. This new starfish, native to the open Internet, is becoming known as the global knowledge commons.

Adding Learning's Long Tail to the Short Head

The Long Tail, *by Chris Anderson:* "The theory of the Long tail can be boiled down to this: Our culture and economy are increasingly shifting away from a focus on a relatively small number of hits (mainstream products and markets) at the head of the demand curve, and moving toward a huge number of niches in the tail. In an era without the constraints of physical shelf space and other bottlenecks of distribution, narrowly targeted goods and services can be as economically attractive as mainstream fare."[3]

The way Amazon.com sells books is the standard illustration for the long tail, and it is a good one. The number of books a physical store can stock is limited to how many its shelves and sales tables can hold. Amazon has no such limitation. Exactly the same principle applies in schools. The physical limitation is the number of printed learning resources the building can manage—and from the individual student perspective, how much he can stuff in his pack and carry on his back. There are no such limitations for open learning resources online.

Chris Anderson's Chapter 9 in his book quoted above is called "The Short Head." For booksellers the short head is made up of the popular and standard books customers who come to the store are likely to buy—he stocks only these books because his store does not have enough shelf space for more books. When we apply this principle to the way we are used to conducting education, it is clear that schools are limited to teaching the short head of knowledge because curricula, standards, textbooks, and class time can only deal with the main part of subjects. When open educational resources online are where a learner engages knowledge, she is not stuck in the short head of a subject. For that reason alone, opening educational resources is a grand opportunity: in a world of multiplying knowledge and complexity, opening educational resources will make it possible for future generations to learn more than the short head, following their curiosity into the long tail of learning.

Tagging

Wikinomics, by Don Tapscott and Anthony D. Williams: "Wired cofounder Kevin Kelly aptly describes a tag as a public annotation—like a keyword or category name that you hang on a file, Web page, or picture. When people tag content collaboratively it creates a 'folksonomy,' essentially a bottom-up, organic taxonomy that organizes content on the Web.…

"…folksonomies are one of many examples of how social networks gravitate naturally toward norms and conventions that enhance social productivity and connectivity."[4]

Back in the 1990s, a lot of people worried about organizing the contents of the Internet. On a more personal level, we worried about organizing the contents of our own hard drive. At both levels, by the early 2000s, it was pretty clear that there were no way to organize either one. We are now realizing that disorganization itself is a good thing because the best way to find meaning in a network is to let it emerge from connecting pieces at the smallest level.

We are now watching the burgeoning of *folksonomy*. The opening of educational resources will allow those who use the resources to add tags of their own, thereby applying folksonomy to OER. Perhaps you are a biologist who places a lucid, well-illustrated animation of mitosis on your Website. Teachers and students who use your animation bookmark it online with tags meaningful to themselves. Lesson plans and student study notes could be assembled by calling up Web pages with sets of tags, including those that bring your animation into the cluster. Curricula become modular instead of hierarchical. We are only seeing the beginning of tagging by us folks. So far, it seems like the most effective way to bring together network resources in a useful way.

Participation and Peer Production

The Wealth of Networks, by Yochai Benkler: "…likely most radical, new, and difficult for observers to believe, is the rise of effective, large-scale cooperative efforts—peer production of information, knowledge, and culture. These are typified by the emergence of free and open-source software. We are beginning to see the expansion of this model not only to our core software platforms, but beyond them into normal; color:#211D1E" every domain of information and culture production… from peer production of encyclopedias, to news and commentary, to immersive entertainment." As the 1980s ended—just before the decade of the Internet's emergence—there was a confrontation in educational theory between pretty much opposite approaches. E. D. Hirsch, Jr. was cataloging "what every American needs to know." Theodore R. Sizer was organizing a Coalition of Essential Schools where high school students worked toward common principles. In a stunning positive for the future of education, the Internet arrived, delivering the opportunity to do everything both Hirsch and Sizer advocated.

Hirsch selected a particular batch of knowledge— something of a short head of what to know for Americans—and the knowledge Hirsch named can be fully available online. Opening educational resources will empower anyone who wishes to teach selectively from the knowledge Hirsch chose, or any other short head of what is known by humankind. The long tail is there too, available to anyone who wishes to teach and study more deeply and in more detail.

At the same time, the quest for common learning is brilliantly served by the online connective platform. Opening resources and letting students participate online—as has happened for other endeavors— will bring to education the peer production of learning intuited by Sizer and described by Yochai Benkler.

Wisdom from Crowds

The Wisdom of Crowds, *by James Surowiecki:* "…the simple, but powerful, truth that is at the heart of this book: under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them."[6]

You may think of several ways that the wisdom of crowds might apply in education. I am struck by the contrast between narrow and limited sources of textbooks and curricula now used and how opening educational resources would bring collective wisdom into the presentation to students of what they are expected to learn.

Dana Lindaman and Kyle Ward investigated the teaching of history in schools in a number of countries and wrote their findings in a book called *History Lessons*.[7] Their volume is packed with quoted material from history books like this one used in Great Britain describing events at the beginning of the American Revolution:

"A man called Paul Revere galloped round the countryside warning that British troops were on the march. Some local farmers formed up with their muskets on the village green at Lexington to meet the British troops on the morning of 19 April. Firing started and fighting lasted throughout the day as the British 'redcoat' soldiers pushed on to Concord. As an American poet, Emerson, wrote much later: 'Here once the embattled farmers stood. And fired the shot heard round the world.'"

The Minutemen, hallowed in American tradition, are taught here only as "some local farmers." In this brief summary, the Brits do not teach their kids who use this textbook that their redcoat soldiers who had pushed on to Concord very soon retreated to Boston, harried and bloodied by hundreds of Americans who had been summoned by the well-planned alarm—nor that the British army was then bottled up in Boston by 15,000 or so "local farmers" who had answered the Alarm of April 18, 1775.

Two more observations from *History Lessons* are instructive:

About typical school history textbooks in the countries studied by the authors: "Unlike independently authored historical accounts, textbooks are a quasi-official story, a sort of state-sanctioned version of history. In nearly all countries the government takes some role in setting the standards for an acceptable cultural, political, and social history—i.e. what the authorities want the next generation to learn about its own national heritage—enfolding them, as it were, into a collective national identity."[8]

About typical school history textbooks in the United States: "Over the last 20 to 30 years, textbook publishers have become averse to bold historical narratives for fear of being labeled as too liberal, too conservative, too patriotic, or too sexist and rendering themselves unattractive to buyers on the textbook market....By reducing history to a series of inoffensive facts and figures, no matter how attractively packaged, textbook publishers are effectively judging students incapable of discussing and debating important topics and issues."[9]

Opening educational resources for the subject of history will allow the collective intelligence of historical scholarship to replace the selective delivery of prescribed viewpoints. Prescribed summary will be replaced by openly patterning facts and ideas. This is a big change, and a good one.

Banding Together for Extraordinary Teaching

A review on Amazon.com[10] of *Infotopia: How Many Minds Produce Knowledge*, *by Cass R. Sunstein:* " 'Infotopia' is a persuasive and sophisticated medita
tion on the ways in which the Web is not just living up to its early hype, but transcending it. Cass Sunstein has given us a brilliant integrative view of how the distributed users of the Internet can band together to produce extraordinary work—along with the circumstances that best give rise to deliberation rather than groupthink.— Jonathan Zittrain, Professor of Internet Governance and Regulation, Oxford University."

Over the years of Internet emergence, a persistent naysayer has been the notion that somehow teachers will be made obsolete if educational resources relocate in the open Internet. Sunstein's book is about values created by the distributed effects of economic participants. How wonderful too could be the distribution of collaboration among teachers: banding together to produce the extraordinary work of educating the new generations!

OER and Convergence

Convergence Culture, *by Henry Jenkins:* "The ideal of monitorial citizenship depends on developing the new skills in collaboration and a new ethic of knowledge sharing that will allow us to deliberate together.

"Right now, people are learning how to participate in such knowledge cultures outside of any formal educational setting. Much of this learning takes place in affinity spaces that are emerging around popular culture....Many schools remain openly hostile to these kinds of experiences, continuing to promote autonomous problem solvers and self-contained learners. Here, unauthorized collaboration is cheating...."[11]

A great deal of learning is a solitary act: I engage a new idea about physics, work alone with a specimen insect studying the creature's characteristics, read a novel losing myself in its setting and story. These—and many other kinds of solitary learning—I can do all by myself. I can do them in an analog way. I can also do many of them with increasing ease virtually, using a computer. None of that has anything to do with the convergent world Henry Jenkins is writing about.

The virtual convergent world is new. The opening of educational resources into the Internet makes those resources available to converging learners—and can thus profoundly enrich the learning taking place where they are. If teenagers are going to meet in affinity spaces on SecondLife or MySpace, for example, should they not have open access there to educational resources? The knowledge shared while using the new skills of collaboration would be given an important new dimension if educational resources were openly accessible. This sharing is not competitive to solitary learning; it is complementary and compatible.

What Resources Do in the Digital World

Everything Is Miscellaneous, *by David Weinberger:* "Smart leaves are not like card catalogs with more room and an extra forty IQ points. Rather than having a dollop of information contained in a small rectangle, an endless Web of information sprawls across the indefinite space of the Web."[12]

This quotation refers to what a teacher or student uses for learning in the digital environment. My favorite

book of the ones I have quoted in this article is Weinberger's. He explores how knowledge behaves in the open Internet. Weinberger takes the discussions from the other books I have quoted to the level where all that they talk about starts. *Everything Is Miscellaneous* describes how resources can now be organized in new ways because the digital world frees them from physical limitations and the paucity of identifying data that can be offered about them in catalogs. In the digital world, because everything is broken into the smallest parts and scattered randomly, the power of open is unleashed. It is being open in the Internet that allows any piece to connect to any other piece.

If we as educators look back over the past ten years in which the Internet has, in Weinberg's words, made everything miscellaneous, we notice that the stuff of education has barely become miscellaneous at all. Instead, structure rules. Locked into courses, curricula, lesson plans, grade levels, subject standards are bits of knowledge that would be miscellaneous in the digital arena Weinberger describes. In education, pieces are locked in order set by the authority experts—the pieces are not the raw materials of the wisdom of crowds. So far, for example, the education establishment has not reorganized resources into networks, as Amazon.com did. If education had done what Amazon did, teachers and students would have available the full range of books and Web sources relative to what is being studied—not a designated source and an assessment standard aligned to that source. The bravest moves in the direction of using the new digital arena for education have been OER, led in significant part by the authors in this issue of *Educational Technology*.

The mechanism of the new connectivity that a miscellany of open educational resources offers is quite simple: pieces link to each other. Because chemistry courseware at MIT is open online and so are the chemistry objects at Connexions, and mummy artifacts at Open Context, a student can connect a chart from MIT with an table from Connexions with an image from Open Context. Students in China can do that if the OOPS project has translated the items into Chinese. A relevant piece about chemistry originating in Africa or one of the small states of the Commonwealth can be added into the connections fully and completely on its own subject merit. The connecting could not have been done had each item not be open to linking. Open is useful for a whole course, a group of objects, a full mummy, an African chemistry curriculum, and a small state lesson plan. But when each of those can be reduced to its miscellaneous parts within the open Internet, the potential connectivity is far, far richer.

Intertwingling Enables Knowledge

Knowing that everything is miscellaneous is a bottom-line concept for understanding education's intertwingled future. The new digital world is, as I call my blog, a golden swamp. All sorts of treasures can be found in it because the possibilities for organisms of information and ideas to develop and surface are nearly infinite.

Everything in this new digital world can be miscellaneous because the venue is open. Anything can connect to anything else: pieces are not isolated in racks of bottles like a shelf of school curricula, texts, and standards where ideas in one bottle cannot connect freely to ideas in another.

The new global digital venue is open in a way no physical swamp can be. As Weinberger says, we can: "Put each leaf on as many branches as possible. In the real world, a leaf can hang from only one branch.... [In the new digital order] it's to our advantage to hang information from as many branches as possible."[13] Because we can do that the richness of potential patterns has no limit. Physically a swamp cannot exist in which every lily pad can attach to every plant where it makes the plant better to do so. But that is how the golden swamp of open educational resources can be. The swamp becomes golden because in its openness every treasure of human knowledge can form and all ideas and knowledge can be there simultaneously, interconnecting cognitively.

The only other place I know of where this kind of open connectivity happens is in your brain and mine. Ideas are patterns we connect from all sorts of parts and pieces floating around in memory and observation. The jump seems easy to make to realize that cognitive connectivity—thinking—is alike in many ways to pattern forming in the open Internet, in the golden swamp.

Weinberger says that in the miscellaneous world his book describes, "information not only becomes intertwingled, intertwingularity enables knowledge."[14] Education's embrace of the miscellaneous digital world will come after educational resources have been opened into that world, and when we appreciate and use the intertwingling that will result, allowing knowledge to be formed, ideas to emerge, and understanding to be shared.

[1]Wikipedia, Interwingularity; *http://en.wikipedia.org/wiki/ Intertwingularity* . [2]Ori Brafman and Rod A. Beckstrom, *The Starfish and the Spider.* Portfolio, 2006, p. 42.

[3]Chris Anderson, *The Long Tail.* Hyperion, 2006, p. 52.

[4]Don Tapscott and Anthony D. Williams, *Wikinomics.* Portfolio, 2006, pp. 41–42.

[5]Yochai Benkler, *The Wealth of Networks.* Yale University Press, 2006, p. 5. [6]James Surowiecki, *The Wisdom of Crowds.* Doubleday, 2004, p.xiii. [7]Dana Lindaman and Kyle Ward, *History Lessons.* The New Key Press, 2004, p. 33.

[8]*Ibid.*, p. xvii.

[9]*I bid.*, p. xx. [10]*http://www.amazon.com/Infotopic-Many-Minds-ProduceKnowledge/dp/0195189280* .

[11]Henry Jenkins, *Convergence Culture.* New York University Press, 2000, p. 259.

[12]David Weinberger, *Everything Is Miscellaneous.* Times Books, 2007, p. 120.

[13]Weinberger, p. 103. [14]Weinberger, p. 125.

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