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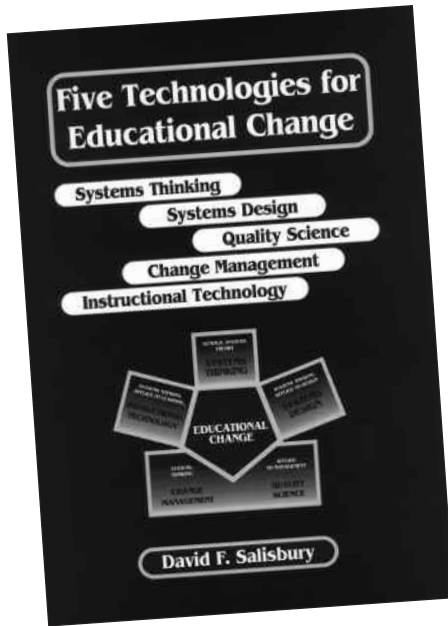
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A special issue on opening educational resources; plus regular features

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# Introduction to Special Issue on Opening Educational Resources

**Judy Breck**  
*Guest Editor*

Is Open Educational Resources (OER) just another pedagogical theory for learning experts to debate? Or another techie thing to come along for educators to play with? Not really. *Opening* educational resources is an action that will cause education to move to a new place. That new place will fundamentally shape learning into the foreseeable future.

The opening of educational resources puts them into a new functional venue that is being called Web 2.0. *Wikipedia states: Web 2.0 is a term often applied to a perceived ongoing transition of the World Wide Web from a collection of websites to a full-fledged computing platform serving web applications to end users. Ultimately Web 2.0 services are expected to replace desktop computing applications for many purposes.\** My closing article in this issue provides some glimpses of how education resources will be affected by moving on to the Web 2.0 platform—when they get there.

Ten years ago, when some of us began opening educational resources into the growing Internet, we did so believing education would benefit from online access to learning materials. We were not intending to move education into a new virtual world, nor aware of any such possibility. By 1999, visionaries at Rice University were conceptualizing open educational object sharing in the project that became Connexions. Soon after the expanding virtual venue entered the new century, MIT was the first major educational institution to commit to large-scale opening of its courseware into the Internet. The articles that follow include one from each of those major pioneers and some of the experience of other OER projects both in the United States and around the world. These articles describe key progress and explore issues that have arisen around OER through the first decade of the online opportunity it represents for learning.

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\*Wikipedia; [http://en.wikipedia.org/wiki/Web\\_2.0](http://en.wikipedia.org/wiki/Web_2.0) .

Education policy-makers, who include most of the readership of this magazine, can help in small ways and large ones to open educational resources. I hope what you read here will instruct and inspire you to become an OER advocate and implementor, as are all of us who have written this issue; we did so with you in mind.

## Is OER a Disruptive Educational Technology?

The first article is written by Duke law professor and Creative Commons Board of Directors board member **James Boyle**, who spearheads ccLearn, and **Ahrash Bissell**, the ccLearn Executive Director. As the opening of educational resources moves ahead, the new ccLearn will endeavor to offer Creative Commons licensing principles to copyright and creativity protection for materials related to education. As Bissell and Boyle describe in their introductory article, education did not emerge over the past decade as one of the innovative leaders of the new online environment. Education still stands pretty much outside of Web 2.0.

The other two big-picture articles were written for this special issue of *Educational Technology* by the open educational resources leaders from The William and Flora Hewlett Foundation. The Hewlett Foundation is an instrumental funder of OER, and the three authors are leading experts on the history, issues, and vision for the opening of educational resources that we explore in these articles.

**Marshall (Mike) Smith** and **Phoenix Wang** look at key dimensions of a needed flexible, extendable infrastructure that will make it possible for educational resources to be opened into an evolving World Wide Web. They look at technical, legal/cultural/social/political, and research dimensions or components—and discuss possible directions for development.

The discussion by **Catherine Casserly** is far-reaching and insightful, by someone who knows as much about the OER experience as anyone. She addresses squarely whether OER is a disruptive educational technology innovation, or is compatible with traditional norms of education.

## OER Project Descriptions

Following the general OER discussions are three articles by authors who describe the experience of early, established, outstanding examples of open educational resources.

Present since the creation in 1999 of Connexions, **C. Sidney Burrus** has been a faculty member at Rice University for forty years, where he has been engineering department chair and dean. His article describes Connexions OER, where the content is organized in small modules, open to use and reuse in creative ways consistent with modern pedagogy, and

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## Open Educational Resources Overview

The term “Open Educational Resources” was first adopted at UNESCO’s 2002 Forum on the Impact of Open Courseware for Higher Education in Developing Countries. Open educational resources (OER) are the efforts of a worldwide community, empowered by the Internet, to help equalize the access to knowledge and educational opportunities throughout the world. They are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual-property license that permits their free use or customization by others. It is the granting of freedoms to share, reprint, translate, combine or adapt that makes them educationally different from those that can merely be read online for free. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge.

At the heart of the movement toward Open Educational Resources is the simple and powerful idea that the world’s knowledge is a public good and that technology in general and the World Wide Web in particular provide an extraordinary opportunity for everyone to share, use, and reuse knowledge. Significantly moving OER into the mainstream, the Hewlett Foundation Open Educational Initiative supports: the development and dissemination of high-quality content; innovative approaches to remove barriers to the creation, use, re-use, and sharing of high-quality content; and projects that seek to improve understanding of the demand for openly available content.

The theme of this special issue of *Educational Technology* magazine is the active phrase: *Opening Educational Resources*. Our authors describe what has been done and is being done as this educational phenomenon has emerged in the 21st century.

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open to new systems yet to be discovered or invented.

Next, the story of MIT’s inspiration and leadership of OpenCourseWare (OCW) is told by the project’s External Relations Director, **Stephen Carson**. The OCW concept primarily represents publication of existing course materials already in use for teaching purposes—something that the author says could eventually develop into a routine and customary practice in education at all levels, creating a widely accepted culture of open sharing.

In contrast to the first two university based, multi-topic OER projects at Rice and MIT, the work of **Sarah** and **Eric Kansa** is a model for the very great deal that can be accomplished by a topic-specific, smaller scale OER endeavor. As the Kansas explain, their Open Context is the first data repository of its kind, allowing self-publication of research data, community commentary through tagging, and clear citation and stable hyperlinks, and Creative Commons licenses that make reusing content legal and easy.

## All OER Is Global

In the Internet world, being open is being global. The three projects discussed in the previous section all receive rich interaction with people across the world. But there are also local factors of fundamental importance to the opening of educational resources. Languages, location, relevance, contributing, and awareness of opportunity and other issues are considered in the next four articles.

**Agnes Chang** and **Lucifer (Luc) Chu** tell the story of the inspiration and creation of a worldwide volunteer network that has translated many thousands of pages of OER digital resources into Chinese. This work has opened significant new educational resources to non-English readers and has demonstrated avid interest in OER from Chinese students and life-long learners.

Based on her work in South Africa, **Eve Gray** writes about OER in the context of a diverse, multilingual student body, many with apartheid-inherited deficits in academic preparedness. She questions the appropriateness of a focus on content alone, rather than educational process, as it addresses particular contexts, and looks at the need to grow the volumes of Africa-relevant content.

Next **Paul G. West** of the Commonwealth of Learning describes how 28 small countries have been learning to work together to enhance the professional capacity of educators, develop new OER course materials, and enable the transfer of courses and qualifications across borders. West describes workshops among people sometimes traveling across eight time zones to attend, benefits including the opportunity to learn about vastly differing countries, and how needs and educational approaches differ from one country to another and one region to another.

Writing about the massive global digital resources of the Development Gateway Foundation, **Mike Pereira** makes the basic point that mainstreaming OER as a public good throughout the developing world could make an enormous contribution. Director of Global Online Communities, Pereira describes the work of Gateway’s OER portal that provides descriptions and links to a wide range of OER content.

## Spotlight on the OER Future

The concluding articles turn the spotlight on to the open new place which will fundamentally shape learning into the foreseeable future.

**Ajit Jaokar’s** article is based on a keynote speech he gave at a conference with a title not familiar in education yet: microlearning. His topics are mobile Web 2.0, microlearning, intertwingularity, and mobile widgets—all now essential factors in the opening of educational resources.

In **my concluding article**, I base some predictions about an open education future on quotations from

books by popular writers about our networked age. When educational resources are opened into the Internet, they are affected by network laws that cause effects popularly described as the long tail, the wisdom of crowds, and peer production. OER becomes decentralized, tagged, aggregated, and miscellaneous. This language is the terminology of the future of learning. □

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**A comment on style.** The backgrounds of our authors vary. Some are academics, others are administrators, and we are from several different countries. For this reason, in editing the articles for publication, we have retained the authors' styles, allowing some inconsistencies among the articles. American and British spellings have been retained.

**Some words of appreciation.** It has been an honor and privilege to edit this special issue of *Educational Technology*. My thanks to each of the authors for contributing. You are key leaders of OER, which is demonstrating an open way for knowledge and has importantly created a leading edge for education into the global learning commons. Thanks also to *Educational Technology* publisher Lawrence Lipsitz for his vision in suggesting this special issue in which to showcase OER and to light a path into the open place where 21st century education belongs.

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## Special Issue Suggestions?

This magazine's special issues, covering important areas in the field, are renowned for their thoroughness and overall excellence. More than one hundred special issues have been published since the 1960s, many of which have been instrumental in establishing whole new directions for work within educational technology and related domains. Your suggestions for future special issues are welcomed by the Editors.

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# Towards a Global Learning Commons: ccLearn

**Ahrash Bissell**

*ccLearn*

**James Boyle**

*Duke Law School*

Though open educational resources (OER) promise to transform the conditions for teaching and learning worldwide, there are many barriers to the full realization of this vision. Among other things, much of what is currently considered "free and open" is legally, technically, and/or culturally incompatible. Herein, the authors give a brief history of open education, outline some key problems, and offer some possible solutions.

## Introduction

Imagine that it is twenty years ago. A stranger asks to you prognosticate about the future. You are to postulate, he tells you, that there will be a worldwide computer network, open in design, that allows relatively cheap access to anyone. It will allow individuals and organizations to offer content to the world and edit it online, or to collaborate internationally in ways that formerly had been reserved for major publishing houses or giant multinationals. It takes a while, but eventually you grasp the idea. The stranger asks this question, "Given such technology, which development on this list will happen first?"

- (1) A free worldwide online encyclopedia, constructed and edited in real time by volunteers, in multiple languages, offering a range of articles wider than any existing knowledge source, which allows anyone with a net connection to read, contribute, or edit.

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**Ahrash Bissell** is the Executive Director of ccLearn. **James Boyle** is William Neal Reynolds Professor of Law at Duke Law School, a board member of Creative Commons, and the head of the ccLearn Steering Committee. The authors thank Marshall Smith, Cathy Casserly, Phoenix Wang, Hal Abelson, Mike Carroll, Laurie Racine, Jimmy Wales, Rich Baraniuk, Bobbi Kurshan, Lisa Petrides, Geoff Bowker, Eric Kansa, and many other participants in the OER community for their insights in discussion around these ideas, and note: They are not responsible for the arguments put forward here. Errors are ours. Direct correspondence to: [ahrash@creativecommons.org](mailto:ahrash@creativecommons.org).

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## Creative Commons Overview

Creative Commons is a non-profit organization committed to giving creators a variety of licensing tools that allow them to make their work available to the public on generous terms, while retaining copyright. The licenses are designed to be understood not merely by lawyers, but also by ordinary people and even by computers. The license terms are expressed in an easy-to-understand “commons deed” complete with icons, but also in “metadata” so that one can search not only for the content of the work, but also for its degree of legal openness. (“Show me calculus textbooks that are available for non-commercial use and modification.”) Creative Commons (CC) licenses are used on Open Educational Resources such as MIT’s OpenCourseWare, Connexions, Open Context, and many others. The advantage of the licenses is that they create a “commons” of material that can be used by anyone without permission or fee, and that they do so in a way that marks the content for computer searching. For Open Educational Resources, CC licenses that permit customization and adaptation of content are particularly important. CC licenses are international. They have been “translated” into the language and legal system of over 30 countries. For more details, go to: [www.creativecommons.org](http://www.creativecommons.org)

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- (2) A type of computer program called free or open source software, constructed by a global army of programmers—some paid, some volunteer—all working outside of a single formal organizational structure. Each piece of coding becomes part of a software “commons” which anyone can add to, modify, or redistribute without permission or fee. This anarchic method of producing software would be strikingly successful, producing the dominant form of software on which the global computer network’s servers actually run.
- (3) A vast network of free and open educational resources, routinely used, contributed to and customized by teachers and students from kindergarten through graduate school to lifelong learners. Making lesson plans or curricular materials on this network would be as routine as saving it on one’s computer. It would also be standard practice for teachers and learners to form and to customize their own courses of study, allowing them to annotate, comment upon, rank, and remix the material so as to suit it to their particular needs.

The question seems easy. Obviously, number three would be the first collaborative commons to develop. Who loves to share materials and tips more than teachers or students? Who has not developed a course or a lesson by customizing something from a colleague’s files, or learned by pooling knowledge with one’s fellow students? In which area—software, ency-

clopedias, or education—are the moral and practical impulses towards free access the strongest? Unlike the volunteer encyclopedist, the teacher has to do much of this work anyway. Why not share it? Unlike the world of programming, the “end user,” or student, is routinely required to produce material in the form of assignments that could actually be added back into the network. The arguments are overwhelming: open learning will come first—open encyclopedias and open software later, if at all.

This prediction is logical, intuitive...and wrong. Wikipedia and open source software are established realities in our networked world. Open Educational Resources (OER) have made great strides over the last ten years, but they have not yet reached the prominence and sophistication described above. Why?

This article is an attempt to offer some partial answers to that question. It examines the reasons why open education is an exciting idea, describes some of its greatest successes to date, outlines the problems in creating a true global learning commons, and offers some possible solutions.

## An OER Snapshot

MIT’s pioneering OpenCourseWare (OCW) initiative, funded in part by the Hewlett Foundation, has made 1550 MIT courses available online for free.<sup>1</sup> Teachers and students get the course materials, the lecture notes, and—in some cases—videotapes of the actual lectures. MIT does not confer a degree on those who use the material, but it also does not hoard the knowledge and insights of its world-class teachers, instead opening their expertise to the world. And the world has responded. “Since September 2002, when the MIT OCW pilot phase opened to the public, MIT OCW materials have been translated into at least 10 languages, including Spanish, Portuguese, Chinese, Thai, French, German, Vietnamese, and Ukrainian.” Some 100 courses have been translated into Spanish and over 130 into simplified Chinese. And all of this can be done without bureaucracy or lawyers because “[u]nder the MIT OCW Creative Commons license, users are allowed to translate MIT OCW materials into the language of their choice. Translations are acceptable use of MIT OCW materials provided they meet the three requirements of the MIT OCW Creative Commons license: that the user provide attribution of the materials they choose to adapt; that the use of the materials be a non-commercial activity; and that the user share the derivative work openly as MIT OCW is free and open, or ‘share alike.’”<sup>2</sup>

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<sup>1</sup><http://ocw.mit.edu/OcwWeb/Global/AboutOCW/about-ocw.htm> .

<sup>2</sup><http://ocw.mit.edu/OcwWeb/Global/AboutOCW/Translations.htm> .



But OpenCourseWare is only one out of hundreds of OER sources. Initiatives range from Open University's "Open Learn," Rice's Connexions, Curriki, and the OERCommons; collectively, these resources could be considered part of a burgeoning OER movement. Like Wikipedia and open-source software, the OER movement constitutes an attempt to transform the conditions of teaching and learning by demonstrating the power of resources that invite participation and that enable contributions to be combined, disassembled, and shared. These initiatives already range widely in both educational level and subject matter. Connexions' innovative learning tools allow users to rearrange the modules in a music theory course or one on Galileo's telescope. Curriki provides a gateway to a particularly strong collection of K-12 resources and curriculum tools. Open Learn makes Open University resources available for free to more than 500,000 people around the world. The list goes on and on.

### Levels of Freedom

The push towards free educational resources is hardly a new one. From Franklin and the invention of the circulating library to the movements for universal literacy, there has been a common sense that as a social good, education is different. Some moral philosophers argue that the moral warrant for access to healthcare ought to be sickness rather than status or wealth. Not everyone would agree. Yet few would challenge the claim that societies are morally required to offer some level of education to their members, and that there are excellent practical and self-interested reasons to do so. In addition, much education now goes on outside of formal settings, and after the end of the formal educational process. The Internet offers the possibility of offering educational resources across huge distances at relatively low cost, and of offering learning tools that citizens can use at their own pace, to learn a new job-skill, or a new language, or to satisfy their curiosity. In many cases, the funders of these resources, whether states or private philanthropists such as the Hewlett Foundation, believe that it is unwise, impractical, and unjust to charge for access. Impractical, because knowledge goods are hard to price *before* you have acquired them and impossible thereafter. Unwise and unjust because the goal of global access to education is to diminish price barriers wherever possible. From this tenet comes the first and most obvious requirement of OER—access must be free.

Free access is commendable. Sadly, for some educational initiatives, freedom stops there. For example, MERLOT, which is otherwise an excellent educational repository, declares itself "free and open" but requires visitors and members of the public to get

explicit permission prior to using materials on the site.<sup>3</sup> Excerpting, reproducing, making multiple copies for teaching, or printing portions in academic articles or books are all prohibited except insofar as they are allowed by the fair use provisions of the US Copyright Act. It goes without saying that reworking, adapting, translating, and republishing in compilations also require prior written permission. In repositories such as these, "openness" effectively means "you can read it on the Web for free." Adapting the terminology of free software licensing, we could think of the right to make non-commercial verbatim copies as the most basic freedom—freedom 0. Clearly some purportedly "free and open" educational sites have a more restricted vision. They see "openness" as simply the ability to read online without payment, a "freedom" granted to the readers of any public Website. Call this freedom level -1; the sub-basement below true Open Educational Resources.

Some form of access is clearly better than none, but to stop here is to ignore the most exciting features of OER. Truly open educational resources give the user the freedom not merely to read, but to redistribute and republish, and not merely to copy verbatim but to customize, combine, and modify. These are freedoms which traditional print learning materials made both physically and legally impossible. In short, OER allows us to do something with educational materials that we have never been able to do before so easily or on such a scale. A recent OECD report recognized that fact.

The definition of OER currently most often used is "digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research". OER includes learning content, software tools to develop, use and distribute content, and implementation resources such as open licenses. This report suggests that "open educational resources" refers to accumulated digital assets that can be adjusted and which provide benefits without restricting the possibilities for others to enjoy them.<sup>4</sup>

If simple access—the ability to read, watch, or listen online—is Freedom Level -1, then the ability to copy and redistribute is Level 0. The freedom to modify, combine, and customize—in copyright terms, to make "derivative works"—is Freedom Level 1. The most expansive possible definitions of openness allow users to exercise these freedoms in both non-commercial and

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<sup>3</sup>MERLOT Intellectual Property Policy: <http://taste.merlot.org/intellectualpolicy.html> .

<sup>4</sup>*Giving Knowledge for Free: The Emergence of Open Educational Resources* (OECD) [www.sourceoecd.org/education/9789264031746](http://www.sourceoecd.org/education/9789264031746) . Ironically the report itself bears the legend, "No reproduction, copy, transmission or translation of this publication may be made without written permission."

commercial contexts. It is worth noting that Wikipedia and open source software also give their users these freedoms. It is because “permission has been given in advance” for copying, modification, redistribution, and so on, that the “creative commons” in each area can actually function.

### Problems and Solutions

Let us return to the question posed at the beginning of this essay. Despite the strides made in OER, it clearly does not possess the same level of visibility or ubiquity as Wikipedia or open source software. Why?

There are many reasons—and they differ at different levels of education. In K–12 education, technical unfamiliarity, sheer workload, and the demands of increasingly standardized curricula all combine to make it very hard for teachers to experiment with open educational tools. Students, too, have obstacles in their way. Even when teachers have the time, discretion, and facility to use online tools, there is a wariness about allowing students to participate actively rather than passively in the educational process. Much innovation is invisible. Legitimate privacy fears and copyright restrictions operate to keep most experimentation hidden behind the firewalls of an institutional BlackBoard or Moodle site—walled gardens rather than public parks.

In higher education the constraints of formal curricula or resources are fewer, but organizational caution, cultural barriers, and tenure standards that give little weight to pedagogical innovation all operate to limit participation in OER. More fundamentally, there is an “agency problem”; those who bear the cost of proprietary educational materials are generally not those who decide whether to develop or utilize free alternatives. For most teachers in the developed world (though not for their students or institutions) *all* teaching materials are effectively free of cost—though some are attracted by the possibility of customization that OER offers. Finally, there is the vital issue of quality. Producers of proprietary educational materials have a powerful incentive to produce popular and high-quality products, and to attract the attention of their audience with new features or online audio-visual materials. There can be comparable quality checks inside commons based movements—both open source software and Wikipedia rely on a variety of informal peer review techniques to police quality, while Web 2.0 tracking and tagging techniques allow the prospect of popularity-based mechanisms that imitate many of the beneficial features of markets, without demanding that the signals be in the form of price. But fully utilizing such techniques would require a transformation of the way that OER currently operates. We discuss some key goals of this transformation below.

No one initiative can remove all of these barriers to

OER. Some barriers will only be overcome through generational change. The entry into the teaching profession of a generation of digital natives—used to using, remixing, and sharing digital content—will have impacts on education we have not yet begun to grasp. So long as this generation is *allowed* to experiment, they will. The same pressure will come from the student population. When those pressures meet standardized curricula and script-based, micro-managed teaching techniques, the results will be...interesting.

Other barriers will be overcome only by scale—as investments in OER finally reach a critical mass and start a self-sustaining reaction. This too happened with Wikipedia and open source software. Still others will require the creation of new initiatives and organizations that we can only dimly imagine now—trusted intermediaries that certify particular assemblages of OER as compliant with a state’s formal curriculum, for example.

Acknowledging the range and variety of obstacles, we nevertheless want to suggest three goals that we believe are vital to the future of open educational resources. These goals alone will not guarantee success. Ignoring them, however, will all but guarantee failure.

### Goals for a Global Educational Commons

From a technical point of view, the key aspect to openness—whether in content, standards, or software—is that it invites widespread cheap innovation and cooperation by strangers. No permission is required before I invent a word or write a poem in English, use TCP/IP or HTML to produce a new service on the Web, or customize and remix a Connexions course on music theory. The language, protocols, and content are open, precisely so that innovation does not have to pass through some filter, make some payment, or receive some bureaucratic permission. To put it differently, there are more than six billion people in the world; it would be strange if at least one of them did not have a great idea about what to do with your content that you have never imagined.

The study of the history of technology, like that of pedagogical innovation, is a lesson in humility. Again and again we fail to predict both success and failure, imagine futures that fail to transpire, miss the key innovation while praising its doomed cousin. The OER movement too may disappoint but it has one key advantage; open resources are the path of humility. They are an invitation to experimentation and collaboration. The more open the resource, the less one is committed to a single pedagogical path or theory, the more one can profit from the insights of strangers, or collaborate with people one has never met. That is the true genius at the heart of commons-based movements such as Wikipedia and Open Source.

What would it take to realize that insight in the OER movement?

**(1) *Compatible and Interoperable Open Licensing Terms.*** Over the next ten years, millions of dollars, euros, yen, and yuan will be spent on supposedly open educational resources. If prior experience is anything to go by, however, many of these resources will only reach Freedom Level –1. The material will be there on the Web, but users will be forbidden to do the things that make OER truly interesting and transformative—reprinting, excerpting, customizing, and so on. Worse still, the material will be incompatible with the other theoretically open educational resources. For example, a site on geology and volcanic eruptions would have vital material that a different site on the history of ancient Crete could use to advantage. Sites created in the public interest by taxpayer or philanthropic payment may—as a practical matter—be utterly incapable of working together either because their licensing terms explicitly forbid, because “license proliferation” has spawned a host of incompatible licenses, or simply because the site leaves ambiguous what may be done with the material. This would be a disaster, a tragic waste of scarce educational resources. Thus, the first goal is that OER sites must actually be open, and that the freedoms given to the site’s users be clear, comprehensible, and compatible. Where possible, we would recommend the Creative Commons Attribution, or Attribution, Share-alike licenses, which give both Level 0 and Level 1 freedom. If more restrictive licensing—such as the Non-Commercial license—is truly necessary, it should be clearly identified and marked as such. In addition, licenses should not simply be clear to people, they should be clear to search engines, so that I can specify the terms of licensing as part of my search, or automate the process of retrieval. Creative Commons licenses already allow this—by specifying the licensing restrictions on the content in metadata that are picked up by search engines such as Google and Yahoo.

**(2) *Compatible Technical Standards.*** One of the biggest obstacles to technical innovation is the failure to settle on interoperable standards. Whether it is incompatible gauges on railway tracks or competing DVD formats, lack of standardization is an enormous impediment to innovation, particularly where one needs to combine and remix. Imagine that you develop a process that can mine video material on OER sites, transcribe a rough version of the dialogue, and add “tags” to the site that allow individuals to search within videos to pinpoint a particular discussion of programming in Java or moral relativism. If we follow goal (1), you will have been granted the legal freedom to engage in this enormously useful activity; permission will have been granted in advance. But what about the *technical* freedom? Incompatible video formats, varying encryption protocols, or streaming technologies that are

applied by default even to open content—these could cripple the very types of experimentation we are trying to encourage.

**(3) *A Cultural Shift: From “My Site” to “Our Commons.”*** At the moment the OER movement is taking its first steps beyond a culture focused around “my site” towards a culture that is focused around “our commons.” Most people who create OER sites have a sense of who they expect their users to be and what needs those users have. This is all to the good, if it is not to the exclusion of those users whose needs—or innovations—we have totally failed to imagine. To quote Michael Carroll, if the future of learning is interdisciplinary, it is axiomatic that all of our content is a marginal case for someone else’s discipline. The evolutionary biologist studying lizard speciation in the Galapagos has a very different set of needs in querying an open site on the geology of the islands than the geologists the creators of the site imagined. Yet his need—and the benefits of cross-fertilization—are no less real. They require not just legal or technical openness but a cultural change in orientation. To paraphrase John Seely Brown and Dan Atkins, we need to shift perspectives from “this courseware is mine” to “this courseware is for (open) mining.”<sup>5</sup>

The goals we describe here are not sufficient conditions for the success of the open educational resource movement. That movement also needs to be brought to the public eye. It needs competitions to feature content, rigorous measures of impact and success, and serious engagement with the bureaucracies at every level of education. We need to apply to OER the same ingenuity in social ranking and tagging tools that we apply to selling books, or letting teenagers flirt with each other on MySpace. Still, we believe that these goals are necessary conditions to success—and that they are independently defensible if we wish to get the most out of our social investment in access to education online.

Our organization, ccLearn, is working with the OER community to discuss the standards and best practices that are necessary if the movement is to survive and flourish. We invite you to work with us. At the very least, we should make sure that millions of dollars poured into open educational resources does not result in scattered islands of incompatible and mutually incomprehensible content. A pedagogical Tower of Babel would be a tragically wasted opportunity, even if the sign on the door claimed it was open to all. □

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<sup>5</sup>A *Review of the Open Educational Resources (OER) Movement: Achievements, Challenges, and New Opportunities*. Dan Atkins, John Seely Brown, Allen Hammond, 2007, The William and Flora Hewlett Foundation, page 10; <http://www.hewlett.org/Programs/Education/OER/OpenContent/Hewlett+OER+Report.htm> .

# The Infrastructure of Open Educational Resources

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The success of OER is likely to depend on a flexible, extendable infrastructure that will meet the challenges of an evolving World Wide Web. In this article, the authors examine three key dimensions of this infrastructure—technical, legal/cultural/social/political, and research—and discuss possible directions for development.

Authors from various disciplines argue that an open information commons would enhance creativity, provide greater balance in opportunity for access and use of information for rich and poor around the world and, in Sen's framework, serve as an enabler of freedoms.<sup>1</sup> Open Educational Resources (OER) are that part of the information commons that focuses on all matters educational.

Over the past half decade, enthusiasm for OER has

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<sup>1</sup>Lessig, Lawrence. *The Future of Ideas: The Fate of the Commons in a Connected World*. Vintage Books, 2001. Smith, Marshall S., and Casserly, Catherine M. "The Promise of Open Educational Resources," *Change Magazine*, Sept./Oct. 2006: 8–11. Sen, Amartya. *Development as Freedom*. Anchor Books, 1999.

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grown into a nascent movement.<sup>2</sup> Since 2001, many thousands of people throughout the world have placed hitherto proprietary content on the Web for all to use, modify, and reuse. They have digitized millions of pages of library materials and books, held conventions and other meetings, written books, journal articles, created a journal, blogged, engaged institutions and governments, and even began to use the same language.<sup>3</sup>

But the movement is in early childhood—at the start of the new millennium OER existed as content and tools of uncertain quality scattered throughout the Web. Though a modicum of structure in the movement has emerged, the child is still young and somewhat fragile. At the heart of the challenges to a successful future for OER is the fact that it has to exist in a world that has a robust infrastructure to support the concepts of private and protected ownership of property with the goal of maximizing its monetization. For a movement with an almost opposite ideology to co-exist and thrive and ultimately to develop into a self-sustaining and worldwide network, it also requires an infrastructure to nurture and support its growth and health. This is not a unique idea.<sup>4</sup> The concept also is embedded in the excellent Bissell and Boyle contribution to this magazine, which describes how a new organization (ccLearn) will contribute to the emerging infrastructure of OER.

In the spirit of sharing and OER, the rendering of the concept of infrastructure in this article stands on the "backs of giants."<sup>5</sup> Infrastructure here refers not only to the technical supports, though pipes and standards are important. Our attempt to sketch a model infrastructure for OER draws on Edwards, Jackson, Bowker, and Knobel's theory of infrastructure, which requires consideration of legal, technical, cultural, social, political, and financial components. The infrastructure is intentional or, in Elliott Maxwell's words, it has a "point of view," a goal. The purpose of the infrastructure is to support an environment for a thriving OER network or, more precisely, in computer science terminology, a network of systems where the infrastructure is transparent and the separate systems and overall network are

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<sup>2</sup>Atkins, Daniel E., Brown, J. S., and Hammond, Allen, L., "A Review of the Open Educational Resources (OER) Movement: Achievements, Challenges, and New Opportunities"; [http://www.oerders.org/wp-content/uploads/2007/03/a-review-of-the-open-educational-resources-oer-movement\\_final.pdf](http://www.oerders.org/wp-content/uploads/2007/03/a-review-of-the-open-educational-resources-oer-movement_final.pdf).

<sup>3</sup>Atkins et al., *op. cit.*

<sup>4</sup>Atkins et al., *op. cit.*

<sup>5</sup>Atkins et al., Edwards, Paul N., Jackson, Steven J., Bowker, Geoffrey C., and Knobel, Cory P. "Understanding Infrastructure: Dynamics, Tensions, and Design." January 2007. Benkler, Yochai. "The Wealth of Networks: How Social Production Transforms Markets and Freedom." Yale University Press, 2006. The thoughts about infrastructure in this chapter do not necessarily indicate the directions or approaches that the Hewlett Foundation will take in its future grantmaking. The Foundation is still working on its new strategic plan for OER.

self-reinforcing and self sustaining.

It seems like a contradiction to imagine from the top down what the infrastructure of the future will look like—no one knows what technologies will exist in five years or how what is inherently a bottom-up phenomenon will evolve. At the least, we know that the infrastructure must be adaptive, supportive, and responsive to the imagination and inventiveness of its stakeholders. The OER network will fail to thrive if its individual components are directed from the top—large numbers of the individual creators, users, reusers, institutions, and governments must be adaptive and responsible for sustaining their work for the system itself to flourish. Yet, the hypothesis that drives this article is that in the early stages, the development of such an infrastructure requires deliberate actions, targeting opportunities and barriers, to increase the odds of success of a sustainable OER network.

In this article we describe a possible OER infrastructure for two goals. The first goal is to enable the fundamental principles of OER—open access, use, and reuse of a grand library of OER for people all over the world. The second goal is to support the use of OER to create innovative and effective strategies for teaching and learning. Let it be clear that the ideas suggested here are a work in progress. Table 1 offers examples of the OER infrastructure that might exist in five and ten years across three dimensions or components: Technical, Legal/Social/Cultural/Political, and Research. In the ensuing narrative, we describe possible leverage points for stimulating development toward these directions.

Due to space restrictions most of the entries in the three components are only briefly described, although in the interest of digging down a little we have selected a few entries to explore more carefully. Two other important areas in the development of OER are not examined in any detail in this article. The first is the structure and processes that need to be in place to measure the OER network's vitality and growth: e.g., the numbers of users, creators and re-creators, the specific great examples of innovation in teaching and learning, etc. The second area is a theory of action for the current state of the OER infrastructure to evolve into the form suggested in Table 1.

### Technical Component

A fundamental fact of OER is that its nature and promise is continually changing in all of its facets. Five years ago, few imagined the worldwide participation in opportunities for interaction and creativity facilitated by FaceBook, YouTube, and the many other open collaborative environments. Our understanding of how openness can change behavior and expectations has been stretched by these examples as well as by the Long-Tail,<sup>6</sup> Wikipedia, MoveOn, and "The Wisdom of Crowds."<sup>7</sup> Similarly, our concepts of the boundaries of teaching

and learning have expanded, as immersive environments, including simulations, virtual worlds, and games, have demonstrated the capacity to deeply engage students in creative and challenging learning. On another front, a new generation of cognitive tutors appears to have the capacity to be more efficient and effective than conventional human instruction.<sup>8</sup> Finally, as information technology changes, so do its capacities and boundaries. Who would have believed that many educators concerned with Africa now see the cellular phone as a primary mechanism for delivery of educational content?

This is the environment within which an OER infrastructure needs to be nourished. As we think about how such an infrastructure might evolve, one idea to consider is whether standards for practice and technology might be useful. Should standards be set for such an infrastructure? Our answer is no. Standards are appropriate for fields and environments that move slowly or in situations where stability and predictability are important, rather than in the rapidly changing world in which OER resides. Yet standards often also serve as specifications for good practice based on prior experience, a useful service that would support the development of a healthy infrastructure. A compromise that might be practicable would be to collectively develop principles for design and use—in effect, easily adaptable, high-level standards. These principles could be instantiated by examples of good practice—open tools, platforms, and content that are easy to access, use, reuse, create, and post to the Web.

Core to technical innovations in OER is the need to simplify the user experience across the entire range of OER activities, from access to use to reuse and creation. To do this we need to pay close attention to the many potential users, including Internet newbies, power users, cellular phone customers, and "hundred-dollar-laptop" users in developing countries. One example of a strategy

<sup>6</sup>Anderson, Chris. "The Long Tail," *Wired*, Issue 12.10, Oct. 2004. *The Long Tail: Why the Future of Business Is Selling Less of More*. Hyperion, 2006.

<sup>7</sup><http://www.wikipedia.org> . <http://moveon.org> . Surowiecki, James. *The Wisdom of Crowds*. Random House, 2004.

<sup>8</sup>Carnegie-Mellon's Open Learning Initiative develops Web-based courses that operate as self-supporting cognitive tutors for a variety of regular college courses. The cognitive tutors provide all of the information and pedagogy necessary for a student to succeed in the courses. Conventional evaluations, some with randomized designs, find no difference between the learning of students who take the course with conventional lectures and the students who use the cognitive tutors and do not have the lectures. This finding is similar to the findings in the literature on distance learning. Carnegie, however, recently ran a somewhat unconventional study in which they gave the students who were using the cognitive tutor only one-half the semester to learn the material, while a second group took the regular lecture-based course. The cognitive tutor students again did as well as the students in the regular class; <http://www.cmu.edu/oli/> .

**Table 1.** Infrastructures for ten-year OER network goal and five-year OER system goal for teaching/learning.

<b>Infrastructure Components</b>			
<b>Goals</b>	<b>Technical</b>	<b>Legal/Social/Cultural/Political</b>	<b>Research</b>
<p>Access &amp; Use and Reuse for All (by 2017)</p>	<p>Design principles and best practices for easy open content use and reuse— support minimal standards to ensure content flow</p> <p>Easy-to-use software applications and platforms for creating, re-creating, and sharing many forms of content (text, video, games, textbooks, etc.)</p> <p>Interoperability across types of platforms (desktops, handhelds, cell phones, etc.)</p> <p>Extensible platforms and software</p> <p>Datasets that are easy to manipulate, search, and overlay other data</p>	<p>IP—reasonable balance reached across world between protected rights and open access—clear and very widespread IP licenses— general understanding of Attribution-only license; Creative Commons, the Berkman Center, WIPO</p> <p>Incentives right for institutions (universities, libraries), governments (Vietnam, UNESCO, APEC, OECD), private sector (Google, Yahoo), scholars (Benkler, Boyle), thought leaders (Brown), foundations, think tanks, teachers to use and contribute to OER environment; requires ongoing demonstrations of added value</p> <p>Marketplaces that match solution seekers with problem solvers</p> <p>Bellwether institutions adopting OER, catalyzing a widespread international movement around the culture of sharing</p> <p>Methods and exemplars of means for translation (OOPS), personalization, customization of content</p> <p>OER seen as way for innovation</p> <p>Sustainability models for OER</p>	<p>Look for creative solutions to social and technical problems that inhibit OER (sustainability, institutional rigidity, incentive structures, etc.)</p> <p>Basic and applied research on OER characteristics and potential byproducts; e.g., innovation, collaboration, creativity, sharing</p> <p>Monitor use—create indicators of progress of OER. Create a dashboard</p> <p>Understand use, demand, and impediments better</p> <p>Examine OER accomplishments and their components</p>
<p>Demonstrate How OER Can Transform Teaching and Learning</p>	<p>All of the above.</p> <p>Especially easy-to-use open platforms for games, immersive environments, OLI, multimedia materials, OCW, open textbooks</p>	<p>All of the above</p> <p>Communities of scholars and researchers focused on OER learning and teaching</p> <p>Incentives right for teachers and professors to create and sustain open content</p> <p>Incentives for users (teachers and students)—change in behavior from teacher to coach</p> <p>Alternative credentialing systems</p>	<p>All of the above</p> <p>Understand the effects of OER on teaching and learning</p> <p>Exemplars of classes of innovative and effective teaching and learning products and practices from OER</p> <p>Outcome and Impact Evaluations of Exemplars</p>

for simplification might be to target the points of interface that obstruct the workflow between supply and demand. Sophie—an application that allows users to draw content from different sources, remix or create new works, and then publish content in any format and on any content management system—is a compelling example of this type of technical innovation.<sup>9</sup>

Taking OER to scale is a challenge that crosses all three of the dimensions of an OER infrastructure. As OER software projects continue to grow in scale and scope, it becomes important to reuse software but with features that meet the needs of local contexts. An important principle to consider is extensibility—architecting the software that enables others to add new capabilities without changing the system itself. Rather than trying to design for the needs of different audiences, extensible software allows users to build upon the system using their own specifications. Web 2.0 has taken extensible development to a new height where content becomes part and parcel of the software. One example of this is the large-scale datasets—images of the earth, sequence of the human genome and images of the universe—compiled for scientific or public use. The technical challenge lies in the rendering of these data in ways that make them easy for people to manipulate and expand upon. Google took mapping data and made the information manageable for non-technical users and made the API open to developers, resulting in “mashups” of Google Maps with photo-sharing Web sites and Chicago crime data. Could we imagine a similar trend building upon images of human anatomy or digitized art?

### **Legal/Social/Cultural/Political Component**

We are not techies, but imagining the development and dimensions of a technical infrastructure seems a lot easier to us than imagining the legal/social/cultural/political infrastructure that might operate to support OER in 2017.

The long-term goal is to stimulate a self-sustaining environment that supports and reinforces the widespread use and reuse, creation, and demand for Open Educational Resources. The realization of this goal will require changes in the attitudes and behavior of organizations, groups, and individuals. The strongest levers for this are incentives for and evidence of the value of using, reusing, and creating OER to various actors in the field.

The positive incentives for professors embedded in OpenCourseWare appear to be a combination of pride in their institution and profession, and, for some, recognition by peers and a global audience. For individual scholars, an open journal such as the Public

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<sup>9</sup>Sophie is a multimedia authoring tool developed by the Institute for the Future of the Book. First release is scheduled for December 2008. For more information: <http://www.sophieproject.org/>.

Library of Science offers the recognition they desire to maintain their academic standing, as well as widespread dissemination of their ideas. In general, the incentives seem to have come together to support open and early publication of research in many fields of natural science. The fields' interest lies in the rapid dissemination and systematic accumulation of knowledge and, apparently, the early placement does not affect the business model for the journals. Similarly, the incentives have been right for some public and university libraries to work with Google to have their books that are out of copyright digitized and placed openly on the Web. The libraries save the money and time and get a copy of their digitized collection in return. Despite the fact that access is limited to Google search and its partners' intranets, the joint venture has spawned a massive effort to open and digitize collections of books from universities and public libraries worldwide.

For governments, the incentives might be to create opportunities for all of their citizens. The Netherlands has helped to support fully open college courses in the hopes of encouraging some of their citizens to go to college. Beyond being offered open courses, citizens might also be motivated by alternative credentialing systems that provide credit by demonstrating on an examination that they have learned from the open courses. This approach offers the possibility of significantly changing life's outlook for millions of people who have limited access to or resources for postsecondary education.

Web 2.0 applications opened the possibility of incentives outside the existing structures and systems. Online marketplaces, or “talent brokers,” scout and reward talent via the Internet. InnoCentive, as one example, matches top scientists to leading companies' research and development challenges. More than 100,000 “challenge seekers” from over 100 countries now help companies such as Proctor & Gamble, and many of them have won financial rewards for their solutions. NASA's ClickWorker project offers no financial incentives and yet has attracted hundreds of thousands of “volunteer scientists” who mapped craters on Mars. Both models have catalyzed a cultural shift toward more transparent and open environments that value inputs from individuals who have no formal ties to the enterprise.

The work of Creative Commons and the Berkman Center at Harvard exploring intellectual property issues and easy-to-use ways of letting creators of content share openly without losing ownership supports the development of an OER culture.<sup>10</sup> Some of these issues are considered in the Bissell and Boyle article in this journal. Another example of support for a culture of sharing is bellwether institutions adopting OER principles.

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<sup>10</sup>Creative Commons; <http://creativecommons.org/>. Berkman Center for Internet & Society, Harvard Law School; <http://cyber.law.harvard.edu/home/>.

MIT's lead in OpenCourseWare catalyzed an international movement, elevating many higher education institutions' understanding of the value of open access. Yale University's open video lectures may have a similar impact. Institutional leaders also have emerged in other sectors, such as publishing and public broadcasting.

Finally, the financial sustainability of OER projects and the field itself present huge challenges. A few early models have emerged to demonstrate new ways for creating value at different points of the OER network.<sup>11</sup> For example, the National Academies Press offers free digitized versions of its publications and sells higher resolution or print versions. Its revenue stream has been significantly increased over its past revenues, because the free version has increased its dissemination and reach.<sup>12</sup> In the long run, if the incentives fall into place and the other parts of this component evolve, new economic models will emerge.

### Research Component

Throughout this short article we have indicated a variety of places where studies would be particularly useful. One of the first priorities is to understand better how various incentives work in different settings and for different types of users. Another is to examine the effects of open educational interventions on learning outcomes, especially those that pertain to twenty-first century skills, such as creativity, innovation, and ability to collaborate effectively. More basic and applied research in these areas would help construct the theoretical framework for understanding the infrastructure necessary to support a vibrant OER network.

At a practical level, systematic research of user behaviors and use patterns would help the field develop better tools. The academic community has just begun to explore how people operate in a digital environment and how everything digital co-exists with the physical world. Few have studied the attributes of successful sites in other sectors that embody principles of open sharing and collaboration. Fewer still have examined the effects of open platforms and content on the process of teaching and learning. Strengthening the knowledge base in these areas and translating it into design principles could advance future development projects.

Along the way, a set of key indicators that tracks the health and growth of a self-sustaining OER network could help the field continually identify challenges and opportunities. To some extent, consideration of indicators will depend on the quality of the theory of change and the validity of the long-term goal. To complicate matters, any theory of change will almost certainly undergo changes over time. This area requires immediate and continuous attention. □

<sup>11</sup>Benkler: see fn 5.

<sup>12</sup>Jensen, Michael. *The Deep Niche*. University of Michigan University Library *Journal of Electronic Publishing*. Spring 2007.

# The Economics of Open Educational Resources

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This article examines from an economic perspective the ways in which Open Educational Resources (OER) can be linked to economic growth, equality of access to knowledge, and the improvement of teaching and learning. In leading economies, technology and knowledge are the critical factors of economic growth, which is a significant shift from the neo-classical economic view, which identified labor and capital as the critical inputs for growth. The shift helps to explain why some developing economies, even with mass amounts of labor and capital, lack access to the knowledge and expertise necessary to create the technological infrastructure needed to compete in the world knowledge economy. This article focuses on economic and teaching and learning issues: the benefits, barriers, and other economic questions about OER. The question is then addressed: Is OER a disruptive innovation? With respect to certain targets, like open textbooks, disruption is likely to be true. However, it is highly unlikely that making high-quality educational content freely available competes with traditional school structures and higher education. OER could alleviate a gap not currently being filled by traditional constraints.

This article examines from an economic perspective the ways in which Open Educational Resources (OER) can be linked to economic growth, equality of access to knowledge, and the improvement of teaching and learning.

In leading economies, technology and knowledge are

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the critical factors of economic growth.<sup>1</sup> This represents a significant shift from the neo-classical economic view held over the previous two hundred years, which identified labor and capital as the critical inputs for growth. Today, the process of knowledge accumulation and technological innovation create platforms for further economic development and sustained expansion.

This cycle helps explain why some developing economies, even with mass amounts of labor and capital, have not attained economic growth—simply put, these economies lack access to the knowledge and expertise necessary to create the technological infrastructure needed to compete in the world knowledge economy. Nations that show rapid economic growth, such as Brazil and India, are creating strong emerging markets, relying on knowledge and technology to spur progress. Open Educational Resources supports knowledge expansion and lifelong learning and is now being viewed as an important element for policies to open up access to formerly protected knowledge and make it easier for people all over the world to contribute.

While the economy has shifted from agrarian, to industrial, to knowledge and information-based, our school and higher education systems are still structured around obsolete models. Nine-month school calendars are planned around harvest cycles, though few of us are directly engaged in agriculture. Students are primarily taught according to the “one size fits all” industrial model and the mass production methods of Taylorism. The continued focus on the teacher as transferring knowledge to the students limits opportunities for more robust learning to occur in step with the critical thinking, communication, collaboration, and global awareness skills needed for active participation in the emerging knowledge economy.

In 2001, The William and Flora Hewlett Foundation stepped into the world of Open Educational Resources in support of the MIT OpenCourseWare (MIT OCW) initiative (<http://ocw.mit.edu/index.html>). Hewlett Trustees readily understood the significance of MIT’s bold idea to unlock knowledge that had previously been locked behind ivy walls and stimulate a culture of sharing. Internal benefits of the MIT OCW project include: increased transparency that positively impacts teaching; outreach to prospective students, and alumni; and worldwide recognition and branding. External benefits include those accrued by faculty, students, and self-learners across the globe that now have access to content previously available only to the privileged few.

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<sup>1</sup>Romer, P., Evans, G., & Honkapohja, Seppo (June 1998). *American Economic Review Growth Cycles*; Romer, P. (October 1990), *Journal of Political Economy, Endogenous Technological Change*.

At the Hewlett Foundation this anchor grant was the first investment into an array of projects supporting the creation, use, re-use, and dissemination of freely available, high-quality educational content (see <http://www.hewlett.org/Programs/Education/> for an overview of Hewlett’s Open Educational Resources Initiative).<sup>2</sup> (See Figure 1 for the logo of OER.)



## OPEN EDUCATIONAL RESOURCES

**Figure 1.** The William and Flora Hewlett Foundation Open Educational Resources logo.

This article focuses on economic and teaching and learning issues. I briefly address a number of the key questions that are asked about OER and include concrete examples that make the issues real. Each topic deserves a deeper treatment and references are included for the reader.

### **What Are the Benefits, Barriers, and Other Economic Questions About OER?**

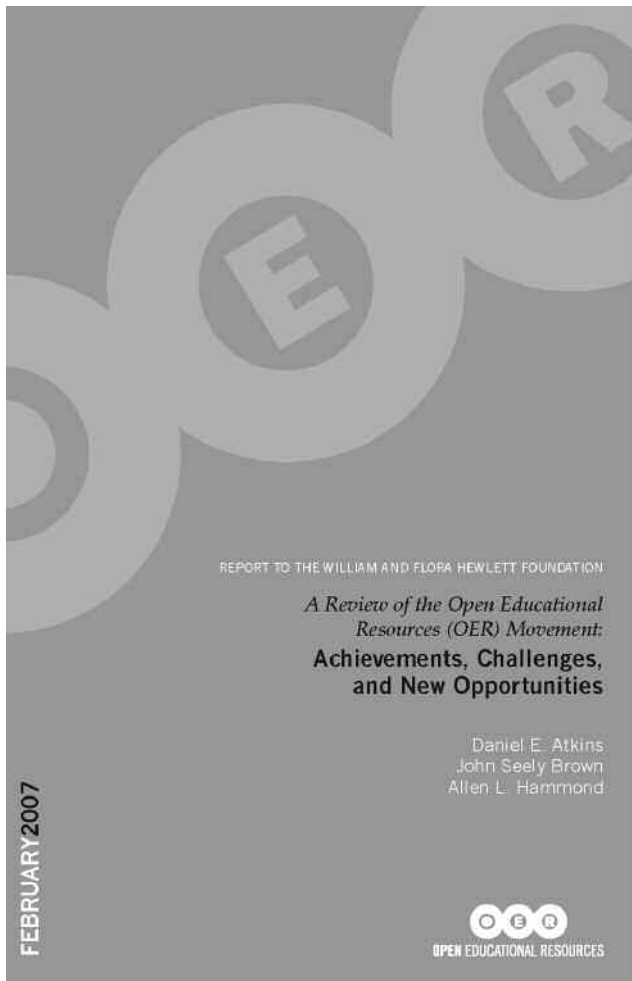
#### ***The Benefits***

Economists note the significant economic benefits resulting from widespread availability of information. Accessibility alone, however, is not sufficient to improve teaching and learning. Openness, in the context of OER delivered across the world via the Internet and the World Wide Web, depends on responsiveness and the potential for modifying content based on contributions from others. When people all over the world are allowed to continually improve, personalize, update, and otherwise add value to content, economic efficiencies of production occur and creative ideas are shared for the benefit of all. The recent review of the Hewlett Foundation OER Initiative<sup>3</sup> argues that the field needs to move from a culture of sharing to a culture of participation (see Figure 2). It is through active engagement and participation with the content that unique value is added.

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<sup>2</sup>Many of the Open Educational Projects described in this article and the other articles of this journal are supported by The William and Flora Hewlett Foundation.

<sup>3</sup>Atkins, D., Brown, J. S., & Hammond, L. (February 2007). Report to The William and Flora Hewlett Foundation, *A Review of the Open Educational Resources (OER) Movement: Achievements, Challenges, and New Opportunities*.



**Figure 2.** Cover of the February 2007 review of the Hewlett Foundation OER Initiative.

By its very nature, the Internet is built for participation, collaboration, and creativity.<sup>4</sup> Yale economist Yochai Benkler<sup>5</sup> chronicles the rise of peer production, which extends open innovation beyond traditional commercial settings and allows everyone to have access to shared information as well as to contribute. But innovation alone does not spring only from individuals modifying and extending existing materials. Great power can also emerge from mass collaboration. The Wikipedia Encyclopedia ([http://en.wikipedia.org/wiki/Main\\_Page](http://en.wikipedia.org/wiki/Main_Page)) is proof of the capacity for creating and distributing knowledge developed when the efforts of many are voluntarily harnessed. Through mass collabora-

<sup>4</sup>Lessig, L. (2004). *Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity*. Penguin.

<sup>5</sup>Benkler, Y. (2006). *The Wealth of Networks*. Yale University Press.

tion economic efficiencies of improvement/feedback and reuse are realized.<sup>6</sup>

### **Some Barriers**

While OER are freely available on the Web, lack of connectivity and computers are economic barriers to use, re-use, and content creation. In many places in the world, prohibitively high connectivity costs exclude participation of many. These barriers are particularly problematic in developing countries, where the cost of connectivity far exceeds developed world costs. OER can, and are, being made available through alternative delivery mechanisms to the Web, such as CD-ROMs or intranets within universities, and are being adapted for delivery to cell phones, which are often cheaper and more ubiquitous. Our hope is that over time there will be technical solutions that meet the delivery problem.

The initial high cost of content development and the later costs of maintaining and updating the content are also economic barriers, especially to institutions that are making their educational materials newly available. Together with the challenges posed by the issue of intellectual property rights, these costs are a strong deterrent. In many instances, however, a belief in the culture of sharing has overcome the hesitancy of institutions to make major commitments of resources to opening large amounts of their content. The BBC Creative Archive (<http://creativearchive.bb.co.uk/>) and WGBH Teacher's Domain (<http://www.teachersdomain.org/tdhome.html>) are examples of public television's movement toward open resources. The expansion of universities in the OCW consortium from the original MIT commitment to approximately 160 institutions worldwide is another. The strength of the open book digitization movement (<http://www.opencontentalliance.org/>) movement, the dramatic increases in open journals, and the interests in OER by governments, e.g., Vietnam, Netherlands, suggest that sometimes these economic barriers can be overcome.

### **Economic Sustainability**

The issue of the economic sustainability of OER is alive and well. What is the market model for educational resources that are given away for free? There are costs associated with the initial stages of development as well as expenses related to maintenance and updates. These costs will vary depending upon whether the project derives from the institutional or community driven perspective. Institutional-based content, in general, is more costly to produce in comparison to community-driven content that harnesses the leisure time and goodwill of participants passionate about contributing.

<sup>6</sup>Surowiecki, J. (2004). *The Wisdom of Crowds*. Random House.

For OER to be sustainable, it needs to create value for organizations and people. Several sustainability models are emerging:

1. Increase value by adding and charging for additional services, e.g., this follows the Red Hat model of value added to the GNU/Linux open-source software, and the membership model of the National Repository of Online Content Network (<http://www.montereyinstitute.org/nrocnetwork/>).

2. Increase value through sales, e.g., once the Prelinger collection of ephemeral videos was made freely available online through the Internet Archive (<http://www.archive.org/details/prelinger>) sales increased dramatically, serving a niche community of the long tail.<sup>7</sup>

3. Increase value by meeting institutional goals, increasing services to students and to alumni, and strengthening reputation, e.g., MIT OpenCourseWare and the Harvard Open Library Collection (<http://ocp.hul.harvard.edu/>).

4. Increase ease of meeting government commitments, e.g., the United States Library of Congress American Memory collection (<http://memory.loc.gov/>), the UK Joint Information Systems Committee (<http://www.jisc.ac.uk/>), Open University of the UK, Open University of the Netherlands (<http://ou.nl/eCache/DEF/36.html>) all add value by promoting lifelong learning for all.

5. The support through endowment model, e.g., Stanford Encyclopedia of Philosophy (<http://plato.stanford.edu/>) has successfully raised an endowment to sustain its high-quality open encyclopedia.

With the rising supply of free educational resources on the Internet, we need to look for new cost recovery models and ways of obtaining revenue. Community-driven content may employ similar business models as institutionally derived content but can also enhance sustainability by the participation of the community.

## Teaching and Learning in the 21st Century

To meet the needs of the information-based economy, we must move away from traditional practices of learning that view teachers primarily as the dispensers of knowledge. Students learn best by analyzing, creating, collaborating, and continually assessing their learning—not as passive recipients. Beyond accessibility, one of the unique values of OER is that the content is open for modification and change. Student learning and creativity are supported by the opportunity for content creation. Teachers have the opportunity to adapt the content for local contexts. And openness for all creates opportunities for groups to collaborate in learning and

<sup>7</sup>Anderson, C. (2006). *The Long Tail*, *Wired*, Issue 12.10, Oct. 2004. *The Long Tail: Why the Future of Business Is Selling Less of More*. Hyperion.

in the production of modified and/or new content. The implications of these opportunities are significant. For example, changing the model of learning may change the nature of teaching from imparting knowledge to coaching, where they structure active engagement and moderate collaborative learning processes, rather than only impart knowledge.

Learning also is no longer bound by time and place—users with access to the Web can now learn anytime, anywhere 24/7. Learners can study at their own pace and at their preferred time. For higher education students, this often means between midnight and two in the morning, not at 9 am lectures. Those who are working need the flexibility to learn while keeping their employment; this is cost-efficient for individuals, businesses, and governments. In Europe, where there is a strong focus on widening participation in higher education, OER are viewed as a bridge between non-formal, informal, and formal learning.

A number of other articles in this journal describe the value that OER brings to the opportunities of teachers to collaborate over the development of lesson plans and other materials and of students to participate in collaborative learning with other students. More is written about this topic in *Change* magazine.<sup>8</sup>

In this article I emphasize other aspects of the potential impact of OER on teaching and learning.

*Can OER help make learning more efficient while improving quality? Can students in a powerful Web-based technology environment learn more efficiently than students in a lecture hall?* Preliminary evaluation data from Carnegie Mellon's Open Learning Initiative (<http://www.cmu.edu/oli/>) clearly show how high-quality open educational materials can rapidly advance learners at home and in school.

One of Hewlett's earliest OER projects, the Open Learning Initiative, presents full instruction for a series of Carnegie Mellon courses in an online format, available 24/7 to anyone in the world. In an experiment this spring semester, Carnegie Mellon students who volunteered to study statistics with the online format were randomly assigned to an accelerated online study group or to a face-to-face lecture course. Students in the online study group had access to course instruction all day, every day, and could meet with a teacher once or twice a week. In addition to carrying a normal course load in other subjects, they were required to accelerate and complete the entire course in eight weeks, rather than the traditional fifteen. Students in the conventional lecture course also had access to the free online course materials, but were not asked or

<sup>8</sup>*Change Magazine*, Learning in Cyberspace, September/October 2006, Volume 38, Number 5; <http://www.carnegiefoundation.org/change/sub.asp?key=98&subkey=2014>.

required to use them.

Results showed that students participating in the accelerated online study group did slightly better in half the time than the students in the lecture course that took the entire semester. This suggests that students can learn very efficiently in a self-paced, essentially teacher-free environment: indeed they learned as well, in half the time, covering the same content as in a lecture course. Carnegie Mellon is following up this experiment with similar studies in other subject areas. If the results of the spring evaluation generalize to other content areas and schools, the implications for reducing costs and for changing the nature of teaching are enormous.

Another example of possible efficiency comes from the use of open textbooks. In the United States alone, elementary and secondary textbooks are a four billion dollar per year industry.<sup>9</sup> California alone spends five hundred million dollars on textbooks for its K–12 system. For California community college students, textbook costs exceed tuition and fees.<sup>10</sup> And, while we assume textbooks are of the highest quality with their glossy pages, professional photos, and state adoptions, there exists no validation regarding their effectiveness. If, however, textbooks were openly available online with embedded assessments that allowed teachers and students to provide continuous feedback and suggestions for improvement, we could begin to collect an understanding of specifications that maximize learning and understanding. This cycle of formative assessment would create a user driven feedback loop. Open textbooks, licensed under Creative Commons licenses (<http://creativecommons.org/>), would allow adaptation and derivative works, thus allowing the original to be maintained but derivatives created for different languages and student groups. Open online textbooks would also allow instant modification with new knowledge.

Beyond clear cost efficiencies, we can imagine the level of engagement for open online textbooks to be quite high. Online texts can include games, simulations, virtual laboratories, and multiple representations of complex concepts. Ultimately, we expect textbooks will easily cross platforms, from computers to handhelds to mobile phones.

The Connexions project at Rice University (<http://cnx.org/>) is a content commons of modules in thirteen languages that can be bundled as courses, textbooks, or reports and printed at no cost at your local printer, aside from the printing expense itself. Some textbooks (see <http://cnx.org/content/col10040/latest/> as an

<sup>9</sup><http://plato.stanford.edu/> .

<sup>10</sup>Zumeta, W., & Frankle, D. (2007). *California Community Colleges: Making Them Stronger and More Affordable*. National Center for Public Policy and Higher Education.

example) can also be printed at approximately 25 percent of the typical cost of a print publisher.

Still another possibility is to increase efficiency and quality by dramatically increasing access to both the learning and the accreditation of the learning. Over the past few years a number of major institutions, including the Open University in the UK, Yale, Carnegie Mellon, and the Open University in the Netherlands, to name a few, have placed high-quality courses openly on the Web for anyone to use, 24/7. While there are no actual professors or teachers supporting the learning, the learner can study on her own, or with a community of online learners in projects such as OpenLearn (<http://openlearn.open.ac.uk/>).

Suppose now that the learners judge they have mastered the material and would like to get credit for their studies. Were there institutions available to administer high-quality course examinations to these students on a secure basis, we might imagine students taking enough courses to qualify for a baccalaureate degree.

In order to meet the world's demands for higher education over the next ten years we will have to build a university a week starting now to meet the demand of the 100,000 students eligible for higher education but unable to participate for financial or geographic reasons. Suppose those universities were largely virtual? Are we willing to expand our traditional<sup>11</sup> notions of university to meet the unmet demand?

### Is OER a Disruptive Innovation?

A disruptive technology is a new technological innovation, product, or service that eventually overturns the existing dominant technology in the market, despite the fact that the disruptive technology is both radically different than the leading technology and that it often initially performs worse than the leading technology according to existing measures of performance.<sup>12</sup>

Is OER a disruptive innovation in the education marketplace? Disruptive innovations are either lower or higher-end. Lower-end disruptive innovations are aimed at consumers, either (1) neglected by businesses as being outside the high profit segments of the market, or (2) the available product exceeds the needs of certain consumer segments. In many cases, these include those who do not need, or cannot or are unwilling to pay for the full performance valued by customers at the high-end of the market. An example of a lower-end disruptive force would be the creation of OER-based

<sup>11</sup>Daniels, Sir John, Commonwealth of Learning (<http://www.col.org/colWeb/site/pid/2833>).

<sup>12</sup>Definition from: <http://www.google.com/search?hl=en&client=firefox-a&rls=org.mozilla:en-US:official&oi=definer&q=define:disruptive+technology&defl=en> .

virtual universities for the 100 million people who otherwise will be denied access over the next ten years.

Will OER evolve to serve these potential customers of higher education? A lower-end disruptive technology may enter the market and provide a product which has lower performance than that which is already in the marketplace but which exceeds the requirements of ignored segments, thereby gaining traction. This disruption targets the least profitable customer first, who is satisfied with access to the lower-end product and cannot/will not pay for enhancements, such as residence universities.

Not all disruptive innovations, however, are of lower performance. At times, the disruptive innovation will outperform the current technology but is not adopted by existing players in the market. This typically occurs in industries with a high level of investment in older technology—where there exists a high cost and greater inertia for the older infrastructure to be replaced. The education industry is certainly an older technology, tied to tradition with embedded cultures.

As an analogy—originally roads were built for horses not cars. Nevertheless, the potential for greater convenience and speed resulted in roads redesigned for cars after overcoming technical and political barriers. Like the car, OER offers added value. Even if innovation is recognized, existing businesses are often reluctant to use it to their advantage, since it would involve competing with their existing, more profitable approach.

Is OER a disruptive educational technology innovation, or is it compatible with traditional norms of education? With respect to certain targets, like open textbooks, disruption is likely to be true. For example, the additional features of cost reduction, increased timeliness, and ability to include immersive games and embedded assessments, make an open-only textbook highly valued in the education market.

However, does making high-quality educational content freely available compete with traditional school structures and higher education? This is possible as OER can alleviate a gap not currently being filled by traditional constraints, be disruptive with respect to the nature of teaching, the ready ability to be actively engaged in production of knowledge, the awarding of degrees, and perhaps with respect to the nature of semester systems.

### Conclusion

Students learn best when they have opportunities to apply their knowledge—to create, problem-solve, and collaboratively participate. These are all competencies needed for the 21st century and for leading economies. Open Educational Resources are potential enablers of such a shift, but only if they are disruptive enough to restructure educational policies and organizational frameworks to empower teachers and learners to make good use of such resources. □

# Connexions: An Open Educational Resource for the 21st Century

**C. Sidney Burrus**

*Connexions Project, Rice University*

The technology for information organization, communication, storage, and use today is the book. It has evolved over 3000 years (in its modern form over 500 years) to the mature object we currently enjoy. The book is now the primary technology used in education. But with the development of the computer and the Web, a new electronic information technology is challenging the book and laboratory, and it promises to allow significantly improved learning. The author and colleagues have developed and are using an Open Educational Resource called Connexions where the content is organized in small modules, open to use and reuse in creative ways consistent with modern pedagogy and open to new systems yet to be discovered or invented. This article presents the Connexions Project at Rice University as an example of that new technology and outlines the experience.

### Introduction

The technology for information organization, communication, storage, and use today is the book. It is a mature technology, having evolved over hundreds (even thousands) of years to the current state that is relatively stable and unchanging. The book and laboratory are the main technologies used by teachers in education today. Authors, teachers, students, publishers, book sellers, and a surrounding infrastructure have built a powerful system that has served us well even though the high cost of books, journals, libraries, etc., and the long time to publication are causing concern.

Current developments in computer hardware and software, in computer networks, in cognitive science, and in information theory indicate there are better systems for the generation, organization, storage, and use of information. Indeed, the subject of this article is

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a system that we feel is a step towards a much better system based on electronics in addition to paper. It is the system of the Connexions Project started at Rice University in 1999 (<http://cnx.org/>).

There have been three major shifts that have occurred in the history of information technology. The first was the development of writing, which resulted in the shift from an oral to a written system [1]. This depended on several other developments, such as an alphabet and an educated community who were literate. The second shift was from a written to a printed document, which was a result of the invention and development of the printing press [2]. This also depended on several technologies, including paper, ink, and movable type presses.

The third shift is occurring just now and that is from a print to an electronic or digital system. It is more difficult to see this shift because we are all in it and part of it [3]. However, the supporting technologies of computers, networks, radio, video, software, storage, and miniaturization coupled with results from information theory, cognitive science, artificial intelligence, computer languages, computer systems, and open source software allow systems such as Connexions to be developed.

### Disruptive Technologies

When a truly disruptive technology is introduced, its impact generally occurs in two phases. First, the new technology does the same job as the old technology, only better. Second, the problem is redefined and radical (sometimes unexpected) changes occur.

Along with these two phases, there is another distinction, stated by G. Moore in *Crossing the Chasm*, that is helpful. The “early adopters” are those adventurous souls that apply the new technology even though it is hard and the short-term payoff is small. Then the “mainstream” users start using it as it becomes less difficult and more acceptable to the larger community. Finally come the “conservatives” and lastly the “laggards.” No one wants to be labeled a laggard, but the other three groups have good reasons for their actions.

The previous shifts occurred to solve problems that were limiting progress in information use. Human memory and oral transmission of information was not accurate enough, required too much expertise, and did not scale with the need to handle larger volumes of information with more creators and users. Writing solved those problems for many years. The growth of literacy coupled with the errors of hand copying manuscripts, the limited volume possible, and the cost were the problems that required the printing press to solve. Now, we again are faced with similar problems. A single high school or college text book often costs well over \$100 and takes years to be written or

updated. These books do not allow the searching or interactive processes that digital materials do. A single book must serve very different learning and teaching styles. So, we are in the first phase of the third shift that is attempting to solve those problems.

### Connexions

In 1994, five other experienced digital signal processing (DSP) authors and I published a book of exercises or homework problems to be used with the computer software system, Matlab. It contained a large number of relatively short DSP exercises together with a brief, self-contained bit of theory. From this collection, an instructor could assign a set of problems that suited the course and philosophy he or she was using. Or, the self-studying student could choose the problems that he or she was intrigued by or that would help in learning a particular point. The problem set could be used with almost any DSP text book or set of class notes or used alone. And, it was priced very low. From the use of this book by many authors in many settings, we have seen how the flexible, modular arrangement detached from the text book worked well. But we also saw that many instructors or students using the book were using only a small fraction of the exercises. But, of course, different folks each used a different small fraction, so creating a smaller book was not the solution.

Although the exercise book was to be used with the software system, Matlab, it was not integrated with the software in an effective way and interactive experiments were clumsy. The collaboration in writing was not easy, even with word processors and LaTeX, and writing the second edition was not easy. I felt this book was a step in the right direction but was not the answer.

In 1999, Professor Richard Baraniuk came to me with the idea of writing a junior level book in electrical engineering. He was frustrated by the fact that the mathematical ideas, the design methods, the applications, the legal implications, the business possibilities, and the ethical dimensions were all separated in different courses taught by different instructors in different departments, all disconnected. He proposed writing a new book that would connect all these ideas. I challenged him not to do that—not to write still another book with only a different spin—but to design a completely new teaching tool using modern computer and information technology. He came back weeks later with the basic ideas that have become what we now call Connexions. This is a new system that “connects” not only ideas but people [4,5,6,7,8,9,10,11,12,13].

The timing could not have been better. The physical technology of the Internet, the desktop and laptop computers, the mass semiconductor, magnetic and optical storage systems, and the new wireless protocols were

beginning to be applied to a new educational resource, whatever that might be. The beginnings of Web 2.0, XML, second generation browsers, better graphics and simulations, interactive systems, and social software were also asking to be applied to education. All of this was accompanied by a new legal vision inspired by Richard Stallman and Eric Raymond, in the open source software movement, to give an educational version of Larry Lessig's Creative Commons. This environment not only supports but encourages a deeper level of collaboration than that of the multiply authored book or curriculum. This does not mean a single point of view is given. On the contrary, the student and instructor are not limited to a particular book or even the books in a particular library, but they do have the guidance and recommendation of the instructor.

There are three parts to the Connexions system:

1. The information itself organized in the form of small modules that can be linked and searched. These modules use the XML protocol and are located in an open "repository" accessible globally over the Internet, a network, or on a disk or CD ROM.
2. Tools that help create, maintain, share, and use these modules. These tools are built into a Web and browser accessible service specialized for this application.
3. A community that develops and uses these tools and modules. The authoring community is modeled around the ideas of the open software projects but operate in a somewhat different environment.

For educational applications, there are several participants:

1. The **author** creates the modules. This is done by writing a new module or by modifying an existing one which may have been written by the modifier or by a completely different author. There are software tools to write, edit, and collaborate. This is strongly aided by the open Creative Commons copyright.
2. The **instructor** creates courses or plans for study by creating a "road map" through the modules in the repository. The instructor may write all of the modules for a particular course or some of them or none of them. The resulting course may be used by a class in a school, by an individual doing self-study or distance education, or a business for documentation. The course material may be used from a screen or be printed out as a paper book.
3. The **learner** or student uses Connexions to learn not only the factual information, but also the contextual "connections" to the piece of information. This allows the traditional instructor

to lead teaching but also allows a learner to actively participate in a controlled discovery experience.

4. The **community**, which consists of all three participants, and especially the first two, allows all individuals to gain maximum benefit from this new technology. It also includes legal, commercial, and educational infrastructure.

Part of the motivation of Connexions is to create and organize information in a format that is more compatible with the way that people think, discover, create, and learn. This was the original motivation of hypertext [14]. The traditional book does a good job of aiding the memory of people and of preserving the hierarchical organization. It does less of a good job of presenting connections or links or of allowing easy searching, both of which the brain does routinely. The book tries to do these things with references, footnotes, and the index. Hypertext links and search engines operating on digital information are much better. Indeed, these are some of the reasons for the digital library. The choice of XML (extendible markup language) over HTML or some other format allows a semantic description of the meaning of the content as well as presentation which is central to Connexions and allows future developments in the Semantic Web with "metadata." It also allows the use of embedded dynamic, interactive experiments through simulation applets, where a "virtual" laboratory can be created.

Connexions has the same problem that the Web itself has in quality evaluation and certification. Indeed, that is a major problem with traditional publications, where the amount of information and the extreme specialization makes reviewing more and more difficult. Connexions allows a post-publication reviewing system rather than (or in addition to) the traditional pre-publication review. This is done by having a "lens" where one may "look" at the repository through a lens (or filter) to see only a subset of the total. Various groups can create lenses to build the equivalent of a "reviewed" or endorsed repository. For example, one professional society has already built an endorsement system and others are in the process.

Connexions started in 1999 with electrical engineering [15]. It has now grown to cover a large part of electrical engineering and several courses in mathematics, some in physics, botany, history, and a wide range of other areas. Two of the most exciting applications have been a course in music appreciation at the university level and a course in music theory for teacher and children. Connexions boasts over 4000 modules, more than 220 courses or books, approximately 550,000 users (96% non Rice University), 2000 author accounts, and approximately 200,000 hits per day from 198 countries. We are now working with Teachers without Borders and UNESCO, bringing content to developing

countries, with QOOP, a printing company for low-cost text books, and National Instruments, bringing interactive applets for embedded demos and labs. We hope an added-value industry will grow up around Connexions content much as Red Hat grew up around Linux.

The system has been used in many traditional courses over the past several years as a primary text or supplementary document. It is now being used to supply the only text book for the introductory electrical engineering course at Rice, where a 300-page book written by Prof. Don Johnson can be purchased online through Connexions from QOOP for \$20. Connexions is being used in a DSP course and a DSP lab at Rice and the University of Illinois. A rather surprising occurrence was the large success of a music theory course by Catherine Schmidt-Jones and a university music appreciation course called "Sound Reasoning" by Tony Brandt. The platform has been chosen by the Rice University Press to be its print engine and several university presses are considering Connexions to reduce costs, speed up printing, and keep books from ever going out of print. It can be used as an online text in a traditional course, it can be used to produce an inexpensive printed book, or it can be used in a distance education program. To see Connexions for yourself, visit <http://cnx.org>. □

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## Visitors Welcome

Readers of *Educational Technology Magazine* are always welcome to visit the offices of the magazine, whenever you are in the Northern New Jersey–New York City Area, for informal discussions with the Editor, Lawrence Lipsitz, and staff of the publication.

Throughout its 47 years of publication, the magazine has welcomed both individual visitors and groups, including delegations from nations throughout the world eager to learn of progress in the field of educational technology in the United States.

Simply call the magazine's offices a day or two in advance to arrange for a visitation. We enjoy discussing the field with our readers, and we believe that this leads to a greater appreciation among all participants of trends and ongoing developments.

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# The OpenCourseWare Model: High-Impact Open Educational Content

**Stephen Carson**  
*MIT OpenCourseWare*

OpenCourseWare (OCW) is one among several models for offering open educational resources (OER). This article explains the OCW model and its position within the broader OER context. OCW primarily represents publication of existing course materials already in use for teaching purposes. OCW projects are most often institutional, carrying the imprimatur of the sponsoring institution and conferring benefits back. MIT launched the first OCW in 2002, and today there are some 150 universities around the world with OCW Web sites running live or in development. Evaluation data show strong user acceptance of the OCW model and demonstrable positive impact for educators and learners.

## Background and History

First announced in April 2001, MIT OpenCourseWare (<http://ocw.mit.edu>) is a large-scale, Web-based electronic publishing initiative. Its goals are (1) to provide free, searchable, coherent access to virtually all MIT course materials for educators, students, and individual learners around the world, and (2) to create an efficient, standards-based model that other universities may emulate to publish their own course materials. MIT's mission is to "advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the

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world." OCW is an exemplary manifestation of the MIT faculty's deep commitment to this ideal.

MIT launched a pilot version of OpenCourseWare in 2002. As of November 2007, OCW is completing the "ramp-up" phase, resulting in a Website offering 1,800 courses—virtually all graduate and undergraduate courses across MIT's five schools and 33 academic units, including Aeronautics and Astronautics; Anthropology; Architecture; Biology; Brain and Cognitive Sciences; Chemical Engineering; Civil and Environmental Engineering; Comparative Media Studies; Earth, Atmospheric, and Planetary Sciences; Economics; Electrical Engineering and Computer Science; Engineering Systems Division; Foreign Languages and Literatures; Health Sciences and Technology; History; Linguistics and Philosophy; Literature; Materials Science and Engineering; Mathematics; Mechanical Engineering; Media Arts and Sciences; Nuclear Engineering; Ocean Engineering; Physics; Political Science; Sloan School of Management; Urban Studies and Planning; and Writing and Humanistic Studies.

The 1,800-course milestone also represents OCW's transition to "steady state" operation, an ongoing program of publishing new and updated courses at a rate of about 200 per year.

OCW is best understood as a free, publicly accessible, and openly licensed reusable digital resource that offers high-quality teaching/learning materials structured around courses and presented in a reasonably consistent format. The idea is that an OCW is a publication of course materials created by faculty (and sometimes other colleagues or students) to support teaching and learning. For any given course, the published materials should fully convey the parameters of the course's subject matter and ideally include a substantially complete set of all the materials used in the course. Typical content may include:

- Planning materials: Syllabus, calendar, pedagogical statement, and faculty introductions.
- Subject matter content: Lecture notes, reading lists, full-text readings, and video/audio lectures.
- Learning activities: Problem sets, essay assignments, quizzes, exams, labs, and projects.

OCW is *not* a distance education program or an online, mediated learning system. Rather, it is a publication. Our target audiences are (a) educators, who may adopt or adapt the materials for their own teaching purposes; (b) students enrolled in educational programs, who may use the materials for reference, practice exercises, or mapping out their programs of study; and (c) self-learners, who may find the materials helpful for enhancing their personal knowledge either from the materials themselves or from the many references, readings, and other resources. The fundamental characteristic of OCW is that it presents teaching and learning materials in the context of

complete courses, and courses in the context of broader curricula.

Another key feature of OCW is that the materials are IP-cleared, meaning that MIT (or any other OCW institution) has the rights, either through ownership or by license (permission), to make the materials available under open terms, and that nothing in the materials infringes the copyrights of others.

MIT OCW is offered under a standard Creative Commons Attribution-NonCommercial-ShareAlike license, which:

- Grants users the right to use and distribute the materials either as-is, or in an adapted form.
- Allows users to create derivative works by:
  - Editing,
  - Translating,
  - Adding to, or
  - Combining OCW materials with or incorporating them into other materials from other sources.
- Obliges users to meet certain requirements as a condition of use:
  - Restricted to non-commercial purposes (not all OCW institutions impose a non-commercial use restriction).
  - Requires that materials be attributed to the institution and/or to the original author.
  - Requires that if original or derivative materials are subsequently republished or redistributed, they be offered freely to others under compatible open terms (“share alike”).

### The Big Idea

MIT OpenCourseWare is an idea—and an *ideal*—developed, supported, and embraced by the MIT Faculty. In 1999 the MIT Provost convened a faculty committee to consider how to take best advantage of the Internet to advance education. While at that time some other institutions saw the Internet as an opportunity to generate new revenue streams from educational content, online courses, or distance education, in 2000 the MIT faculty committee proposed to give away their teaching materials for free through the mechanism of OCW.

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OCW opened a door for me. This door is to infinity. I believe it will change the concept of education in the future world. Education does not mean getting a certificate. Education means I have the right to learn anything in this world and nothing can obstruct me. OCW is just showing this to the world. Thanks a zillion times.

—Student, Bangladesh

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The idea of open sharing of intellectual content had many precedents at MIT. Prominent among these were

two long-standing traditions: the open source software movement, which has deep roots at MIT, and the practice of open sharing of preprints of research work within many disciplines.

Consider this: MIT policy holds that faculty members, and not the Institute, generally own the copyright in course materials they author for use in teaching. Moreover, participation in OCW—that is, contributing one’s teaching materials for open publication—is strictly voluntary. Yet some 90% of MIT faculty have chosen to participate, underscoring the faculty’s deeply held commitment to advancing education through open sharing.

### Impact Around the World

In January 2007 we set a new record: over two million visits to MIT OCW content\* in one month. Since inception, there have been some 25 million visits to MIT OCW and another 13 million to affiliated translation sites. In addition, “zip downloads,” a more recent innovation that allows users to work with MIT content offline, are rapidly gaining in popularity with 2.5 million complete course downloads so far. One other distribution channel is our mirror site program. We ship hard-disk copies of the entire OCW Website to over 100 mirror sites in Africa and Asia. These sites, typically located at universities where Internet access is limited, deliver MIT content to untold numbers of additional users.

In addition to publishing primary course materials, we have integrated video production more closely into our regular publication production process. Many courses now have video materials associated with them—well over 1,000 hours in total, including several courses that offer complete videos of the entire course lecture series. Other courses have complete audio recordings of the lecture series.

Our most recent evaluation shows that 16% of visitors are educators, 32% students, and 49% self-learners, about the same proportions we found in earlier studies. We derive from the data that about 2 million educators have used OCW. Fully 96% of educators surveyed say OCW has helped them improve their teaching and their courses. Indeed, over half these educators have adopted or adapted MIT materials for their classroom use. Imagining that each teacher reaches, say, 20 or 30 students a year, one can surmise that tens of millions of people all over the world are benefiting from OCW.

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\*Translation affiliates: Universia (Spanish and Portuguese); China Open Resources for Education (CORE, simplified Chinese); Opensource OpenCourseware Prototype System (OOPS, traditional Chinese); Chulalongkorn (Thai).

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These resources contain the most informative set of course materials made available to the public. I would actually go as far as saying that this ranks among the greatest higher education initiatives in history.

—Educator, UK

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In our evaluation surveys, all types of users overwhelmingly say that OCW meets their needs and has a positive impact. The data are reinforced by tens of thousands of e-mails, many telling moving stories about how OCW has opened new doors and changed lives. In a few instances, we have followed up on some of the surveys and emails to develop case studies illustrating how users take advantage of OCW and what difference it makes for them.

### Impact at MIT

Worldwide users are not the only ones who benefit. OCW—and the open sharing that underlies it—has become well established as a part of the academic culture at MIT. With only a few exceptions, almost all faculty embrace the OCW concept. We attribute the widespread acceptance of OCW not only to its philosophical underpinnings, which resonate with the personal values held by many in our community, but also to the many tangible benefits that have accrued to MIT faculty, students, and the Institute as a whole.

About 60% of MIT faculty use OCW materials in their teaching or advising at MIT. Some 32% say publishing on OCW improves their materials. And OCW enables faculty to gain more detailed insight into what is taught in other courses in their own departments as well as other departments across the curriculum. Some departmental curriculum committees have reported that they have been able to be more effective in reviewing and fine tuning the offerings within their departments. Other faculty have used OCW to “flash students back” to earlier courses to help them better understand materials that should have prepared them for more advanced study.

### Expansion of the OpenCourseWare Concept

The OpenCourseWare idea is catching on, even beginning to feel like a “movement.” About 150 institutions around the world so far have either launched their own OCWs or are in the development stage. The OCW Consortium (OCWC, <http://www.ocwconsortium.org/>) brings together people from these and other institutions to share approaches and best practices. Although MIT was instrumental in establishing OCWC, the Consortium is now spinning off as an independent entity with its own Board selected by the membership and its own Executive Director.

The mission of OCWC is to advance education and empower people worldwide through OpenCourseWare. The goals of the Consortium are to:

- Extend the reach and impact of OpenCourseWare by encouraging the adoption and adaptation of open educational materials around the world.
- Foster the development of additional OpenCourseWare projects.
- Ensure the long-term sustainability of OpenCourseWare projects by identifying ways to improve effectiveness and reduce costs.

As a result of this interest, the OCW concept is becoming more mainstream. We believe that it will eventually develop into a routine and customary practice in education at all levels, creating a widely accepted culture of open sharing. As this culture takes root, it holds the promise of transforming education in two fundamental ways. First, it provides access to knowledge and educational resources for people around the world, including people who because of economic, political, or social disadvantages have never before had such opportunity. Second, it enhances the quality of education to levels never before imagined, especially as educators share materials and feedback with each other. We have significant data demonstrating these phenomena.

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Through MIT OCW, educators and students everywhere can benefit from the academic activities of our faculty and join a global learning community in which knowledge and ideas are shared openly and freely for the benefit of all.

—Susan Hockfield  
President of MIT

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Meanwhile, the development of new OCWs is adding to the collective body of high quality educational materials that comprise a broad spectrum of disciplines and teaching methods, that provide thorough coverage within subject areas, and that are offered freely and openly for educational purposes. Across all OCW Websites, there are now more than 4200 distinct courses. Worldwide interest in this movement, and the investment so many others are making, further validates the value of sharing educational materials openly. □

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### Send Us Your Comments

All readers of **Educational Technology** are welcome to send in comments for possible publication in these pages. Your views may deal with your reactions to articles or columns published in the magazine, or with any topic of general interest within the larger educational technology community.

# Open Content in Open Context

**Sarah Whitcher Kansa**

**Eric C. Kansa**

*The Alexandria Archive Institute*

*Open Context Project*

This article presents the challenges and rewards of sharing research content through a discussion of Open Context, a new open access data publication system for field sciences and museum collections. Open Context is the first data repository of its kind, allowing self-publication of research data, community commentary through tagging, and clear citation and stable hyperlinks, and Creative Commons licenses that make reusing content legal and easy.

## The Challenges of Sharing Data

Advances in digital technology are transforming research and education. Field researchers, from archaeologists to environmental scientists, collect vast and growing amounts of multimedia content. Open Context is our initiative to make Internet publication of this research easy, open access, and free of charge. Our goal is to see this digital material shared globally, without barriers and, ideally, in real time. With Open Context and other emerging technologies, researchers, educators, and students at all levels can enjoy unprecedented levels of access to ongoing research and, perhaps more importantly, to access and communicate with the researchers themselves.

Why are we focusing on field research, and what does this have to do with education? The answer is simple: Field research gives students a window into other worlds. These other worlds may be remote time periods and ancient cultures, or they may be endangered habitats that may disappear before today's youth

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**Sarah Whitcher Kansa** and **Eric C. Kansa** are co-founders of the Alexandria Archive Institute, a California-based nonprofit working to create tools for scholars to share open content. With support from The William and Flora Hewlett Foundation and individual donors, they have created Open Context, an open access, Web-based system for publishing cultural heritage content from the field sciences and museum collections (e-mails: [skansa@alexandriaarchive.org](mailto:skansa@alexandriaarchive.org); [ekansa@alexandriaarchive.org](mailto:ekansa@alexandriaarchive.org); Websites: [www.alexandriaarchive.org](http://www.alexandriaarchive.org); [www.opencontext.org](http://www.opencontext.org)).

ever get a chance to explore them first-hand. Finding cost-effective strategies for publishing field research is critical if we want to give today's generation and future generations a chance to learn about our history and environment. Field researchers collect a vast amount of digital information but currently lack good ways to publish and preserve these irreplaceable observations. In too many cases, our knowledge of the past and the natural world is one hard-drive crash away from irrevocable loss.

Fortunately, the Internet now provides the capacity to publish all of this vulnerable and irreplaceable content. However, given the complexity of the field sciences, online data publication is easier said than done. Tools and incentives are needed to rescue field research from loss. The Alexandria Archive Institute (AAI) was formed to address these problems so that researchers, educators, and students can explore and understand our natural and cultural heritage. The AAI builds free, open source tools to publish field science research on the Internet. The AAI also works to understand and structure incentives so that researchers will be willing to participate in a culture of openness, and share their materials in ways that enable others to build upon their work. More specifically, our work addresses the technical and cultural challenges of open access to research content.

## Technical Challenges to Data Sharing

One of the greatest hurdles to sharing data online is the great diversity of content generated in most disciplines. Databases tend to be project-specific, posing a challenge to data sharing, even within a narrow field. Large project databases often include tens of thousands of individual records created by multidisciplinary teams, all in complex relationships. If a dataset needs to be downloaded and deployed on specific software, it may be difficult to use even with adequate documentation. Once deployed, users will have to familiarize themselves with a project's database organization and interface. The steps involved in downloading and deploying such databases require too much time and expertise for the average user.

To attract and keep users, Internet-based data sharing systems should be designed so that they appear immediately familiar and accessible to first-time users. They should be easy to navigate and not require any additional steps for use (such as downloading plug-ins or creating password-protected accounts). They should also provide apparent and immediate rewards for data contributors, such as clear authorship, editing functions, and search engine exposure. Many well-funded projects have custom designed Websites that provide access to all or part of their research. However, customization and database design are time-consuming and costly. A generalized solution for sharing and

exploring data across multiple projects would be much more effective than customized, project-specific systems.

Even if data sharing systems are simple to use, many researchers are reluctant to publish data that they perceive as too small, too incomplete, or too “messy” to share with the world. Smaller projects, in particular, suffer from information loss because they have little capacity to develop customized solutions on their own. They may generate rich bodies of documentation, but without Internet dissemination, much of this material will never see publication because paper simply isn’t up to the task. Data sharing systems must be flexible to accommodate all content generated in projects large and small, complete and incomplete.

Scholars sharing their research via the Internet need assurance that it will be preserved in its original form. Too much research is vulnerable to loss through accidents or neglect. Researchers need easy tools to publish their digital materials in open file formats (that can be read by free software and are more likely to stand the test of time). They also need help migrating their materials to digital archives. Thus, open content systems should include simple migration and archiving options.

### **Cultural Barriers to Data Sharing**

In our experience creating Open Context, the most frequently voiced concerns over data sharing are the perceived loss of professionalism (peer review) and authorship. “Going online” does not mean abandoning peer-review and adopting the radical egalitarianism of the *Wikipedia*. Peer review can be built into open digital dissemination and is already successfully in place in many open access journals (Harnad & Brody, 2004).

Professionalism also requires proper attribution of an author’s work, and many scholars worry that open access will cause their content to be “scooped” by someone else. Clear and recognized forms of citation will make researchers more comfortable with online data publication. Systems should have clearly marked authorship and citation information for every piece of content they contain. Other features such as time-stamps on contributions, logos, and search engine indexing, make original contributors easy to recognize and such exposure would deter misuse.

### **Open Context: An Open Access Data Publishing Solution**

In 2005, with a series of grants from the William and Flora Hewlett Foundation, we set out to create a system that faced these challenges. The most important requirements for this system were the following:

1. It had to be easy to navigate for the “average” computer-literate user.

2. It had to accommodate diverse and non-standardized projects.
3. It had to be scalable (generalized to apply to many different projects without requiring expensive customization).
4. It had to be academically robust (peer-reviewed and citable).

The resulting system, called Open Context ([www.opencontext.org](http://www.opencontext.org)), is an online, open access publishing system, developed to support enhanced scholarly communication in archaeology and related disciplines. Open Context enables researchers to publish structured data along with textual narratives and media (images, maps, drawings, videos) on the Web. This new system provides a cost-effective and scalable solution to the current problems of data loss and limitations to data sharing.

### **How Open Context Works**

Open Context is especially effective for publishing large bodies of complex documentation, where diverse datasets can be linked together in an integrated data publication system. It is also designed to accommodate idiosyncratic data from small or incomplete projects, thereby giving a home to content that might otherwise never see publication. Open Context is a cost-effective and powerful means to share large collections of rich media and complex data (see Figures 1 and 2). Contributors to Open Context use the system’s Web-based data import application (called Penelope) to upload and edit their own data, before submitting it for peer-review and online publication. No one but the contributor can edit an original item; however, anyone can make comments and links to items through tagging. In this way, the user community draws linkages between items across different projects. With this streamlined data publication process, a dataset that takes months (or even years) to develop can be published in a matter of minutes in a system that gives clear credit to the author. Because Open Context draws on powerful open source technologies, it can be easily adopted by others and maintained by anyone with standard Web development skills. That is, users can either explore Open Context as it is, or they can adopt the open source code to use for their specific data sharing needs.

Open Context currently features the following tools for scholars and students to easily share, preserve, and reuse educational materials:

- **Web-Based Data Publication:** Penelope, Open Context’s Web-based publishing tool (see Figure 3), enables individuals to publish their own datasets and make them interoperable with other projects and collections in Open Context. With Penelope, data contributors upload and edit all content within the application, without having to

Open Context Community-based data sharing and tagging BETA

You are logged in as: skansa

Navigation: Login/Account, New Search, Browse, Selections, Details, My Tags

Search: GO [New Search] [Within Results] Search History Modify Results Tag Results Other Tools

Selection Results Your current selection includes 26 items. Page 1 of 1

Class	Item	Project Name	Context	Tags	Delete
Small Find	DT# 209 Artifact Name: Bead Material: Carnelian...	Domuztepe Excavations	Turkey / Domuztepe / Lot 576	carnelian beads	⊗
Small Find	DT# 524 Artifact Name: Bead Material: Carnelian...	Domuztepe Excavations	Turkey / Domuztepe / Lot 659	carnelian beads	⊗
Small Find	DT# 506 Artifact Name: Bead Material: Carnelian...	Domuztepe Excavations	Turkey / Domuztepe / Lot 682	carnelian beads	⊗
Site	Ur	Iraq Heritage Program	Iraq		⊗
Small Find	necklace (ID:78)	Iraq Heritage Program	Iraq / Ur / Royal Graves / PG 1058	carnelian beads	⊗
Small Find	necklace (ID:79)	Iraq Heritage Program	Iraq / Ur / Royal Graves / PG 1058	carnelian beads	⊗
Small Find	necklace (ID:80)	Iraq Heritage Program	Iraq / Ur / Royal Graves / PG 1058	carnelian beads	⊗

Developed by the Alexandria Archive Institute

Figure 1. Results of a search for “carnelian,” showing items from multiple projects.

Open Context Community-based data sharing and tagging BETA

You are logged in as: skansa

Navigation: Login/Account, New Search, Browse, Selections, Details, My Tags

Item Info: Photo(1) DT# 719, Class: Small Find, Linked with: DT# 719, Number of Views: 2, Last View: December 4, 2006, 2:49PM

Actions: Cite Item, Tag Item

Media Description (0): (Click the image to see full resolution version, if available)

Linked Items (1): Small Find DT# 719, Context: Turkey / Domuztepe / Lot 1766

Linked People (1): Stuart Campbell, Creator

Domuztepe Excavations. Artifact Name: Stamp Seal, Pendant Material: Serpentine

This media item is licensed with a Creative Commons Attribution-Noncommercial license Attribution: Stuart Campbell (Domuztepe Excavations)

Developed by the Alexandria Archive Institute

Figure 2. An image linked with its small-finds registry record and context.



Figure 3. A view of Penelope, Open Context's Web application for data publication.

- download any special software or viewers.
- **Flexible Design:** Open Context acts as a (near) “universal recipient” for the vast variety of information generated by field research. The system can accept and integrate diverse content from a huge project such as ten years of excavation drawings, photos, small-finds databases, maps, and specialist analyses from an archaeological site. It can also house very small projects that might consist of only a few field notes and photographs, projects that are at risk of loss without a simple and cost-effective means of publication.
- **Simple Tools for Use:** Open Context's interface offers straightforward browse, search, and analysis functions. Users have a variety of options to find materials in Open Context, including simple, “Google-like” text searches to more sophisticated, advanced searches that use complex query logic. Simple charting tools help with data visualization, and a selected dataset (potentially drawing records from multiple projects) can be exported into common formats, such as *Excel*.
- **Data to Knowledge:** By offering comprehensive access to highly structured research and collections data, Open Context supports reanalysis and reinterpretation of research results. Students can use Open Context as a primary source to develop

important analytical skills by exploring primary data.

- **Citation and Easy Retrieval:** Stable URL links are attached to *each and every piece of content*, so items can be referenced in paper or e-publications and retrieved on the Web. Automatic generation of citations for each item enables scholarly use and promotes good scholarly practice (see Figure 4).
- **Peer Review:** Open Context, like most open access publication systems, retains professional editorial control over content. It only accepts content from permitted research and recognized collections, and all content is subject to professional editorial review.
- **Community Tagging:** Open Context offers a “folksonomy” tool to let others annotate and identify materials of specific interest (Bearman & Trant 2005). Users can tag items either individually or collectively (i.e., users can assign a tag to items in a query result set). Tagging can serve research interests, or may identify a set of material useful for a specific course, problem set, or even grade level. The folksonomy tool is a very simple way to help make complex databases easy to use for many different communities of users.
- **Comments and Community:** Open Context pro-

You are logged in as: skansa RDF/XML

Login/Account	New Search	Browse	Selections	Details	My Tags
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Item: DT# 242 Number of Views: 37  
 Class: Small Find Last View: June 21, 2007, 1:49PM

Context (click to view): [Turkey / Domuztepe / II / Lot 785](#)

<p><b>Description (7 properties)</b></p> <p><a href="#">Small Find / DT number</a> 242</p> <p><a href="#">Internal Find Number</a> 56</p> <p><a href="#">Registration Date</a> 1996/08/21</p> <p><a href="#">Artifact Name</a> Pendant ?</p> <p><a href="#">Material</a> Stone ?</p> <p><a href="#">Mass (g)</a> 0</p> <p><a href="#">Disposition</a> Marash Mus. invent</p>	<p><b>Contents (0 items)</b></p> <hr/> <p><b>Linked People (2)</b></p> <p><a href="#">Stuart Campbell</a> Observer</p> <p><a href="#">Elizabeth Carter</a> Observer</p>
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**Item Notes**

Seal or pendant shaped like a screw with an horizontally pierced rounded suspension loop. Very encrusted since it was incorporated into a wall and found in flotation sample. Umm el-Qasir has a similar pendant, but worked only on one face.

**Proper citation for this item:**  
 Stuart Campbell, Elizabeth Carter. "Domuztepe Excavations, DT# 242" (Released March 1, 2006). *Open Context*. (Accessed June 22, 2007) <[http://www.opencontext.org/database/space.php?item=15289\\_DT\\_Spatial](http://www.opencontext.org/database/space.php?item=15289_DT_Spatial)>.

**Our citation format is as follows:**  
 Authors. "Project, item's name" (Released date). *Database (Open Context)*. (Access date) <item's url>.

[More citation information](#)

**User Tags (1)**

[seals with images](#)

This item description is licensed with a [Creative Commons Attribution, Noncommercial license](#)  
 Attribution: Stuart Campbell, Elizabeth Carter (Domuztepe ...)

Developed by the [Alexandria Archive Institute](#)

Figure 4. Automatically-generated citation for an Open Context item.

vides feedback tools, such as a “ping-back,” which keeps track of external links to the data in the system. For example, if someone links to a set of items in Open Context, the system would automatically recognize the link and, upon administrative approval, set up a reciprocal link. In this way, the ping-back tool is useful for linking Open Context content with external analyses, interpretations, and comments.

- **Sharing Updates:** Open Context broadcasts a number of RSS (“Really Simple Syndication”) feeds for content contributors to share news and updates across the Internet. For example, if a project director adds a series of photos to an existing project, the system will automatically generate an announcement of the update.
- **Preservation:** The Internet Archive, a leading digital repository, helps safeguard Open Context materials. The Internet Archive offers this invaluable service for free, so long as copyright permissions are granted for others to use and reuse the content (copyright is discussed further below).

### Continuing Development and the Power of Peer Production

Future development plans for Open Context include customization tools for data contributors to “brand” their content with logos and styles, further clarifying authorship. Customization will also help users or groups of users to target information specific to their

research or instructional interests, thereby organizing the system into overlapping, user-defined sub-groups. These tools would allow teachers to customize modules for students to work with during the course of a semester. Modules would only draw from specific Open Context content selected by the teacher. Students would both gain first-hand experience working with a focused body of primary data and contribute to the research process by tagging items or publishing the results of their reuse of the data in Open Context.

Researchers publish, review, and edit materials as part of their academic activities. Open Context streamlines all of these processes and distributes the job of data publication through “peer production.” Peer production is how the *Wikipedia* and open source software are generated. Participants in peer production, motivated by social returns, contribute small pieces to a larger whole, often resulting in very sophisticated and high-quality outputs (Benkler, 2006). Leveraging peer production and distributing the work of data publication and software updates is an important way to keep costs down for Open Context and open educational resources more generally.

### What Makes Open Context “Open”?

“Openness” is much more than simply not charging for access. Even if a resource is free to view, the legal default of “all rights reserved” copyright makes it very difficult for anyone to do anything with the content. Copyright law forbids nearly all copying and use of



material to make new “derivative” works. This runs counter to the mission of research, which is to build upon the works of others. It also runs counter to many exciting instructional opportunities, including having students act as active participants in knowledge creation. Thus, to make Open Context content valuable to the community, we must provide needed copyright permissions. Each item in Open Context is licensed with a Creative Commons copyright license, which gives explicit permissions to copy and use the material so long as users properly attribute the source.

Creative Commons licenses also offer certain optional conditions, such as restrictions against commercial uses. Unlike the public domain, creators still retain their copyright when they use Creative Commons. However, creators are able to grant permissions to encourage research, education, and many forms of creativity while retaining their right to be attributed for their contributions. Creative Commons licenses now see wide implementation in many leading scholarly Web resources. The prestigious journals published by the Public Library of Science (with impact factors rivaling *Nature*, *Science*, and *Cell*) use Creative Commons licenses to clarify terms and permissions for each of their scientific articles. This openness and flexibility ensures that Open Context content is of maximum value for reuse in both instructional and research applications.

### Open Access for Educational Reuse

Open Context and related open access systems can forge new paths to understanding by making research easier to find and use and giving that research more impact and significance. As the user community grows, their contributions (in the form of published open content, tagged sets, and other links) will work to expedite searches and facilitate reuse of content. Open access to this digital content means that students and scholars who use search engines to do research will be more likely to find primary, scholarly data and relevant syntheses linked to those data. Thus, the entire research process is made transparent, from primary data collected in the field to published syntheses and finally to further re-mixes by others (including students). This will create a virtuous cycle of creative reuse of high-quality research material and help draw students into the process as active participants, rather than passive observers. □

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## Author Guidelines for Magazine Articles

In preparing an article for *Educational Technology Magazine* the primary fact to keep in mind is that this magazine is not a formal research journal. It is, as the name implies, a magazine. The Editors are looking generally for articles which interpret research and/or practical applications of scientific knowledge in education and training environments.

Thus, your article should not be cast in the form of a traditional research report. The facts of your research, or that of others, should be stated succinctly. Then you should go on to explain the implications of this research, how it can be applied in actual practice, and what suggestions can be made to school administrators, trainers, designers, and others.

The style of writing should be on the informal side—an essay—since once again this is a magazine and not a formal academic journal. Authors are free to state their opinions, as long as the opinions are clearly identified as such. The use of specialized jargon should be kept to a minimum, since this magazine has a very wide interdisciplinary audience.

There are no minimum and maximum length restrictions. Make your article as short as possible to do the job you intend. As a general rule, most articles are about 3,000 words. Include graphics as appropriate.

Note too that this magazine is read in more than 100 countries, by persons holding prominent and influential positions. They expect a very high level of discourse, and it is our goal to provide major articles of excellence and lasting significance.

# OOPS! A Miracle Created by Confucius

**Agnes Chang**  
**Lucifer (Luc) Chu**  
*Opensource Opencourseware  
Prototype System*

The story is told of the conception and creation of OOPS (Opensource Opencourseware Prototype System), which is a massive, worldwide volunteer project that translates OER into Mandarin. The founder and leader, Lucifer Chu, describes how the project grew from his own solo translation work to over 2,400 volunteers in 22 countries. In 2005 and 2006 alone, over three million people had used OOPS with around 10,000 people visiting the Website on a daily basis. Sustainability issues are outlined. Highlights are given by some OOPS participants.

The date was June 13, 2007. The International Opencourseware and E-learning Conference was held in Taipei, Taiwan. The speakers who sat with the audience included guests from Massachusetts Institute of Technology (MIT), Johns Hopkins University, Carnegie Mellon University, the Open University of U.K., Canada Research Council, Keio University of Japan, and the National Institute of Multimedia Education of Japan. There were also over 600 participants from different parts of Taiwan. The organizer of this conference was OOPS' founder, Lucifer Chu. He stood up, started to walk toward the stage for his 30-minute presentation. For any other speaker, this might only have taken 30 seconds, but for him, it took over 1,200 days and over hundreds of thousands of miles to get on that stage.

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**Agnes Chang** received a master degree in Translation and Interpretation from Monterey Institute of International Studies. She worked for OOPS in 2006 as a full-time editor. She now lives and works in California as a freelance interpreter (e-mail: agneschang0429@gmail.com). **Lucifer (Luc) Chu** graduated from Taiwan's National Central University in 1998 with a BS in electrical engineering. He is the founder of OOPS (Opensource Opencourseware Prototype System). He spends half of his time in Taiwan and half flying around the world to promote OOPS. He made a big mistake in high school while choosing his own name, so you can call him Luc if you like (e-mail: Lucifer.chu@gmail.com; Website: [www.myoops.org](http://www.myoops.org)).

For the moment, let's just get back to the real start of the story.

It begins at TVBS news channel, Taiwan, 2003. Lucifer Chu had just earned over one million U.S. dollars from the royalties for translating *The Lord of the Rings*. He was working at a part-time job hosting a ten-minute technology news program that aired five days a week. He introduced a great variety of ideas and stories that happened on the Internet, but the audience was not interested in the program, and the ratings were really low, so the program was cancelled eventually after the summer vacation. During the entire two months the program aired, there was only one time that the audience showed the slightest interest. A mother called in to ask what was the link to MIT's OpenCourseWare ("OCW") that was introduced in the program. She didn't know, and probably will never know, that this phone call led to tremendous changes.

In February 2004, in Lucifer Chu's bedroom, he decided that he wanted to change something. After waiting for six months after OCW was mentioned on the radio program, no government official nor any higher education institution did anything about OCW. No promotion, no localization, means no education. So he quit his job and started to translate the whole MIT OCW Website into Chinese. Chu is the kind person who "leaps before he thinks." So he just started to translate everything by himself.

There were only two men who knew about his project at that time. One is Lucifer Yang, with whom Lucifer Chu had established one of the biggest Chinese fantasy literature Websites, so Yang had gotten used to this request, which later would lead him to lose thousands of hours of sleep. Chu and Yang got to know each other when they fought to register their name Lucifer\* on different discussion boards 10 years earlier. The other guy was Jeffer Tang, who went to National Central University one year before Chu and thus was also used to the various novel ideas proposed by the strange guy. Tang agreed to provide a server that he hid at the Internet Center of National Central University for the project. That's it! Chu started to translate the project that cost MIT US\$20 million with a server that no one even knew existed.

After several weeks of work, Chu translated every introduction page of OCW and put them on the Internet. But there were still 600 courses left untranslated at that point, so he finally realized that what he envisioned could not be done by one man. What could he do? Even if he were a professor, there is still no way the OCW could be translated by one department, or one school—not even 10 schools can do that. But one day, when Chu was musing about the

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\*Lucifer Chu now makes a point of saying the name Lucifer that he once choose for himself is "stupid."

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## OOPS Open Learning Salon

In the evening of October 24, 2006, the Open Learning Salon was once again held in an office building located on Jiangsu Lu (the most-happening area in the city) in Shanghai, China.

Over a dozen of white-collar participants from the fields of information technology, design, Internet companies, NGOs, and finance and head-hunting services came to the venue in haste after leaving their offices for the meeting, which is conducted regularly from 7 p.m. to 9 p.m. every Wednesday night to discuss and share views regarding the Open Education Resources provided by MIT. The subject of this meeting was the international business case studies provided by MIT and a speech given by Jack Welch, which was provided by MITWORLD and translated into Chinese by OOPS. Our goal was to combine the experiences of participants while discussing these materials so as to use OER in a more interactive and self-learning manner.

Both the case study and the speech discussed whether entrepreneurs should be adventurous or conservative. In this regard, Huang Yimeng, a famous entrepreneur in China's Internet circle and the CEO and founder of VERYCD, said that an entrepreneur's attitude is an adjusting process. Take him, for example; he has always enjoyed trying new things so that he was able to establish his own company after dropping out from college when he was a junior. However, as his enterprise grows bigger, he acknowledged his responsibility to the employees and thus became less adventurous. Liu Hongyu, a headhunter, thought that young people should not be encouraged to be recklessly adventurous because the society still admires people following rules. Mao Jianyu, a designer, said that young people should be adventurous without worries because only young people have the luxury to undertake adventures so that they will find out what career paths are suitable for them and that only after being punished can they understand social rules and thus become truly matured.

Each and every participant of the meeting admires the

Open Learning Salon because the materials used at the meetings are the ones they seldom have access to. They all appreciate MIT for providing these great resources free of charge, and these materials are easier to understand after OOPS has translated them into Chinese. All of the participants agreed that without OOPS's translation and promotion efforts they would never be able to locate and use these high-quality education materials in the vast ocean of the Internet. Through the mechanism of the Salon, participants can meet with learning partners from different fields, and broaden each other's knowledge and horizon. Moreover, at these meetings all participants are encouraged to be active contributors, to express their viewpoints in an open manner so that learning has become a proactive process.

Zhang Yang from IT industry: "I want to express my appreciation to OOPS volunteers for establishing a valuable learning data base. Although in my opinion, the setting of the database seems to be more appropriate for instructors who need teaching references, college students who are not satisfied with what they learn at school and people who want to conduct further learning and make friends after graduating from schools, and not for people who don't have access to college. To make this database have its utmost effects, the mechanism of Open Learning Salon is of great value for it can gather like-minded people to discuss and express their views freely."

Wang Lijie from the telecommunication industry: "I believe that the most valuable knowledge comes from things behind books, the speeches in particular, for which we normally don't have the opportunity to participate in or get access to. Only through sharing by these universities and translating and organizing by OOPS volunteers can we have the access to the speeches and discuss with other learners so that better learning results can be reached. These materials and knowledge are usually helpful for my career."

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definition of OpenCourseware, an idea suddenly struck him. The "open" in "OpenCourseware" came from "open source"—then why does everyone only think about "commercial" as the way to translate OCW? Why not use the open source approach? He was also inspired by the *Book of Rites* written by Confucius 2,500 years ago, where it says: "TIAN XIA WEI GONG," *the world belongs to all and everyone should help*. If one school can't do that, ten schools can't do that, what about calling for help to people who use Mandarin all over the world?

Chu sent out the call for help to Mandarin speakers. "Anyone who is interested in using knowledge to help others, please come to OOPS (Opensource OpenCourseware Prototype System), we will find something for you to do." You may call it lucky, power of Web 2.0, or you may think it is the miracle created by goodwill. Just like the movie *Return of the King*,

when Gondor calls for help from Rohan, the message passed through one beacon station to another beacon station. After three months, there were 200 volunteers doing different jobs, some were translating, some were editing, some were designing the Web page. After one year, there were over 800 volunteers, and today over 2,400 volunteers serve under the banner of OOPS.

Thousands of people responded to the beacon. One of the most dedicated volunteers is Peter Ma, a retired government official from Hong Kong. Peter Ma was born and educated in Hong Kong and joined the Hong Kong government as a career civil servant at the age of 19. After 31 years, Peter left the service at the rank of Chief Executive Officer. He took early retirement in 1999 to begin the second chapter of his life. Much of what he has acquired is through self-learning and that is one of the main reasons why he joined OOPS as a passionate volunteer.

During an interview concerning why he joined OOPS, Peter said:

I am an advocate of life-long learning and a believer in volunteerism. OOPS offers me both. Like it or not, the world is moving at a greater pace and the one who stands still will be left behind. Life-long learning is really about survival, not just upgrading oneself. I attended the same course at the University of Birmingham, the first time in 1980–1981 as a diploma student and returned in 1999–2000 as a masters student after my retirement. Much to my surprise, the Development Administration course I attended was completely revamped with new topics and issues. That reminds me that even a PhD would soon become stale and outdated if one is not keeping pace with the changing world. OCW and OOPS together offer a helping hand to the self-learners.

Yang Cai is an 18-year-old girl who was born in Beijing who will soon be a freshman at Princeton University. Even though she is young by some standards, OOPS still had a position for her. She is helping OOPS to translate articles and interview people in Beijing. When asked by reporters about why she joined OOPS, Yang Cai said:

Once, when I was surfing through the OOPS message board, I saw a message written by a Chinese reader from Kansas to all OOPS translators. It said 'Don't stop, please! Whatever obstacles you encounter, don't stop, please!' He learned by home-schooling, and OOPS is his major resource. I used to worry that there will be few people viewing our works, yet an ecstasy of achievement overwhelmed me when I read the reader's messages. Never before had I felt so much needed, and I find my value to the society through their needs. Undoubtedly, I will continue to work for OOPS, not only to contribute what I have, but also to learn what I don't through it.

After three years of growth, Opensource Open-courseware Prototype System ("OOPS") had become a team composed of 2,400 volunteers from 22 countries with an official translation agreement signed with MIT. OOPS was the third group in the world to sign such an agreement. In 2005 and 2006 alone, over three million people had used OOPS with around 10,000 people visiting the Website on a daily basis. OOPS has introduced projects translating courses from Cambridge University, MIT, Harvard University, Johns Hopkins, Utah State University, Japan OCW Alliance, and others. Some of these are Opensourceware from the institution and some of them are authorized by professors like Harry Bhadesia from Cambridge University and David Malan from Harvard. In addition, the alma mater of Lucifer Chu and Lucifer Yang—National Central University and National Chiao Tung University, respectively—are about to dedicate and launch their own OCW.

In addition to translating courses, OOPS will soon

introduce various education programs and communities for self-learners, after re-organizing and arranging these courses so as to let more and more people use and learn about the resources from these prestigious universities.

On April 2, 2006, *The New York Times* reported Lucifer's story: "Lucifer Chu, a 31-year-old from Taipei, Taiwan, is as good an example as any of the shrinking distances between East and West." Of course, this comes with a price. Lucifer Chu has to give over 80 talks per year both in Taiwan and in China to promote the idea of OOPS. He has spent most of the royalties he received from translating *Lord of the Rings* on OOPS.

Now, it is time for us to get back to the International Open-courseware Conference in Taipei. During Chu's 30-minute speech, he explained the achievements along with the challenges OOPS is facing. For example, OOPS's learning model for now is mostly focused on self-motivated learning, which is quite different from the traditional learning style. Local institutions are still slow to catch up with the open and sharing trend. And even though it is a volunteers' effort, even though the William and Flora Hewlett Foundation already has provided some financial support, OOPS still needs more funding to move on. At present, most of the budget still comes from Lucifer Chu; the problem of sustainability has always loomed in the horizon.

Finally, at the end of the speech, he spoke frankly to the audience of over 600 people:

OOPS is a new model, we cannot guarantee that it will succeed, and we don't know for sure if it will survive. However, even if OOPS perishes, our tens of thousands of volunteers and users who understand the importance of openness and sharing will still be out there. One day, when they become professors, CEOs and policy makers, then the world will really be changed. And, that, will be the best gift OOPS can give for our next generation.

Lucifer Chu walked down the stage to wild applause and cheering that usually would not happen in a conference. This may make him looked like a hero, but if you log on OOPS discussion board, you will see his favorite signature from "Band of Brothers" (which is a TV movie about WWII's D-day) along with every post: "I am not a hero, but I served with heroes."

And that is the true spirit of OOPS. □

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# The Other End of the Telescope: Opening Educational Resources in a South African University

**Eve Gray**  
*University of Cape Town*  
*South Africa*

This article explores the question of opening educational resources in the context of an educational technology unit, the Centre for Educational Technology at the University of Cape Town, in South Africa. It describes the impact of a high level of policy intervention for the transformation of higher education and of a diverse, multilingual student body, many with apartheid-inherited deficits in academic preparedness. In this context of very particular needs, the article questions the appropriateness of a focus on content alone, rather than educational process as it addresses particular contexts. Where content does become important is in the need to grow the volumes of Africa-relevant content, something that is inhibited by traditional publish-or-perish policies.

## Introduction

It has been MIT's bold and visionary move to open its courseware to the world at large that has framed the understanding of what is meant by open educational resources (OER). First of all, the emphasis is on content. Next comes the recognition of the contribution to global educational development that can be made through the expense and effort of putting course materials online.

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**Eve Gray** is an Honorary Research Associate in the Centre for Educational Technology at the University of Cape Town, South Africa. Her current project explores how ICT and Open Access can be used to maximize the impact of scholarly communications for research, teaching, learning, and community outreach at UCT. She has worked for many years as an academic publisher and publishing strategy consultant (e-mail: [eve.gray@uct.ac.za](mailto:eve.gray@uct.ac.za); Website: <http://www.cet.uct.ac.za>).

However, I write from an African perspective, and there are dilemmas posed to African countries by the success of ventures such as this one. The dominance of developed countries over the production of OER risks relegating developing countries to the role of mere consumers. Is there a risk that well-meaning development initiatives will end up by exaggerating the knowledge divide even further? How does an African country find its own voice in this arena? What perspectives on knowledge are privileged?

In this article I want to look at the question of opening educational resources (the progressive tense is important) from the other end of the telescope. What does this look like from the perspective of a small educational technology unit in a 22,000-student campus-based university on the southernmost tip of Africa? This offers an interesting case study, as South Africa's status as a middle economy country with its very wide wealth disparities means that the university combines its access to sophisticated technology with a need to address very serious issues of social and economic disadvantage.

When it comes to higher education policy, this manifests itself in an emphasis on the universities' central role in fostering the use of information and communication technologies (ICT) to build South Africa's place in the global information economy, even as national higher education and research policy stresses the need for universities to contribute to the redress of past inequalities and address national development goals. Paradoxically, this perspective on the one hand challenges the centrality of content as the focus of open educational resources, while at the same time raising very forcefully the need for more African content in both research and learning—the burning issue of the global knowledge divide.

What emerges is that the opening up of the educational process is as important as opening content and, in the second instance, the development of ICT for higher education raises issues about the range of publication outputs the university would need to support if it is to advance the knowledge commons.

## A South African Case Study: The Centre for Educational Technology

This article explores the ways in which this dynamic environment has impacted on the question of opening educational resources as it has been encountered in the Centre for Educational Technology (CET) at the University of Cape Town (UCT). CET was established in 2005 following five years of operation as the Multimedia Education Group (MEG). MEG was supported by external funding, predominantly from the Andrew Mellon Foundation, and when CET was established in 2005 it was a result of the university's decision to fund a larger unit with institution-wide responsibilities in recognition of the importance of ICTs for education as a core function

of the institution.

In common with a handful of other South African universities, CET is situated, not in a technology department, but in the Centre for Higher Education Development. This is evidence of the transformative role that the university perceives for the use of ICT in education. CET is involved in the development of a next-generation learning environment, and is a partner in the Sakai open source collaborative framework. The UCT version of Sakai, named Vula, was launched at the beginning of the 2007 academic year. CET supports Vula and other educational technologies for teaching and learning, working in partnership with the university community. It enables, promotes, and investigates the integration of learning technologies in teaching and learning at the University of Cape Town and in higher education, and works in curriculum development, staff development, and research.

### **Transformation in South African Higher Education**

The context in which CET operates is a challenging one. Only 13 years on from the devastation wrought on South Africa's education system by the implementation of apartheid ideologies, the keyword that continues to dominate policy and practice in universities is 'transformation.' Higher education policy in the first decade of democratic government has aimed at the rationalisation and consolidation of the higher education institutions, combined with redress in the form of increased access for black students, resulting in transformation not only of the racial profile but also of the dominant culture of the universities. As a result, the higher education institutions have encountered and continue to encounter high levels of uncertainty and change.

As the universities face outwards into the community, they are under pressure to contribute towards the social and economic development of a rapidly-changing country through their research and their output of suitably qualified graduates. Within the institutions, higher education policy exerts considerable pressure for the university system to redress past inequalities, both in transforming the demographic profile of students and staff and in becoming more responsive to the needs of a diverse student body and the social realities that this diversity reflects.

The policies that have framed this transformation process emphasise the need to foster an Afro-centric approach while at the same time meeting the demands of global competitiveness. Considerable importance is placed on the need to align policy with changing ICTs in a global knowledge economy. As the 1995 White Paper on Science and Technology states, 'the ability to maximise the use of information is now considered to be the single most important factor in defining the competitiveness of countries as well as their ability to

empower their citizens through enhanced access to information.' Sentiments such as these are repeated in higher education policy, making it clear that the universities are expected to fulfil a crucial role in contributing to the development of an information society in South Africa, through research and teaching.

### **Scaffolding Learning for a Diverse Student Body**

In this dynamic context, the impact of the transformation process manifests itself in a number of ways in the classroom: as a result of economic and social disadvantage and of the inadequacies inherited from the apartheid education system, many students entering higher education have deficits in academic preparedness; there is great diversity in language background in a country with 11 official languages; and, compounding these challenges, large classes are a feature of undergraduate courses. This, in turn, influences the ways in which the use of ICT for educational purposes is both conceptualised and managed, making the question of openness more complex than it might be in a more homogenous cultural context.

An educational environment as demanding as this one requires from an educational technology unit such as CET a primary focus on providing scaffolding for learning delivery, and, while this varies across disciplines and at different educational levels, both the content and its framework need to be geared to very specific needs. In these circumstances, 'content' cannot be narrowly defined as simply subject matter, and opening educational resources becomes more than placing learning material online; rather, the question of openness relates to learning and knowledge at a deeper level. Everything is context-laden and driven by the purpose of a particular intervention; this requires deep intellectual engagement with the nature of learning. The issues that have to be addressed are fitness for purpose, context, and effective integration. When it comes to opening and sharing resources, the value that emerges from a context such as this relates to the interface and techniques being developed in order to teach particular concepts, rather than content alone.

### **Opening Resources**

The motivation for driving openness exists in CET, as a result both of its role in Sakai and as a result of the conditions of its genesis and early history. The donor funding that supported MEG, as an earlier incarnation of CET, gave it an explicit mission to report findings and make its learning open and transparent, releasing resources and making its findings open to the community. The commitment to openness has been carried over into CET, although the changed context of a university academic department raises interesting questions about the creation of open content resources within the policy

context of a South African university.

There is a gap between the community-focussed discourse of a reflective practitioner required in opening up educational resources and the theorised and individualised discourse imposed by policies for academic advancement. These make promotion dependent on publication in international (read Northern) journals and monographs in a global academic publishing environment that is all too effective in isolating and marginalising voices from developing countries. South African research publication policy, driven by such publish-or-perish metrics, places considerable pressure on academic staff to keep up a high level of output in scholarly journals, predominantly in the global North. This policy framework, built as it is on the idea of individual effort and 'originality,' also works against the collaborative development in communities of practice that is an important component of ICT-driven education and is also reflected in research policy at a national level.

### **Bridging the Knowledge Divide: Impact of the Sakai Community**

Looked at through this lens, the question of content becomes very important. The African continent generates only 0.4% of global online content and this drops to 0.02% if South Africa is excluded. There is a fundamental need to develop policies and strategies that could grow the output and effective dissemination of Africa-based research in and from Africa, for African development, and in the most appropriate media and formats. A change is needed in policy and global politics to enhance the dissemination of African research as the reservoir of locally relevant content that could feed into open educational resources and balance out the current dependency on imported content.

However, there are possibilities emerging from the creation of courses on the Vula platform. This has generated an explosive growth in ICT-assisted courses: over 500 course sites have been set up, with more being added every day. At present more than 60% of registered students have access to courses on Vula, while on a busy week day more than 5000 unique visitors log in. The very positive student reaction has resulted in pressure on departments to provide online learning resources, and there is evidence of independent student creation of online content. In a lively presentation at the Sakai conference in Amsterdam in June 2007, Joseph Hardin charted the considerable potential that he saw in the worldwide Sakai community for the generation of open courseware, outlining developments at the University of Michigan for creating a courseware publishing tool in Sakai. What is of particular interest is what he calls the 'long tail of education' where students are active participants in courseware development.

This tallies with what is happening at UCT, where some of the most striking potential for the growth of open courseware comes from participatory programmes that rely on a high level of student participation. Specific examples include a simulation exercise in Public International Law, in which students are contributing to an African perspective in a field in which the cases are predominantly African, yet there is little or no published material from an African perspective. Another is the use of a wiki for the creation of a collaborative classroom resource in the History of Economic Thought.

### **Conclusion**

From a South African perspective a successful approach to the opening up of educational resources would thus involve awareness-raising in the higher education sector and in government of the need to develop policies and strategies that address opening up of the dissemination of African knowledge from scholar to scholar and from scholar to learner and back again. A project to explore this potential at UCT, funded by the Shuttleworth Foundation, commenced in mid-2007. This will explore how ICT is changing scholarly communication; how both research outputs and open educational resources can be fostered and grown, and how best to combine content and process in producing effective educational resources. □

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# The Virtual University Becomes a Reality

Paul G. West  
*Commonwealth of Learning*

This article describes a network among the Commonwealth's 28 smallest countries created to enhance the professional capacity of educators, developing new course materials, and enabling the transfer of courses and qualifications across borders. The focus is on topics such as entrepreneurship, tourism, professional development of educators, life skills, disaster management, and a range of technical and vocational subjects. The transfer of courses and qualifications among countries requires having in place an agreed framework of quality assurance and unit standards. Workshops, or "boot camps," are run by a group of team leaders selected from the participating countries. After feeling "left behind," these countries are now putting the Internet to use in connecting themselves with other small states, sometimes more than 10,000 km away.

"Create a network of educators that spans 28 of the world's smallest countries and, in some cases, the world's most remote countries," could have been the way Ministers of Education made their request to the Commonwealth of Learning ("COL") in 2000.

Ministries of Education in small and island states, led by Seychelles, The Gambia, Mauritius, Namibia, Samoa, and St. Lucia expressed their concern in 2000: With the rapid growth of the Internet and eLearning, our countries might be left behind. COL was asked to conduct a review of possibilities these countries could implement to help advance their education systems and increase their course offerings. Since 2003, when Commonwealth Ministers of Education approved COL's recommendations, COL has worked to engender a

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network among these countries. Ministers asked that this virtual network be created to strengthen institutions and that it be called the Virtual University for the Small States of the Commonwealth<sup>1</sup> (“VUSSC”).

After extensive consultations and deliberations, the main areas of focus came down to enhancing the professional capacity of educators, developing new course materials, and enabling the transfer of courses and qualifications across borders. The subject areas focussed on topics such as entrepreneurship, tourism, professional development of educators, life skills, disaster management, and a range of technical and vocational subjects. To participate in the network, educators need to learn how to form working relationships with peers in other countries, which may be thousands of kilometres away. This may sound straightforward to some people in industrialised countries, but in countries where cultural interaction happens predominantly in a face-to-face environment and the Internet is a relatively new technology, online collaboration might seem more far-fetched.

The second task, that of facilitating the transfer of courses and qualifications among countries, requires having in place an agreed framework of quality assurance and unit standards. Since these have not been universally implemented in most parts of the world, it creates both an opportunity and a challenge for small states to take a leadership position.

### The Member Countries

Now participating in the Virtual University Network are twenty-eight Commonwealth countries—and in some events The Comoros, which is not a Commonwealth country:

- |                      |                                       |
|----------------------|---------------------------------------|
| 1. Antigua & Barbuda | 16. Samoa                             |
| 2. Barbados          | 17. Seychelles                        |
| 3. Belize            | 18. Sierra Leone                      |
| 4. Botswana          | 19. St. Kitts & Nevis                 |
| 5. Cyprus            | 20. St. Lucia                         |
| 6. Dominica          | 21. St. Vincent and the<br>Grenadines |
| 7. Grenada           | 22. Swaziland                         |
| 8. Guyana            | 23. The Bahamas                       |
| 9. Jamaica           | 24. The Comoros                       |
| 10. Lesotho          | 25. The Gambia                        |
| 11. Maldives         | 26. Tonga                             |
| 12. Malta            | 27. Trinidad & Tobago                 |
| 13. Mauritius        | 28. Tuvalu                            |
| 14. Namibia          | 29. Vanuatu                           |
| 15. Papua New Guinea |                                       |

### International Training and Materials Development Workshops

“Thanks for a wonderful, well-crafted programme,” said one participant; “skills and knowledge acquired

will enable me to perform efficiently and effectively in my organization,” said another. With comments like these as encouragement, the third VUSSC International Training and Materials Development Workshop, affectionately called a “boot camp,” was run in Trinidad & Tobago in the Caribbean and arrangements are underway for a fourth in Samoa in the Pacific. Being away from home for three weeks is a long time for most people, but this length of workshop helps to ensure that the maximum amount of time is made available for participants to practise their newly learned skills. Participants are immersed in training and practice exercises, while they build their technical skills for use in education. Skills learned range from how to create more engaging slide presentations to creating Web pages of learning materials using wiki technology, and how to work with graphics files.

It’s often felt that training courses do not deliver results as people attend for a few days, listen to crammed-in lectures, and then leave, without having had time for the learning to assimilate properly. Online learning for people who do not usually work in cyberspace also did not seem a likely reality. The concept of a longer workshop, which combines elements of training, practise, and materials development was the chosen methodology. With people having to travel across eight time zones or more around the world to get to these workshops, it is also more cost effective to pack in as much practise time as possible while they are together.

The workshops, or “boot camps,” are run by a group of team leaders selected from the participating countries. A coordinator is selected from the host country, who can act both as a team leader and a go-between, between the team and the expertise to be found within the host country. COL and the host country’s Ministry of Education provide a supportive environment, while the team leaders and participants get on with sharing expertise and valuable life-lessons.

Hidden benefits of the workshops include the opportunity to learn about vastly differing countries and how needs and educational approaches differ from one country to another and one region to another. Personal bonds have been formed in the three workshops held to date, which will last a lifetime and help to reduce the isolation of educators in these countries—educators who can now comfortably work online in a truly international setting. In the words of Sir John Daniel, COL’s President and CEO, at the opening of the last workshop:

You all come from the small states that make up two-thirds of the 53 countries in membership of the Commonwealth. Small, in this context, refers either to population or to geographical size—or to both. Most of the small states of the Commonwealth are small islands with small populations located in the Caribbean, in the Pacific, and in the Indian Ocean. But there are also

landlocked states with small populations, such as Lesotho, Swaziland, and Botswana—although Botswana is not small geographically. There are also coastal states with small populations, such as The Gambia and Belize, which are geographically small, and Guyana and Namibia, which are rather large.

Embracing and celebrating diversity is central to the Virtual University for the Small States of the Commonwealth.

### OERs and Copyright

Copyright<sup>ii</sup> is never far from the discussion as participants grapple with finding, customizing, and creating learning materials that may be freely shared, adapted, and published for others to use. Materials that are the easiest to share are those covered by the Creative Commons<sup>iii</sup> licenses with attribution and share-alike restrictions, but participants must understand the implications of this and other licenses. There are a few Creative Commons licenses that enable sharing of materials under various circumstances. Participants are made aware of what they are allowed to do with materials carrying each of the possible licences they use from others and to what they are committing when they publish their materials online.

The wiki used by the VUSSC teams uses the copyright license: Creative Commons<sup>iv</sup>—with Attribution—Share Alike, which enables anyone to use the materials for anything, including for purposes of profit. Other possible options include the ability to restrict the materials for use for non-profit purposes (so-called “non-commercial”), and to restrict any users from making any changes to the material (“no-derivatives”). Both of these restrictions should be fully understood and used where necessary. COL’s copyright guidelines<sup>v</sup> may provide some help in this regard, but legal advice should be sought.

The online wiki environment<sup>vi</sup> supports the evolution of a piece of learning material by the contributions of an online team. Within the teams, one person may start creating the first page, but very soon other team members become confident enough to create pages themselves. All team members edit each other’s work, and teams peer review each other’s work online. Documents and learning materials are always in a state of flux in a wiki, as anyone can change a Web page at any time. This online model includes the ability to have teams of people spread around the world. Distance has little impact on educators’ ability to participate online once they have the skills to collaborate via the Internet. This has been demonstrated by the millions of learners around the world who are dependent on learning at a distance to free themselves from the physical location and time limitations of classrooms.

### Learning Materials for a Real-World Setting

Learning materials in small states are frequently needed in printed form so that they can be used both at a distance, and to support classroom-based instruction. It is therefore important to ensure that materials shared and developed on Web pages can either be printed from the Website or easily converted into a word processor format for finishing touches. Programmes of study are mostly at the post-secondary level, focussed on the so-called “bottom of the pyramid,”<sup>vii</sup> where the large majority of the population are who earn their living in the informal and semi-formal economies. By increasing the skills of people at this economic level, they are helped to improve their business practices and contribute to national economies.

To move the learning materials from the online workshop environment of the wiki to a format that can be immediately used and further customized, the contents of the more developed subject areas are now being converted to an Instructional Design Template<sup>viii</sup> created by COL. This template helps to standardize the content to look more uniform and provide a pedagogically based framework. Content that has been converted to the template is a snapshot of the total contents, which remains stable, while the versions in the wiki continue to evolve. Later, further snapshots may be taken and so new, stable versions will be published.

### Transnational Qualifications Framework

COL is collaborating with the South African Qualifications Authority (“SAQA”)<sup>ix</sup> to provide facilitation and expertise in the development of a master list of national qualifications frameworks from both member and other countries. The initial starting point for this framework is expected to be ready for examination and discussion in early 2008. At this point, government officials will be invited to meet and agree on a way forward in the creation of a system to which member countries can ascribe.

The framework will help countries in the development of new courses and the evaluation of qualifications of people seeking local recognition. This will represent a “level playing field” for all who choose to use it.

### Co-contributors, Not Consumers

Educators in small and island states are becoming contributors rather than simply consumers of other peoples’ learning materials. Ministers of Education wanted their countries to become fully-fledged partners in the world of education and ICTs, and this is happening as their selected educators are gaining skills in the immersion environment of the boot camp. Each boot camp draws a group from around the Commonwealth, usually representing about 15 to 20 countries. Having

never previously met, strong bonds are quickly formed and as the group members return home after three weeks, they have formed a “New Diaspora from scratch,” a term coined by Professor Senteni, who assisted the Ministry of Education of Mauritius to host the first boot camp.

Countries that have only gained access to the Internet during the last five to 10 years now have increased motivation to improve the quality and availability of bandwidth—the data connection that binds the country with the rest of the world. It is bandwidth that will enable educators to continue collaborating with colleagues from around the world and develop new courses to strengthen the institutions in their own countries.

The Virtual University for the Small States of the Commonwealth is leading the way in cooperative materials development using online technologies. After feeling “left behind,” these countries are now putting the Internet to use in connecting themselves with other small states, sometimes more than 10,000 km away. Their need to be recognized in a highly competitive world is bringing out a determination to set their own pace and standards, including a qualifications framework that will span the largest number of countries around the world. □

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## Notes

- i <http://www.col.org/vussc>
- ii <http://www.col.org/copyright>
- iii <http://creativecommons.org>
- iv <http://creativecommons.org/licenses/by-sa/2.5/>
- v [http://www.col.org/colWeb/Webdav/site/myjahiasite/shared/docs/COL\\_Copyright\\_Guidelines\\_May\\_2007.pdf](http://www.col.org/colWeb/Webdav/site/myjahiasite/shared/docs/COL_Copyright_Guidelines_May_2007.pdf)
- vi <http://www.wikieducator.org/vussc>
- vii [http://www.12manage.com/methods\\_prahalad\\_bottom\\_of\\_the\\_pyramid.html](http://www.12manage.com/methods_prahalad_bottom_of_the_pyramid.html)
- viii <http://www.col.org/colWeb/site/pid/3145>
- ix <http://www.saqa.org.za/>

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## Features on Web Site

Visitors to the Web Site maintained for this magazine will find the following features:

See all of these features at: **BooksToRead.com/etp**

- **Sample Articles.** At least two recently published articles from this magazine are always available at the site.
- **Contributing Editors.** The complete list of our regular contributors is available at the site.
- **Author Guidelines.** Prospective authors of articles for the magazine are encouraged to read these guidelines.

# Open Educational Resources: A Bridge to Education in the Developing World

**Mike Pereira**  
*Development Gateway Foundation*

Leveraging ICT to equalize access to education is critical in a world with over four billion poor people who have little access to formal education. Mainstreaming OER as a public good throughout the developing world could make an enormous contribution. The Development Gateway Foundation has established an online OER portal—<http://topics.developmentgateway.org/openeducation>—that provides descriptions and links to a wide range of OER content. Powerful open source collaborative platforms enabling collective authorship of content that is continuously updated and refined by users offer a new and unprecedented opportunity to advance OER content creation, localization, and dissemination. Collaborative tools hold great potential for delivering impact through improved utilization of OER; however, Website clearinghouse functionality that aggregates and disseminates external links to OER online and via e-mail should not be set aside. Content localization is of particular importance, and local partners have the expertise to build local OER capacity and facilitate OER content audits and inventories. Working together has created an opportunity to greatly expand the OER core content library by facilitating collaborative, user generated content. The Development Gateway Foundation believes the work undertaken together can lead to the wide availability of OER throughout the developing world.

## Introduction

According to the 2007 *World Development Report*, there are 1.3 billion young people now living in the developing world. A record demographic of youth 12–

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24 years of age could provide an extraordinary economic boost to developing countries and lift many people out of poverty.<sup>1</sup> However, this optimistic vision can only come to fruition if young people have access to high-quality education that equips them to prosper in a rapidly globalizing knowledge economy. Information and communication technologies (ICT) can play a key role in facilitating this critical access. Today young people are primary users of the Internet, and account for over 40 percent of users in some developing countries. In this regard, leveraging ICT to equalize access to education is critical in a world with over four billion poor people who have little access to formal education.

### **Collective Effort and Collaborative Tools**

Those of us working in the Open Educational Resources (OER) space have undertaken a collective effort to eliminate the access gap to high-quality education in the developing world. Mainstreaming OER as a public good throughout the developing world could make an enormous contribution in this regard. Our work is focused on providing platforms to facilitate the greater uptake, dissemination, and utilization of OER. We aim to deliver platforms that provide content catalogues to existing OER and robust collaborative tools. These tools will facilitate the policy discussions and capacity building among practitioners that could lead to greater availability of OER and formal adoption of OER into curricula through localization and local content creation.

At the Development Gateway, we have established an online OER portal<sup>2</sup> with support from The William & Flora Hewlett Foundation. The portal provides descriptions and links to a wide range of OER content. Registered members can access the content online and via e-mail alerts. Our goal thus far has been the wider dissemination and access to OER content by users in the developing world. Going forward, we will enhance the collaborative tools available on the platform to enable greater localization of OER content.

Powerful open source collaborative platforms that enable collective authorship of content by users that are continuously updated and refined offer a new and unprecedented opportunity to advance OER content creation, localization, and dissemination. Platforms such as TYPO3 and Drupal provide thousands of extensions “out-of-the-box” and offer low-cost oppor-

tunities to provide wikis, blogs, sub-topic communities for specialized content creation and discussion, document management, and many other useful collaborative tools. In addition, they have advanced the Web 2.0 phenomenon, which, in sharp contrast to more centralized models of editorial control, offers a radically decentralized community driven approach.

Collaborative tools hold great potential for delivering impact through improved utilization of OER. That said, Website clearinghouse functionality that aggregates and disseminates external links to OER online and via e-mail should not be set aside. Our surveys indicate practitioners have a tremendous need for access to original research and finished knowledge products; researchers, academics, program managers, and senior executives use these resources for professional development, to stay current in their field, and in support of their own published reports, policy initiatives, and teaching.

The potential of collaborative tools to serve as a venue for user-generated OER content that can also be disseminated online, via e-mail or text messaging is great, and the combination of easily accessible original research and user-generated content is formidable. Moreover, these open source platforms—in combination with rapidly improving machine language translation—appear to hold the answer for achieving multilingual services at very low cost, by enabling communities to simply clone, translate, and adapt Websites to their needs.

### **Outreach to Stakeholders**

As compelling as the technology may be, there is still a need for vigorous outreach to key OER stakeholders to raise awareness, attract partners and participation, and access distribution networks. This is essential work that assembles people and organizations that can be agents of change. It is only by working together that we can increase OER impact in developing countries. Content localization is of particular importance, and local partners have the expertise to build local OER capacity and facilitate OER content audits and inventories. They can also establish pedagogical teams that can classify OER content, incorporate materials into curricula, and create frameworks for standardization that validate content and harmonize formats per local requirements.

Working together we have an opportunity to greatly expand the OER core content library by facilitating collaborative, user-generated content. We can work against limited or prohibitively expensive Internet connectivity in developing countries by exploring opportunities to disseminate OER via mobile telephony, community radio, and offline. We can take advantage of e-mail as an extremely low-cost and effective capacity-building tool. We can establish inclusive OER

<sup>1</sup>World Development Report 2007: Development and the Next Generation, World Bank; <http://Web.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTWDRS/EXTWDR2007/0,,menuPK:1489865~pagePK:64167702~piPK:64167676~theSitePK:1489834,00.html> .

<sup>2</sup><http://topics.developmentgateway.org/openeducation> .

networks that produce multilingual, multicultural OER platforms by leveraging low-cost Web 2.0 functionality. We can demonstrate the practical value of OER by mainstreaming high-value content into a wide range of distance training programs.

We believe the work we undertake together can lead to the wide availability of OER throughout the developing world. If we can accomplish the intermediate outcomes described above, the ultimate outcome is surely possible, perhaps even probable. Key obstacles include constraints imposed by expensive Internet connectivity costs, limited computer lab/local area network infrastructures, and resistance from established orders of educational policy, curriculum requirements, and design. But just as the creation of public education as a fundamental societal institution took generations to achieve in the United States, we should not expect major paradigm shifts in public policy to happen overnight in other countries.

That said, there is already keen interest and vigorous support for progressive OER policy and programs from within developing countries, and this passion and awareness should be nurtured and adequately resourced. In addition, given the rapid rate of Internet uptake and mobile telephony in the developing world, constraints will lessen significantly over the next five years, particularly in urban areas. Rural areas will follow, and in 10–20 years, it is reasonable to envision near ubiquitous connectivity, with all of the potential for quality of life improvement that a truly global interactive educational infrastructure portends.

### Role of the Development Gateway Foundation

The Development Gateway Foundation provides Web-based tools to make aid and development efforts more effective. It offers innovative solutions that increase access to critical information, building local capacity and bringing partners together for positive change. The foundation's global services portal,<sup>3</sup> is a robust platform for development information.

It is a one-stop access point to a global database of development activities, 50 country-specific gateways, 30 virtual communities focusing on development topics, and the leading independent aggregator of government tender opportunities worldwide.

The Development Gateway Foundation is a nonprofit organization with activities around the world. Learn more at <http://www.dgfoundation.org>. □

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<sup>3</sup><http://www.developmentgateway.org> .

# Mobile Web 2.0, Microlearning, Intertwingularity, and Mobile Widgets

Ajit Jaokar  
*futuretext*

Four facets of the unfolding mobile open ecology in which OER will move are described. Web 2.0 is a platform harnessing collective intelligence where participation and pushing content are stimulated. Microlearning is different from e-learning, which replicated the classroom online; microlearning deals with relatively small learning units and short-term learning activities. The fragmented Web may bring the fulfilment of the intertwingularity vision. Mobile widgets are suited to microlearning and are part of a holistic trend.

## Introduction

This article is based on my keynote speech at the Microlearning Conference<sup>1</sup> held in June 2007 in Austria. Here, we covered the application of mobile widgets to the area of microlearning. I am familiar with mobility and wireless applications—but am not an expert in education. Hence, I had to draw on the expertise of Judy Breck and David Smith<sup>2</sup> for some of

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<sup>1</sup><http://www.microlearning.org/index.php?itemid=121> .

<sup>2</sup>David Smith, Director of ICT, St. Paul's School, London, UK; <http://www.preoccupations.org/> . Smith spoke at the 2007 Microlearning Conference in Innsbruck on *Messiness, Education, Mobility*. (Web page for proceedings, *Ibid.*)

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the learning-related ideas in this talk, especially around the ideas of intertwingularity. Note that this talk covers **A** future and not **THE** future (i.e., there are many ways to implement the principles of microlearning—other than those outlined here).

## Opening Resources and the Subjects of This Article

By definition, none of subjects of this article can function within walled gardens—where connectivity among players and users is limited or blocked. In its early Mobile Web 1.0 stages, the industry fell into a walled garden mentality and practice that is now breaking down. For the Mobile Web 2.0 widgets to intertwingle within the burgeoning microlearning environment—as this article explores—the networks must be open.

**Web 2.0.** There is a lot of confusion around the ideas of Web 2.0. To understand Web 2.0, you have to understand four ideas:

- (a) the use of the Web as a platform;
- (b) harnessing collective intelligence;
- (c) consumption vs. participation (i.e., user-generated content); and
- (d) pushing content out: consuming content away from its source (through RSS, mashup, widgets, etc.).

Often, the misunderstanding with Web 2.0 arises from the lack of taking a big-picture view. Often, it is like Tennyson's tale of the blind men and the elephant. The blind men look at a specific part of the elephant (like the trunk, tail, etc.) and mistake the whole, i.e., think that the trunk is a snake and so on. Thus, we have to understand all these ideas and apply them together.

Often, these ideas can be best understood by looking at the opposite concept. For instance, in the Web 1.0 world, the Web was viewed as an extension to television. It is only when Google saw the Web as an entity with unique characteristics in itself—i.e., using the Web as a platform—that Web 2.0 really took off. Similarly, Google page rank is an example of harnessing collective intelligence. The page rank algorithm collects intelligence from Websites globally and then applies some logic to derive the best (most trusted) information sources globally.

In the Web 1.0 world, we all became content consumers. We were all supposed to “eat what we were fed” and pay for it. In contrast, the Web 2.0 world is all about content creation and, unlike the days of Web 1.0, content is consumed away from its source—for instance, through RSS feeds and widgets.

Mobile Web 2.0 extends the principle of “harnessing collective intelligence” to mobile devices through mechanisms like geo tags (location tags).

**The good news and the bad news.** The good news is: There are more people with phones than PCs. The

bad news is: These phones have nothing in common except voice and SMS. There are limitations to what you can do with voice and SMS. I propose that they, and specifically widgets, could be the common element across phones. That has implications for microlearning

**Microlearning.** Microlearning is different from e-learning. E-learning methods replicated the classroom online. In contrast, we are now using the fundamental principles of the Web (and more specifically Web 2.0). Microlearning is much more natural because: it is creative, fun, network oriented, the minds of the young are adapted to learning in that way, it is suited to their attention span etc.

According to the Wikipedia definition: Microlearning deals with relatively small learning units and short-term learning activities. The Microlearning conference in Innsbruck offers some more relevant points:

- Microlearning is what people are doing, knowingly or not, when they face the challenge to find new information and build new knowledge in networked digital media environments.
- With e-mails, mobile phones, Google, and Web 2.0, they have to deal with small chunks of microcontent, loosely joined, permanently changing, re-arranging, and circulating.
- We will have to find new mental and learning strategies, by analyzing and putting further the practices and behaviours new disruptive technologies are bringing with them.
- Microlearning is a catchphrase bundling a number of new technologies and applications relevant for learning, whose common denominator is the processing of digital microcontent.
- They tend towards dissolving the more static and macro-sized structures that have dominated our education and learning systems so far.

**Intertwingularity.** Having now explored the concepts of Web 2.0, Mobile Web 2.0, and microlearning, let us discuss the idea behind intertwingularity.

Intertwingularity is a term coined by Ted Nelson<sup>3</sup> to express the complexity of interrelations in human knowledge. According to Nelson, intertwingularity is not generally acknowledged because people “keep pretending they can make things hierarchical, categorizable, and sequential when they can't....Everything is deeply intertwined.”<sup>4</sup>

With a fragmented Web (and subsequently reused

<sup>3</sup>Theodor Holm Nelson (born June 17, 1937) is an American sociologist, philosopher, and pioneer of information technology. He coined the term “hypertext” in 1963 and published it in 1965. He also is credited with first use of the words hypermedia, transclusion, virtuality, intertwingularity and teledildonics; [http://en.wikipedia.org/wiki/Ted\\_Nelson](http://en.wikipedia.org/wiki/Ted_Nelson) .

<sup>4</sup><http://en.wikipedia.org/wiki/Intertwingularity> .

content away from its source via widgets), we see a possible fulfilment of the intertwingularity vision. There is a deeper principle driving this change. Hierarchy is the opposite of a network. As networks emerge (the Internet, MySpace, Facebook), hierarchies break down. With fragmentation (widgets), comes aggregation (through a network). With a fragmented Web (and subsequently reused content away from its source) via widgets, we see the fulfilment of the intertwingularity vision.

**Widgets.** What is a widget? Wikipedia describes a Web widget as: "a portable chunk of code that can be installed and executed within any separate HTML-based Web page by an end-user without requiring additional compilation. They are akin to plugins or extensions in desktop applications. Other terms used to describe a Web widget include gadget, badge, module, capsule, snippet, mini, and flake. Web widgets often but not always use Adobe Flash or JavaScript programming languages."<sup>5</sup>

**The widget model is attractive because of ease of development. Most widgets can be created with a few images using from less than ten to several hundred lines of XML/JavaScript/VBScript, depending on their complexity.**

In addition, widgets are extending the same ideas to the Mobile Web. The Mobile Web now supports the full Web technologies (Javascript, CSS, etc). Thus, widgets can easily migrate to the Mobile Web.

Mobile widgets are suited to microlearning because they enable applications with a short duration and can be a part of an informal, ongoing, and collaborative process. Like other microlearning applications, widget-based applications could include screensavers, quizzes, flashcards, word-of-the-day, etc., perhaps in a networked environment spanning the Web and the Mobile Web. At the time of writing, some of the companies supporting widgets include Apple, Opera, Google, Microsoft, netvibes, and Yahoo. Opera, Nokia, and Apple are supporting widgets on phones.

### Conclusions

Widgets should not be viewed in isolation but rather as a part of a holistic trend. The wider socioeconomic impact, including the rise of networks, break down of hierarchies, and open standards, complement widgets.

The Web 2.0 concept of 'pushing out content' leads naturally to microcontent. Microcontent, microlearning, and widgets go together.

The Web is the unifier. Mobile is a strong driver. Network (community) is the enabler. Widgets is the mechanism—especially within a network spanning the Web and the Mobile Web.

<sup>5</sup>[http://en.wikipedia.org/wiki/Web\\_widget](http://en.wikipedia.org/wiki/Web_widget) .

Widgets are suited to small chunks of information. We already use them on the Web. We will be using them on the Mobile Web. □

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- [http://en.wikipedia.org/wiki/Widget\\_engine](http://en.wikipedia.org/wiki/Widget_engine)
- [http://www.pavingways.com/mobile-widgets-the-ubiquitous-mobile-Web\\_84.html](http://www.pavingways.com/mobile-widgets-the-ubiquitous-mobile-Web_84.html)
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# 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. Intertwining is discussed as a general term for what 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, “intertwining 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

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**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: *Intertwined: A Compelling Story of the Joys of Being Connected in the Digital World of the Future*. *Intertwined* will be available in 2008 from future-text, London (e-mail: [jbreck@nyc.rr.com](mailto:jbreck@nyc.rr.com); Website: <http://goldenswamp.com/>).

it possible for human ideas to be organized in bountiful new ways. Here is how his insights are summarized in Wikipedia:

Intertwining 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. Intertwining is not generally acknowledged—people keep pretending they can make things hierarchical, categorizable, and sequential when they can’t.”<sup>1</sup>

In contrast to what Nelson calls intertwining, 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 intertwining 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 intertwined.

## 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.”<sup>2</sup>

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

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<sup>1</sup>Wikipedia, Intertwining; <http://en.wikipedia.org/wiki/Intertwining>.

<sup>2</sup>Ori Brafman and Rod A. Beckstrom, *The Starfish and the Spider*. Portfolio, 2006, p. 42.



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## OER in the Mobile Web

Two mobile trends are underway that affect open educational resources in big ways. “Mobile” here refers to the proliferating handheld devices called cellphones and mobile phones. While technically, the words “Web” and “Internet” have shades of different meaning, for this discussion they both mean the open virtual venue we can access online.

The first trend is the increasing and improving interfacing of the Internet by mobile phones. The mobile Web will be the same Internet that we access on bigger computers. Headed by Internet inventor Sir Tim Berners-Lee, the World Wide Web Consortium’s W3C Mobile Web Initiative “is a joint effort by vendors, providers, manufacturers, and mobile operators to make Web access from a mobile device as simple, easy, and convenient as Web access from a desktop device” (<http://www.w3.org>). The Mobile Web is not a different Internet; it is expected to be the simple, easy, and convenient access to the one Internet from a mobile device.

The second trend is the increasing likelihood that mobile phones will turn out to be the primary way individuals connect with the wireless world. Thus, as educational resources are opened into the Internet, and the Internet is interfaced from mobile phones, educational resources will soon be carried by students in their pockets and available for learning in their hands.

This mobile ubiquity of OER for students is visible over the horizon in the least developed countries, where schools are often woefully inadequate and desktop computers are rare for education. Almost suddenly youngsters there are holding mobile phones in their hands that very soon can deliver the Internet. In more developed countries, where desktop and laptop computers have to some extent brought the Internet into the education venue, the delivery of open learning resources through mobile devices will be part of a changeover from PCs and laptops. It is likely that children born in the closing years of the first decade of the 21st century will never routinely access learning materials from a PC because they will carry Internet access with them through a mobile device. Making certain educational resources open into the mobiles the kids will carry will be a key responsibility of 21st century educators.

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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.

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.”<sup>3</sup>

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

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<sup>3</sup>Chris Anderson, *The Long Tail*. Hyperion, 2006, p. 52.

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.”<sup>4</sup>

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

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<sup>4</sup>Don Tapscott and Anthony D. Williams, *Wikinomics*. Portfolio, 2006, pp. 41–42.

every domain of information and culture production... from peer production of encyclopedias, to news and commentary, to immersive entertainment.”<sup>5</sup>

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.”<sup>6</sup>

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*.<sup>7</sup> 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

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<sup>5</sup>Yochai Benkler, *The Wealth of Networks*. Yale University Press, 2006, p. 5.

<sup>6</sup>James Surowiecki, *The Wisdom of Crowds*. Doubleday, 2004, p. xiii.

<sup>7</sup>Dana Lindaman and Kyle Ward, *History Lessons*. The New Key Press, 2004, p. 33.

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."<sup>8</sup>

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."<sup>9</sup>

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<sup>10</sup> of *Infotopia: How Many Minds Produce Knowledge*, by Cass R. Sunstein: " 'Infotopia' is a persuasive and sophisticated medita-

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<sup>8</sup>*Ibid.*, p. xvii.

<sup>9</sup>*Ibid.*, p. xx.

<sup>10</sup><http://www.amazon.com/Infotopia-Many-Minds-Produce-Knowledge/dp/0195189280> .

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..."<sup>11</sup>

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.

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<sup>11</sup>Henry Jenkins, *Convergence Culture*. New York University Press, 2000, p. 259.

## 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."<sup>12</sup>

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 Weinberger'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.

## Intertwining Enables Knowledge

Knowing that everything is miscellaneous is a bottom-line concept for understanding education's intertwined 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."<sup>13</sup> 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 intertwined, intertwining enables knowledge."<sup>14</sup> 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 intertwining that will result, allowing knowledge to be formed, ideas to emerge, and understanding to be shared. □

<sup>12</sup>David Weinberger, *Everything Is Miscellaneous*. Times Books, 2007, p. 120.

<sup>13</sup>Weinberger, p. 103.

<sup>14</sup>Weinberger, p. 125.

# Q & A with Ed Tech Leaders

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## Interview with Margaret Riel

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Susan M. Fulgham  
Michael F. Shaughnessy  
Trudy LeDoux

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**Margaret Riel** discusses her work at SRI in the teaching of learning, the sharing of expertise in teaching networks, and in efforts to reform schools. She shares how the “digital divide” includes not only physical access but also having knowledgeable teachers who know how to integrate technology in education. With a focus on learning, she explains how *Learning Circles* are used to establish the continued circle of learning between student and teacher. Tapped In and Wikis are discussed as collaborative tools. Concerning technology in higher education, she discusses online educational issues regarding assessment, creating learning communities, and communication tools such as blogging, podcasting, and YackPack. The interview concludes with a visionary forecast of teaching and learning in the upcoming decade.

**1. We see that you work both at SRI International (Menlo Park) and at Pepperdine University (Malibu) in California. Can you say a bit about how that works?**

Yes, I currently split my time and energy between two workplaces, each of which is excellent in what they

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**Susan M. Fulgham** is an instructional designer at West Texas A&M University and a doctoral candidate at Texas Tech University (e-mail: [susan.m.veronikas@ttu.edu](mailto:susan.m.veronikas@ttu.edu)). **Michael F. Shaughnessy** is Professor of Special Education at Eastern New Mexico University and Director of the New Mexico Educational Software Clearinghouse in Portales, New Mexico (e-mail: [michael.shaughnessy@enmu.edu](mailto:michael.shaughnessy@enmu.edu)). **Trudy LeDoux** is a doctoral student in Instructional Technology at Texas Tech University and the Texas Planning Coordinator for the Texas Education Agency (e-mail: [taledoux@aol.com](mailto:taledoux@aol.com)).

do—SRI International and Pepperdine University. SRI International is a non-profit research organization with many divisions, and I work in the Center for Technology in Learning, with many very talented researchers. Some of the most innovative research around technology in the country is being done by people at this center, so I am very pleased to be working there. My work centers on the teaching of learning, the sharing of expertise in teaching networks, and in efforts to reform schools. You can see some of this work by finding me among the people at SRI (<http://ctl.sri.com/people/people.jsp>).

I am also on the faculty at Pepperdine University, teaching in a very innovative program that offers an M.A. or Ed.D in educational technology. The Masters in Ed Tech is a blended (85% online) program which uses distance technology to take the university to the workplace—to situate learning in the context of the learning communities of professionals educators.

This program helps students engage in action research as a way to learn from, and in, their workplace communities. The program teaches a form of a leadership which is *service to the community*. I find this teaching very rewarding, as it is a way to effect transformation reforms from within organizations.

By using computer and communication technology, I can work with colleagues at both of these distant locations while often working in a home office. This arrangement does require a shift in travel. I don't travel every day, but when I do, the commute is long. Telecommunications is however, very effective in creating a sense of *tele-presence*. I use my computer as a phone (via Skype), as share whiteboard (via Wikis), as meeting room (using Webex, Tapped In), as mail and fax service (through e-mail), and to store collective memory (Web spaces). And, of course I have other technology—cell telephone, printer, scanner, and fax—to help me stay “connected.”

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**Margaret Riel** is a Senior Researcher at SRI International and Visiting Professor at Pepperdine University. Her interests center around using emerging technologies to mediate learning, social networking, collaborative-learning models and communities of practice, teacher education, and school reform at the high school level (supported by the Bill and Melinda Gates Foundation). Her research examines the relationship between learning and instructional practices mediated by technology. Her current projects include *Learning Circles* (a part of the International Education and Resource Network), *Passport to Knowledge* (National Science Foundation), and emerging technologies in communication (augmented reality). She was the former Associate Director of the Center for Collaborative Research in Education at the University of California at Irvine. Information regarding Dr. Riel's research and projects can be found at [www.learn.org](http://www.learn.org) and <http://ctl.sri.com/people/people.jsp>.

**2. What is your School Renewal Webcenter all about? How did this come into being?**

I also like to experiment with knowledge building. The School Renewal Webcenter ([www.schoolrenewal.org](http://www.schoolrenewal.org)) was a project funded by Ford Motor Company which I led when I was at the University of California, Irvine. Our goal was to find a vehicle for the sharing of knowledge about school renewal. As with many good projects, it relied on external funding, and it is hard to keep the project operating now that the grant period has finished. I am also starting up a new Webcenter, the Center for Collaborative Action Research, with Karen Elinich, from Franklin Institute Science Museum and a graduate student at Pepperdine. We are looking forward to be able to share the best of the action research projects that students have created.

**3. In terms of school change with technology, what do you mean by “crossing the digital divide”?**

The digital divide refers to the separation of students by race, gender, and social class in learning with innovative technology. I use the visual metaphor of a physical divide to help understand the dimension of the problem that keeps all schools from making good use of technology. The width of the divide represents the access to technology in the school. Students in schools in more privileged contexts have ready and frequent access to the new tools. The slope of the walls of the digital divide represents the conceptual knowledge of the teachers who will help students use the technology. Students in schools where teachers do not have deep conceptual knowledge of how to use technology to augment learning often are trapped behind pre-programmed learning that neither teacher, nor student, can structure. The depth of the valley created illustrates the access, knowledge, and use of technology in home and community settings.

This metaphor helps to illustrate why it is so difficult to close the digital divide with a single intervention. If access to equipment is provided in the schools, then *the width* of the divide is narrowed. But unless *teaching* is improved, the steep slope and deep divide make the journey to equal opportunity very difficult. If teacher knowledge is increased, then the *slope* decreases. But unless regular access to technology is provided in schools, families, and the community, a deep, wide chasm remains, separating students from equal opportunity to learn with technology. If the structural inequalities outside of the school are addressed and students have good home access to technology, then the *depth* of the divide is reduced, but without school access and knowledgeable teachers, the large slope and width of the divide make for a long, but less difficult path, to equality. So, to

close the digital divide, there needs to be a concurrent effort to increase access to, and develop more innovative patterns of, use of technology in the school, home, and community

**4. What do you mean by cross-classroom collaboration?**

In the early days of my career, *cross-classroom collaboration* meant linking classrooms from around the world in small teams called *Learning Circles*, where groups helped and supported each other's learning. Project-based learning can extend learning beyond the classroom—getting students to connect what is happening in their communities with what is happening in communities around the world. But what really excited me, personally, about Learning Circles was that I could see teachers being released from the repetitiveness of the curriculum and being pulled into topics where they were more learner than teacher. And I saw students wanting to understand what was it that was about learning that had transformed their teacher. In my current research, I continue to focus on contexts for the teaching of learning. I think that one of the best ways to improve the quality of teaching is to provide opportunities for rich, robust, and continual learning on the part of teachers. If you want to follow up on my work on Learning Circles, go to [www.iearn.org](http://www.iearn.org).

**5. You teach online now, so how do you react to the move away from the community of the classroom?**

Online teaching and learning can be different from what most people expect. It can, of course, be a tutorial or a correspondence course, where the learner takes charge of the learning, perhaps with some minimal help from someone else. But it is also possible to structure learning in a way that really takes advantage of a number of factors. Once you get out of the social setting of classrooms, you can take learning anywhere. Since learning often gets trapped in university classrooms, it never makes it to the places where it changes people. By contrast, online learning can be a lifeline.

At Pepperdine, we take learning to the workplace, and we ask students to *live* the theories they learn. Their assignments push them to practice community skills and put learning ideas to work. When this happens, it becomes a part of their identity, not something that they hold in their heads. Knowledge doesn't belong to us until we *use it*. And when the *lag between learning and using* is too long, the knowledge trace evaporates.

So, I find this way of teaching online very rewarding. I watch as students use what they learn to create cycles of action research. Midcareer students bring a tremendous amount of social capital to the

learning context. In the slow pace of threaded discussions afforded by online learning, students are more likely to draw on their own knowledge. I place them in Learning Circles and they serve as consultants on each other's action research.

**6. *You have written about telementoring. Can you tell us how this might take place in a school setting?***

There are lots of ways that expertise and resources can be shared on a network, from "asking an expert" to locating help with a problem, to coaching around strategies for school change, and long-term mentoring relationships, particularly to help with teacher induction. Increasingly, time and distance from resources are minimized, as instant messaging and collaborative tools can be employed to more effectively address and deliver the needed support of teachers isolated in classrooms. Coaching can be more effective when resources are shared, practice can be recorded, and ideas can be discussed.

When this is done in a public forum, it provides a way for others to learn from the exchange long after the interaction has taken place. In this way, schools that set up coaching and mentoring online can continue to benefit from the exchanges. *Tapped In* is a great tool for supporting all of these forms of help at a distance.

**7. *"Tapped In" was developed by SRI. Can you tell us a bit more about this tool?***

Tapped In is a valuable electronic context for community building. It is a Web tool that exploits the notion of place. You go to Tapped In to meet with colleagues and students and to do work together. It has a set of community tools in a protected environment. You can make your meeting place open or private. You can use the room to post notes, images, and other things you might put on the wall of an office. There is a shared whiteboard for group planning or note taking. The community tools include real-time chatting and discussion forums.

The chatting is particularly rich, and I use it for my course discussions. One of the things we like about Tapped In chatting is that we can write text, but we can also describe what we are doing in the imaginary space and even what we are thinking. When you make your thinking apparent, it is different than saying something, and it operates differently in subtle ways. I rarely compliment students directly, as that seems to require a response (and good natured teasing), which breaks the flow of the conversation. But if I use "think" bubbles, it seems that I can compliment in a way that fuels, rather than dampens, the learning conversation.

**8. *What are some "new designs" in teaching and learning technology?***

This year I am most excited about Wikis. Wiki means very fast in Hawaiian, and Wikis refer to Webspaces that have an edit tab. When you select this tab, you can add, delete, or reorganize the content and then save it back to the Web. It employs a simple mark-up language for formatting the page (or in some cases formatting options). What makes them valuable is that students can work collectively. The history is kept, not on the common document, but in the versions of the page. You can back-track, if you wish. The Wiki I use will notify me when a page is changed and tell me who changed it. I can watch as students work together to create what few students could have created alone.

In less than three weeks of reading and writing, 17 students wrote two essays summarizing what they had learned about the promise and perils of technology. Work on a Wiki was new, and many had never written a review of literature. They struggled as a group, and those with more experience and skill in writing helped by adding some framing advice. From time to time, I would help them see the structure that was emerging and encourage them to think of how to organize the ideas. I was pleased to see what we could create between us an example of a task that they are now doing on their own. I can use various stages in the process to help them understand how to transform their notes into a review of the literature for their action research (<http://mindmaps.wikispaces.com/perils-promise-main>).

I also used the same Wiki space with my colleagues to develop a symposium to submit to the American Educational Research Association Conference. We were able to have the master online, and each of us added our sections as well as work on the introduction. It can be disconcerting to see your text change, but there is also some degree of excitement to see the ideas transformed (<http://mindmaps.Wikispaces.com/Peer+Evaluation>).

**9. *When you teach online, how do you assess student learning, and isn't it easy for students to "cheat?"***

I think that the nature of the assignment is part of the issue. When students don't feel a personal investment in the ideas, it is easier for them to be tempted to use the work of others. In my online teaching, the assignments involve an interaction between workplace and theories. It is a new extension of ideas, and it involves thinking about things that are important to the students. So, they are less likely to find things to copy, and they are hopefully more engaged in working out their own ideas. But there are still ethical issues with respect to student behavior that is just a part of teaching, face to face or online.

**10. Do you find you spend more time grading students' work online?**

Teaching online, I find I organize more around projects than topics. When students are writing and completing projects, they have a high need for feedback. After years of listening to teachers and professors make sense of information for them, students are hesitant to assert their ideas and not willing to pay close attention to the ideas of their peers. The work of a professor then shifts from lecturing to mentoring, from source to support. And since I could not help students individually at the level they think they need, I help students learn to participate in a culture of open and honest critique. All assignments are posted online, and feedback comes from peers as well from the professor. We reframe the work from a competition for the best grades to an effort to have everyone learn to be more effective in their work. Our goal is help all students become more powerful versions of themselves. They do that by being open to critique and listening to different perspectives. It requires taking risks, building trust, and acting honestly. This is a different form of honesty than not "cheating" by copying the work of others. It is more difficult to develop, can be time consuming, but can also have outcomes that are worth the investment.

**11. How should we be preparing tomorrow's teachers to work in "learning communities"? How do they help us think about teacher preparation?**

Learning communities are diverse groups of people who come together to improve their understanding, their practice, or to create an outcome. Learning communities are not the same as a community of practice and may not have all of the properties that we associate with communities (voluntary memberships, multi-generational, ongoing). The emphasis is on learning, and community is used more as modifier describing the organization of learning. Teachers need opportunities to learn every day from teaching. They are less likely to do this when they are isolated in classrooms. There are more opportunities for teachers to work out their ideas with their peers, and this encourages the continuous learning that leads to a form of adaptive expertise. The irony of schooling is that teachers rarely model or engage in learning with their students or other teachers. Linda Polin and I have described and given examples of three types of learning communities—product-based, practice-based, and knowledge-based—in a paper in Barab, Kling, and Gray's *Designing for Virtual Communities in the Service of Learning* (2004, Cambridge University Press).

**12. What is social capital? What does it have to do with school change and learning communities?**

Social capital refers to the access that a person has to resources embedded in the social structure. Human capital refers to the knowledge and expertise a person has and can use to accomplish one's goals. Social capital, in contrast, is the access to expertise and resources that belong to your friends who are linked to you in social networks. For example, if you have a technology expert in your network of colleagues, you have technical expertise as part of your "social capital," even if you personally know little about technology. And, depending on the strength of the ties and norms at the school, you can count on using what this person knows to help you.

When schools decide to enact school-wide reform, there are people who understand the implementation process better than others. They embody the resources for change. The teachers who have regular access to their expertise are more likely to be successful in implementing the change than teachers who are isolated from them. If these resource experts are well-connected throughout the school, they form links, helping knowledge move not only from teacher to teacher but from also small group to small group. On the other hand, if these experts do not interact with others, then they are more like bottlenecks, restricting the flow of social capital. We are finding in our study of social capital and school change that what counts is not just how often teachers work with colleagues, but where the expertise is located and who has access to these teachers.

**13. Should blogging or podcasts be used in teacher preparation programs? If so, in give us some examples.**

We use both in our program. I think that these tools and the ones that follow them will become a regular part of education. We have our blogs (online journals) password protected but shared with students in the program. This is their chance to think "out loud" and invite others to think with them. This reflective, open thinking is already a basic part of the learning process. Podcasts and other forms of voice are just beginning to play important roles in teaching and learning. My colleague, Linda Polin, uses podcasts to provide an annotated reading of the books she assigns. Linda records a podcast as she skims through the content of a chapter that the students are reading. She alerts them to parts to read more carefully, and she fills in the intellectual history that is indexed by theoretical concepts. Some of this involves storytelling around people and the development of ideas. It is not a lecture, but rather a modeling of the thinking process involved in learning from reading.

Another "voice" tool that I am experimenting with is



YackPack ([www.yackpack.com](http://www.yackpack.com)). Think of this environment as linked-voice recording boxes. The interface shows small icon images for my students, with me in the center. I can move the students in any group formation I want. I can leave a verbal message for a single student, a group of students, or the whole class. I am using it for grading, and employing it when I think that voice might do a better job of communicating than e-mail. While there are now “threaded” voice discussion forums, I think this might not be the best use of the verbal channel. It takes longer to listen than it does to read. So, the slight speed in talking over typing for the speaker is not well-balanced with the increased time everyone would have to spend in listening. I think it will be important for instructors and community builders to think carefully about how to match the best technology for different forms of learning.

The other tool that is coming of age is 3-D, visually stunning, immersive worlds like Second Life. Currently, I do not think that chat in Second Life is as good an educational tool as the text chat in Tapped In, if the focus is on the learning dialogue. I think that the avatars and their expressive features invite a level of playfulness that may interrupt the focus on learning.

But I do think that these worlds will soon provide new and fluid ways of interacting with Web-delivered tools. I suspect that after some experience, we will learn how to build ideas together in much richer ways than we do in text only or verbal environments. So I am exploring.

#### **14. Any thoughts on what things will be like in 2017?**

Ten years ago, I wrote a White Paper for the U. S. Congress Office of Technology Assessment called *The Future of Teaching Projecting into the Year 2006*. (It is linked on my Website if anyone wants to see how good I was in predicting the future.) Some of the structural features of my vision overlapped with the Pepperdine program, which is partly why I found it an attractive place to teach. I am a “community teacher” in my model, with some differences. I do stay with my students throughout their program as their action research professor and advisor. I don’t actually “team teach” with my colleagues, but I do monitor my students’ experiences in other classes, and their professors contact me if they are underperforming (and compliment me for their successes). Students also let me know what is and is not of value to them in their other courses. We use this information to help structure changes in the program. So, I feel lucky to be teaching in a program that aligns so well to my vision.

But now, if I look out to 2017, how will learning be different? Well, I still hope we will move away from the structure of one teacher for 30 students (elementary),

and away from one hour with 30 students times five (150 students). And I hope we move toward advisories or school families for all students.

I think that school families and advisories provide a support structure in education that is vital. Not all parents understand the structure of school and expectations for high-level experiences. Too many students are “lost” because no one advocates for them, no one notices them. I would also hope that the pendulum will swing away from the oppressive obsession with standardized tests toward learning contexts that will, in themselves, be both diagnostic and proscriptive in terms of the data collected. School lessons should involve the use of technology (digital paper is on the horizon) to keep track of learning in rich simulations of physics, engaging historical travel, and immersive problem solving. Student learning profiles can be recorded every day. School testing can be accomplished by selecting a handful of students to validate the accuracy of electronic learning profiles. This should add a month of valuable learning time each year. Students, teachers, and parents will be able to monitor levels of accomplishment. Students will know that, if they put in that extra time, they might move to the next level. This feedback is as motivating in real life as in games. I remember how excited my children were when they could get MS WORD to assess the grade level of their writing. Feedback is a strong motivator of learning. So is interest. Students need to be challenged and to be exposed to the basics of many different disciplines, but we cripple learning when we don’t give students some choice over what they explore.

I have one test question I ask when I go to visit schools. I ask a student, “If you do your very best on this assignment, and your friend here does his very best, will your work look the same?” If the answer is “Yes,” I can feel relatively confident that the learning I value is not taking place at this school—even if each student has a tablet computer on his or her desk. □

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## **An International Magazine**

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# Edgar Dale

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## A Significant Contributor to the Field of Educational Technology

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Sang Joon Lee  
Thomas C. Reeves

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How can teachers use audiovisual materials to promote learning that persists? How can audiovisual materials enable students to enjoy learning through vicarious experience? These were two of the many important research and development questions addressed by an extraordinary educational technology pioneer, Edgar Dale. Although he is perhaps best remembered today for his often misinterpreted “Cone of Experience,” Dale made significant contributions in many areas, as evidenced by just a few of the titles of the many books he wrote during his long lifespan (1900–1988), including: *How to Appreciate Motion Pictures* (1933), *The Content of Motion Pictures* (1935), *Teaching with Motion Pictures* (1937), *How to Read a Newspaper* (1941), *Audiovisual Methods in Teaching* (1946, 1954, 1969), *Can You Give the Public What It Wants?* (1967), *Techniques of Teaching Vocabulary* (1971), *Building a Learning Environment* (1972), *The Living Word Vocabulary: The Words We Know* (1976), and *The Educator’s Quotebook* (1984).

### Background

Born in 1900 at the dawn of a new millennium,

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Edgar Dale’s work continues to influence educational technologists in the 21st Century. Dale grew up on a North Dakota farm, and according to Wagner (1970), he retained the no-nonsense thinking habits and strong work ethic of his Scandinavian forebears throughout his illustrious career. While working on the family farm and later as a teacher in a small rural school, Dale earned both his Bachelors and Masters degrees from the University of North Dakota, partially through correspondence courses.

In 1929, he completed a Ph.D. at the University of Chicago, and then joined the Eastman Kodak Company, where he collaborated on some of the earliest studies of learning from film. Interestingly, although many of these early studies were experimental ones designed to compare learning from film with other media, Dale later expressed distain for such studies. According to De Vaney and Butler (1996):

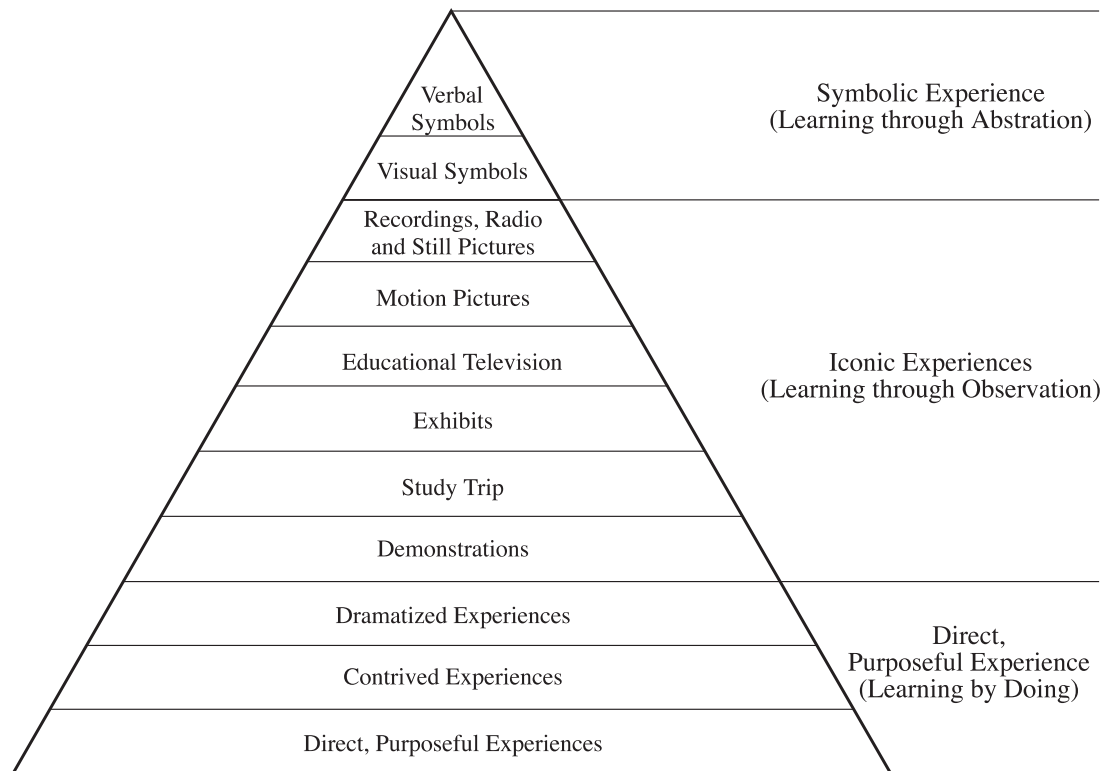
When Dale was asked why he did not do experimental research in which a scholar attempted to prove over and over that students learn from radio or film, he replied: “It always bothers me, because anybody knows that we learn from these things (media). There’s no issue about that....Well, I suppose in any field, to be respectable you have to do a certain kind of research.” (p. 17)

In addition to his own prolific scholarship, Edgar Dale mentored an outstanding cadre of doctoral students during his long role as a professor at Ohio State University (1929–1973), including Jeanne Chall and James Finn. Dale also served as President of the Division of Visual Instruction (DVI) of the National Education Association (NEA) 1937–1938, the professional association that is now known as the Association for Educational Communications and Technology (AECT).

### Influences

Although his traced his ideas back as far as Pestalozzi (1746–1827), who pioneered the concept of learning through activity, and Froebel (1782–1852), who first promoted the principle that children have unique needs and capabilities, Dale’s work was most heavily influenced by John Dewey (1859–1952). Dewey (1938) stressed the importance of the continuity of learning experiences from schools into the real world and argued for a greater focus on higher order outcomes and meaningful learning.

In his first edition of *Audiovisual Methods in Teaching* (1946), Dale expanded Dewey’s concept of the continuity of learning through experience by developing the “Cone of Experience,” which relates a concrete to abstract continuum to audiovisual media options (Seels, 1997). Dale (1969) regarded the Cone as a “visual analogy” (p. 108) to show the progression of learning experiences from the concrete to the



**Figure 1.** Dale's Cone of Experience.

abstract (see Figure 1) rather than as a prescription for instruction with media. In the last edition of *Audio-visual Methods in Teaching* (1969), Dale integrated Bruner's (1966) three modes of learning into the Cone by categorizing learning experiences into three modes: enactive (i.e., learning by doing), iconic (i.e., learning through observation), and symbolic experience (i.e., learning through abstraction).

In moving toward the pinnacle of the Cone from direct, purposeful experiences to verbal symbols, the degree of abstraction gradually increases. As a result, learners become spectators rather than participants (Seels, 1997). The bottom of the Cone represented "purposeful experience that is seen, handled, tasted, touched, felt, and smelled" (Dale, 1954, p. 42). By contrast, at the top of the Cone, verbal symbols (i.e., words) and messages are highly abstract. They do not have physical resemblance to the objects or ideas. As Dale (1969) wrote, "The word *horse* as we write it does not look like a horse or sound like a horse or feel like a horse" (p. 127).

Dale (1969) explained that the broad base of the cone illustrated the importance of direct experience for effective communication and learning. Especially for young children, real and concrete experiences are necessary to provide the foundation of their permanent learning. The historical importance of Dale's Cone rests in its attempt to relate media to psychological theory (Seels, 1997), and the Cone has

shaped various sets of media selection guidelines ever since. For example, influenced by Dale, Briggs (1972) delineated general principles for media-selection according to the age of learners, the type of learners, and the type of task.

As noted above, Dale's Cone has been frequently misunderstood and misused. Dale's Cone is often confounded with the "Remembering Cone" or "Bogus Cone" (Subramony, 2003, p. 27), which claims that learners will generally remember 10 percent of what they read, 20 percent of what they hear, 30 percent of what they see, 50 percent of what they hear and see, 70 percent of what they say, and 90 percent of what they both say and do. Even though Dale did not mention the relationship between the level of the Cone and a learner's level of recall, many practitioners mistakenly believe that the bogus "Remembering Cone" was Dale's work. A Google search reveals an astonishing number of attributions of the "Bogus Cone" to Edgar Dale. Molenda (2003) concludes that the so-called empirical evidence for the "Remembering Cone" appears to have been fabricated by petroleum industry trainers in the 1960s.

In addition to this confusion, the implications of Dale's Cone have been misunderstood or misapplied. For example, Dale's Cone has been used to maintain that more realistic and direct experience is always better. However, Dale (1969) demurred, writing that, "Too much reliance on concrete experience may actu-

ally obstruct the process of meaningful generalization” (p. 130). Also, Dale noted that providing realistic learning experiences may not be efficient in terms of cost, time, and efforts. Instead, Dale suggested that teachers should balance combinations of concrete and abstract learning experiences.

### Experiential Learning Environments

In another book, *Can You Give The Public What It Wants?* (1967), Dale reiterated Dewey’s influence on his ideas by writing: “As I return to *Democracy and Education* [published by Dewey in 1916] I always find a new idea that I had not seen or adequately grasped before” (p. 186). Dale (1969) described learning as a “fourfold organic process” (p. 42) which consisted of needs, experiences, incorporation of the experiences, and the use of them. To promote permanent learning, Dale asserted that teachers should help students identify their *needs* for learning and set clearly defined learning goals related to their needs. A learning *experience* must be personally meaningful with respect to students’ backgrounds and developmental stages, and the nature of the experience should be logically arranged to help students *incorporate* new knowledge with what they already have. Later, students should have opportunities to *practice and try* out their new knowledge in real life as well as in learning contexts. Dale (1972) wrote:

To experience an event is to live through it, to participate in it, to incorporate it, and to continue to use it. To experience is to test, to try out. It means to be a concerned participant, not a half-attentive observer. (p. 4)

Thus, effective learning environments should be filled with rich and memorable experiences where students can see, hear, taste, touch, and try. Dale (1969) articulated the characteristics of rich experiences. In a rich experience:

- students are immersed in it and use their eyes, ears, noses, mouths, and hands to explore the experience;
- students have a chance to discover new experiences and new awareness of them;
- students have emotionally rewarding experiences that will motivate them for learning throughout their lives;
- students have chances to practice their past experiences and combine them to create new experiences;
- students have a sense of personal achievement; and
- students can develop their own dynamic experiences.

In Dale’s perspective (1972), most students in schools did not learn how to think, discover, and solve real problems. Rather, students were forced to

memorize facts and knowledge in most schools, and as a result, any knowledge they acquired was inert in their real lives. For this reason, he argued that we should have revolutionary approaches to improve the quality of educational learning environments. To build learning environments infused with rich experiences, Dale argued for the development of new materials and methods of instruction. Dale promoted the potential of audiovisual materials, believing that they could provide vivid and memorable experiences and extend them regardless of the limitations of time and space. Dale (1969) argued:

Thus, through the skillful use of radio, audio recording, television, video recording, painting, line drawing, motion picture, photograph, model, exhibit, poster, we can bring the world to the classroom. We can make the past come alive either by reconstructing it or by using records of the past. (p. 23)

Dale believed that audiovisual materials could help students learn from others’ first-hand experience, or *vicarious* experience. Dale (1967) claimed, “Audiovisual materials furnish one especially effective way to extend the range of our vicarious experience” (p. 23). Dale concluded that audiovisual materials could provide a concrete basis for learning concepts, heighten students’ motivation, encourage active participation, give needed reinforcement, widen student experiences, and improve the effectiveness of other materials.

Although, as noted above, Dale (1969) did not advocate comparative media studies, he did recommend evaluating combinations of media and instructional materials in actual learning environments. Amazingly, Dale anticipated the direction of media research as if he had been privy to the Great Media Debate between Clark (1994) and Kozma (1994). Dale (1969) provided an analogy:

As we think about freight cars and their contents we can and do distinguish them. But the vehicle and its contents are closely linked. The gondola car is linked with coal: we do not haul oil in it. The piggy-back conveyances for transporting automobiles are not used to transport wheat. In all communicating of messages, therefore, we must consider the kind of vehicle used to transport them, realizing that medium-message characteristics will influence what can be “sent” to a receiver. (p. 133)

Dale recommended that researchers should look at the effects of combinations of media in the environment where they will be used rather than the testing of a single, isolated medium in the laboratory. By conducting research in real classrooms, the varied combinations of possible factors such as attributes of audiovisual materials, how to use and administer them, learners’ characteristics, and learning environments could be examined because learning occurs

through dynamic interaction among the learner, the context, and the media. Although the experimental methods of educational and psychological research were focused on testing the tenets of behaviorism and pitting one medium against another throughout most of his career, Dale was prescient in his recognition that the complexities of learning render most such studies fruitless.

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### Final Remarks

Dale was much more than a scholar isolated in the ivory towers of academe. As described by Wagner (1970), "He actively fought for better schools, academic freedom, civil rights, and other causes long before these became popular issues" (p. 94). Dale also anticipated the still-neglected importance of media education by promoting in the 1930s the then radical notion that teachers should help their students to understand the effects of media on them, their parents, and society, and to learn how to critically evaluate the contents of the radio, newspapers, and films. Dale was a socially responsible researcher, a thoughtful humanist, and dedicated educator. Any educational technologists seeking inspiration for their work in our field would find no better role model than Edgar Dale. □

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# Topics for Debate

Alexander J. Romiszowski

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## Learning Management in Historical Perspective

**Project PLAN—was it an early form of LMS?** The year was 1967. As a young researcher, working in the UK in the newly emerging field of Educational Technology, I arranged a three-month study tour of centers of R&D in North America. It was a busy schedule: a couple of days at Professor Skinner's labs in Boston, reviewing the latest research on programmed instruction; a visit to OISE in Toronto, where some of the earliest R&D on CAI was underway; a stay at a US federal Job Corps Center in Lincoln, Nebraska, where the whole program ran on contingency-management principles; a visit to New Mexico to see how some Zuni Indian villagers were studying by means of a system of learner-directed, on-demand video (what's new in ed tech?).

However, the part of the trip that is most strongly rooted in memory is my visit to the San Francisco Bay area, where I stayed much longer than originally planned. Part of the reason was the time and place—San Francisco in the summer of 1967, at the height of the flower-power movement. The scenes at the Haight/Ashbury intersection and Golden Gate Park have left indelible impressions. But that was incidental to my principal reasons for staying, which were visits to several R&D projects that influenced my own research for many years to come: Berkeley, where Professors Crutchfield and Covington were using programmed instruction for the development of creativity and productive thinking skills; Stanford, where Professor Suppes was conducting a multi-year study on the use of CAI for the teaching of arithmetic (the results are still relevant today); and the American Institutes for Research (AIR) in Palo Alto, where Professor Flanagan was then implementing Project PLAN.

It was at the AIR that I first met Robert Mager, who was running a workshop with a group of teachers developing

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performance objectives for all subject domains of the school curriculum. I sat in on the workshop for a week and got involved quite deeply in this project of "Program for Learning According to Needs."

The goal of Project PLAN was to support classroom teachers by computer-based analysis of the learning performance of individual students and matching of this data to suitable learning materials and methods. The teachers writing objectives in Mager's workshop were creating the indicators and measuring instruments by which any teacher in any classroom could assess the strengths and weaknesses of each of the students and prescribe appropriate basic, remedial, or enrichment learning activities on a highly individualized basis. The materials and activities themselves were not computer-based.

Project PLAN was one of the first large-scale implementations of CMI—computer-managed instruction. As such, it may possibly be considered as a precursor to today's ever-growing number of LMS—learning management systems. What can we learn from revisiting this early project?

**The management of learning, according to PLAN.** The data collection system and interface used in Project PLAN was an electronic "postbox" installed in every participating classroom. The learning progress of the students would be evaluated on a daily/weekly basis by means of objectives-based multiple-choice tests. The students would respond on pre-printed cards, marking their choices of response for each question, and then "post" the cards into the "postbox." The data would be optically read and transferred to a mainframe computer located in Los Angeles, which would update the databases and provide, in real-time to each teacher, detailed reports on the progress of each individual student in comparison to others in the class, of this class in comparison to that teacher's previous classes, of this class in comparison to classes in other schools, and so on.

The system also made comparative analyses in order to generate long-term educational advice. For instance, by linking the data of the Project PLAN students to data collected in a previous long-term project (TALENT) that had correlated school performance and subsequent professional career success of millions of US youth, it was hoped to provide computer-assisted academic and career guidance counseling. I used the words "it was hoped" because the life of Project PLAN was quite short—only a few years involving a few dozen schools spread across the USA—in fact, only as long as the funding lasted. So, some of the long-term hopes for Project PLAN were not realized. But the short-term results were very promising and pointed to how the management of learning might be implemented once the necessary technology became more generally accessible and affordable.

That stage was reached some 20 years later, in the late 1980s, when relatively cheap microcomputers and networks came to be part of the generally expected technology infrastructure of a modern educational institution. But the pioneering educators who first got involved at that time devoted much more attention to using computers as *content-presentation* devices than as *learning-management* devices. This was partly due to the limited memory and power of early microcomputers.

Then along came the explosive growth in capacity and power of computers, the plummeting costs of technology in general, the Internet, and the consequent interlinking of everything to everything else. So, let us look back from the vantage point of a further 20 years to see whether any large-scale learning management systems based on lessons learned from projects like PLAN were ever implemented. Or, alternatively, whether such initiatives perhaps superseded the approaches used in PLAN with more sophisticated and powerful methodologies based on more recent research and pedagogical theory. Where are we now in terms of computer-based management of learning?

**Management of learning, today.** One confusing development is the plethora of names that have been invented to label, or mislabel, the recent spate of educational management software and systems. First were the so-called *course management systems*, or CMS, which provide instructors with the ability to perform tasks such as: putting course materials online; tracking student progress through assignments, quizzes, and tests; maintaining online grade books; using discussion boards, group e-mail, and chat; and generating course statistics and a limited range of reports. Academic literature sources that have attempted to classify the technology alternatives cite among the examples of CMS such commercial products as FirstClass, BlackBoard and Desire2Learn, and also many open-source systems, such as Aulanet, Sakai, and Moodle. However, other sources, including in many cases the brochures of the manufacturers themselves, refer to these as *learning management systems*, or LMS.

So are these terms synonymous? Apparently, they are not. Writers who have attempted to classify the functionality of existing products define LMS as software that may perform some or all of the above mentioned CMS tasks, but also performs other tasks, such as student registration; keeping track of participation and attendance; keeping track of completion of assignments, test scores, and grades; testing the students; providing feedback, learning advice, and follow-up; preparing a wider range of reports, aggregating data across various repetitions of a course; processing tuition charges, keeping financial records, and transferring payments among departments; and providing course catalogues and other orientation or marketing information. These authors would not classify most of the previously cited list as examples of LMS, but rather as CMS, due to limited functionality. They quote such systems as NetDimensions EKP, Saba, and SumTotal Systems as true example of LMS—products that are found most frequently in corporate training contexts but rarely in universities and almost never in schools.

Then along came Learning Content Management Systems (LCMS). This led Leonard Greenberg, writing in the ASTD's Source for eLearning ([www.learningcircuits.org](http://www.learningcircuits.org)), to comment: "If you're confused about the differences between a learning management system (LMS) and a learning content management system (LCMS), you're not alone." He states that an LMS and an LCMS are "complementary but very different systems that serve different masters": an LMS is "a high-level, strategic solution for planning, delivering, and managing all learning events

within an organization, including online, virtual classroom, and instructor-led courses"; and LCMS "gives authors, instructional designers, and subject matter experts the means to create e-learning content more efficiently...just in time to meet the needs of individual learners or groups of learning." But, once more, other sources, including the product developers, do not always agree on these definitions.

So, it would seem that confusion reigns, and the use of the different labels is often driven more by marketing considerations than descriptive clarity. However, it would seem that today's LMS (but not LCMS), while performing a much broader range of management functions, are still recognizable as the descendants of systems such as PLAN. They find ready application in corporate training, but they are not being widely used in school or university contexts, where the most popular systems seem to be the less comprehensive and multipurpose CMS systems. This may, at least in part, be due to their being somewhat out of tune with currently reigning educational philosophies.

A glance at literature that is critical of the use of LMS reveals statement such as: learning—is not a process to be managed—is by nature multi-faceted and chaotic; using an LMS—dictates the nature of interactions between instructors, learners, and content—limits discovery/exploratory/constructivist learning; one-way instruction doesn't work well in the information society—networks do—blogs, wikis, and collaborative learning spaces are more relevant. However, it is not at all clear from this literature how and indeed whether the resultant learning is tracked, evaluated, and managed. Maybe that is the real reason for the historical discontinuity in the development of LMS for education—the *management of learning* is now anathema to the formal education system. Is this really so? Is this a problem?

**A historical postscript.** The year is 1971. My boss and I were teaching a workshop in Egypt. During a week-long break, we made a rapid tour of the antiquities, flying from Cairo to Luxor, Aswan, and the Abu Simbel temple in the Nubian Desert. On the third leg of this trip, our plane broke down, and we spent a day in Aswan waiting for it to be fixed. The other passengers were mostly members of a tour group of Americans working in Saudi Arabia for the large oil company ARAMCO. I spent the day chatting with the company's Director of Human Resources. He told me that his job was tough, as the Saudi government made ARAMCO responsible for providing all health and education services to family members of local employees, and the local concept of family was very much extended.

"I have five times as many children in our primary school as I have local hires," he said. He then continued: "But we got that running really efficiently—we use Project PLAN."

He proceeded to describe a scenario of Saudi children learning American history ("nothing in the contract about curriculum") from English-language materials ("that can't be bad"), supervised by untrained monitors, and managed by a computer in California.

"The technology works real well!" he concluded.

I was dumbfounded. But, on reflection, is this all that different from some e-learning systems we might find operating today, right here, just around the corner? □

# Learning Trails

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## *Traversing the European Ed Tech Scene*

Kevin Walker

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### Reading Text and Tech

Gunther Kress is a pioneer of multimodal discourse analysis and social semiotics, and a Professor of English at the Institute of Education in London. What follows is from a talk he gave at our lab recently, about a new project called *Gains and Losses: Changes in Representation, Knowledge, and Pedagogy in Learning Resources*.

What does a Professor of English have to say about images, digital media, and Web 2.0? In fact he looks not just at language but at all semiotic modes, in terms of their affordances. He is also interested in the social forces behind different modes and media. The titles of his books say it all—*Social Semiotics* (with Robert Hodge), *Reading Images* and *Multimodal Discourse* (both with Theo van Leeuwen) have become required reading for the digital age.

He qualified the following as work in progress, so what you are getting here is not just a presentation (that old 20th century mode of communication), but a dialogue. It's knowledge building in action.

#### Stability and Fluidity

"The project," Kress begins, "is about how knowledge has been represented in textbooks over the last 70 years, and the changes from a semiotic perspective. Of course, if you're doing social semiotics, always closely behind is the notion that these semiotic changes are generated by social changes.

"We're doing this at a moment when teaching materials that used to be in a book, or at least in a storable form like a CD, are becoming archaic. Whereas texts traditionally had a certain stability, these things are now completely different—there's a cooperative rather than authoritative relation; they are dynamic, fluid, multiply authored.

"Can we still use the notion of 'text'? These new texts are fluid, multiply authored, but above all I think they're provisional. Things are never completed, because just the next moment, somebody else is doing something else with it. Are we looking for completion anymore?

"To think about this solely in terms of representation, of course, would be completely wrong. In social semiotics it is

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the social, which produces and underlies representation. So, I would ask, 'What is going on in the social domain?'

"In England I would say that the state has become the servant of the market. And that has absolute effects on education, on the subjectivity of people who, when they enter an educational institution, are now called 'learners,' and they come to school already with the subjectivity of consumers in a marketplace.

"From a political aspect, I would say that *style* is the politics of choice. And, when you make a choice, something else doesn't happen. This whole thing about carbon footprints, incidentally, is the politics of choice—'What should I do to remain socially ethical?'

"English is the area I've been working in over the last 15 years or so. And English ought to be the subject providing tools for making informed decisions about choice."

#### Text (and Picture) Books

"Here is a page from a book from the 1920s." (He shows a traditional old textbook page, heavy on text.) "In the very design of these pages, there is a kind of social relation inscribed. Somebody has produced knowledge. This somebody (the author) is authorized to produce knowledge, sets forth the knowledge in particular forms (chapters), and the chapters are arranged in sequence. Those who wanted to understand it worked hard to get at the knowledge the author intended. It was a book written, it says in the preface, for children between five and 11, about electricity.

"Now look at a contemporary book by Dorling-Kindersley. The relation seems to me quite different. This is a kind of supermarket shop—there's a range of informational items, like kinds of breakfast cereals, and you choose the one you like. The authority of the designer has begun to override the authority of the author. It's a design question how this page should look.

"The reader of the previous page had no choice but to read the page. But the reader—if we can still call him or her that—of the DK book is in quite a different position, because she or he says, 'What am I most interested in?' You're dealing with young people whose identity is already so formed by the market and entertainment that you must appeal to them in that way.

"Here is a science textbook from 1935." (This has a few images interspersed in the text.) "The information which is necessary to get hold of is represented in writing. The images have a kind of supplementary function. At the bottom here I wrote 'Figure 4 about here.' For those of you who have written a book before, that is a kind of joke, because when you wanted to put an image in there, you said, 'Figure 4 about here.'

"In the DK book, you could not imagine such an instruction to the layout person. Here I think the designer says, 'This is what it should look like, and what do you think we should fit into there?'"

At this point Yishay Mor, a researcher at our lab who works a lot with social software, chimes in, "Content 4 about here." Laughter all around.





# New Issues, New Answers



Marc Prensky

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## To Engage, Engage *With*

There is no substitute for dialoging  
with kids about how they like to learn

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"I love to learn, but I rarely like being taught."  
—Winston Churchill

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Engagement is a hot topic today in educational circles. It is what I am most often asked to speak about when I talk to teachers and administrators. My talk, "Engage Me or Enrage Me" (the term was coined by Kip Leland of LAUSD) is typically very well received.

Yet I am always somewhat apologetic about talking to teachers about needing to engage their kids. What decent teacher, I think to myself, doesn't already know that? Most, of course, already do.

### Engagement Is Changing

So what value do I bring to the conversation? "The reason I am talking to you about this" I tell my audience, "is that engagement is changing." In the past, many of us could engage our classes with a good lecture. Today, as one teacher e-mailed me recently, "I could do handstands in front of my class and no one would care."

Yes, our twenty-first century students *are* different. We can no longer spew content at them and expect them to learn it. They have to see it as worthwhile to their lives and want to learn whatever it is.

As we all know, our kids are exposed constantly to

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claims on their attention—songs, TV, movies, commercials—that cost millions of dollars to produce. One might assume that it does require millions to get their attention, and therefore, despair. We educators clearly don't have that kind of resources.

The biggest mistake educators make today, however, *is assuming they know what their students want and need, without bothering to ask them.* Put differently, it is rarely possible to engage your students until you engage *with* them, i.e., until you sit down with them and ask them about their own education: how they learn best, what they are looking for, how they become engaged.

This is precisely what I ask student panels at most of my 60+ talks, in the USA and around the world, each year: "What engages you?" The results are amazingly consistent. Whether they are top students or slackers, in elementary, middle school, or high school, they speak with one voice: "Don't lecture us!" Today's kids crave, demand, and thrive on interactivity. All engagement goes, and all listening stops when, as a fifth grader puts it, "The teachers just talk and talk and talk."

### Is Technology The Answer?

So how do we bring interactivity and engagement to today's kids? Is technology the answer? Not necessarily, the kids tell us—just because it's technology doesn't mean it's engaging.

How *do* we engage kids? When we take the trouble to ask them, they tell us: Group work. Case studies. Projects. Discussions. Asking them what they think, rather than have them memorize facts. If technology helps this process, fine, let's use it. If not, leave it out.

Put somewhat differently, what the kids are asking for from their education is *community*. It's the kind of community they get in their social lives and after-school activities, but get only rarely, from a small minority of their teachers (they say), in their classes.

### The Meaning of Community

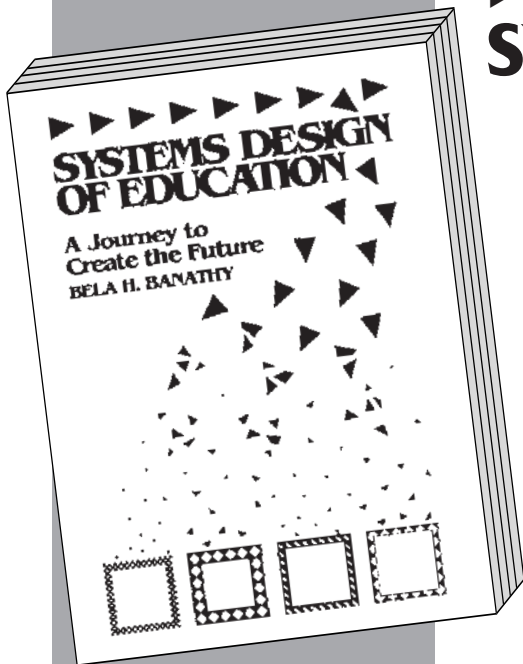
Today's students want to dialog with their peers and teachers, and have their voices heard—not just in the classroom. In the twenty-first century, "community" has a much bigger meaning: a conversation with your peers all over the world. Post our thoughts on a blog or on YouTube and the entire world can see and comment on them—and often does. Little that students do engages them as much as receiving worldwide feedback on something they have created.

And engaging, interactive dialog can be local as well. At the end of my student panels, after the teachers in the audience have had the opportunity to question the students for roughly an hour, I ask the kids what they thought of the experience of interacting with their teachers in this way. A 10-year-old's comment at a school district in California pretty much sums it up: "It was really cool," he said. "Usually teachers talk and I fall asleep. But now my brain's on fire!"

To engage our students, we must engage *with* them. □



# SYSTEMS DESIGN OF EDUCATION



**D**uring recent years a host of reports has brought into focus the crisis in education that has placed the "nation at risk." The reports have offered remedies for "fixing" education. Whatever terms are used—reform, restructure, renew—the recommendations suggest making adjustments or improvements in the existing system.

Around the middle of this century, our society entered what is often called the "post-industrial/information age," a new stage in the evolution of humanity. It has brought about new thinking and revolutionary changes and

transformations in the society. Faced with these changes, making adjustments to and improving an educational system which is still grounded in the assembly-line thinking of the 19th century will not do any longer. The entire educational enterprise has to be rethought and taken much more seriously. A new design of education has to be created that can guide a broad sweep of a comprehensive transformation: a metamorphosis of education.

In this book, Bela Banathy points out that the current crisis of education, first and foremost, is a crisis of perception, and its persistence is due to a lack of an approach that is capable of creating a new design. Facing this two-pronged predicament, the author offers new ways of thinking about education and its societal function and the formulation of a new learning agenda. He offers organizing perspectives and an innovative framework that can guide the envisioning of a new image of education. Most significantly, Banathy introduces the intellectual technology of systems design—heretofore not practiced by the educational community—that has the power to transform education by design and meet the challenges of the nineties and beyond.

The book serves as a guide to "create the future," to be used by front-line practitioners and educational leaders, as well as the educational R&D and policy-making community. Banathy proposes the notion of "user designers," the involvement in systems design of all those in the community and beyond who have a stake in education and human development. The work sets out an agenda for preservice and inservice professional development and may guide the creation of a new breed of educational technologist: *systems designers*.

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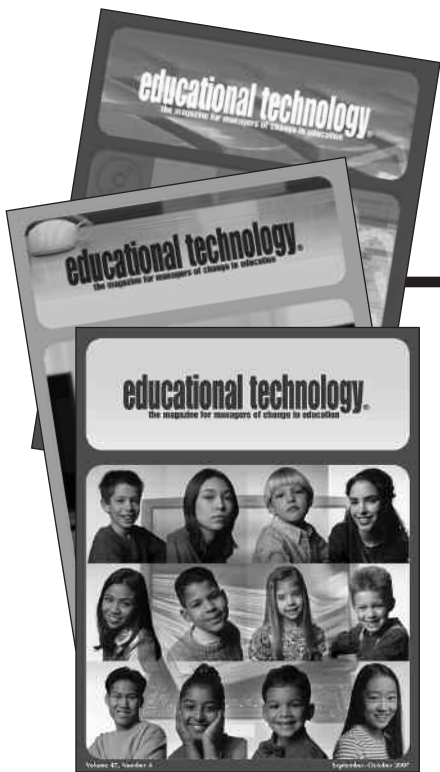
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