WILLIAM AND FLORA HEWLETT FOUNDATION

EDUCATION PROGRAM

MIT's OpenCourseWare Initiative: Reading the Implications

This is the report of a forum concerning implications of the MIT OpenCourseWare (OCW) initiative, convened in San Diego during December 2001 by the Western Cooperative for Educational Telecommunications (WCET), a project of the **Western Interstate Commission for Higher Education** (WICHE), and the **William and Flora Hewlett Foundation**.

Three background papers were prepared for forum participants, and their substance is incorporated here. Their authors are Clara Lovett, President Emerita, **Northern Arizona University**, on institutional implications; Georgia Harper, of the **University of Texas System**, on intellectual property issues; and John Rose and Tarek Shawki of the **United Nations Educational Scientific and Cultural Organization** (UNESCO), on implications for developing countries. Briefing papers concerning programs under development at **Princeton University** and **Carnegie Mellon University** were prepared by Serge Goldstein and Joel Smith respectively. Related Web sites and portions of the project proposal to the William and Flora Hewlett Foundation were also consulted. John Witherspoon prepared this report, with assistance from Hewlett Foundation staff.

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Introduction: Concept and Context

The Project. Over the next few years, the Massachusetts Institute of Technology (MIT) will post on the Web the core documents for more than 2000 of its courses. Under the OpenCourseWare (OCW) program, these materials will be available free of charge to anyone with an Internet connection.

OCW will not provide "online courses," as that term is usually understood. Rather, the typical offering will consist of key course documents: reading lists, lecture notes, assignments, and, where appropriate, experiments, demonstrations and samples of students' work.

The essentially costless, instant availability of these materials will open up MIT's pedagogical methods to inspection by all. Faculty members, enrolled students and individual learners will be free to use or adapt OCW material as they see fit. MIT copyrights will require only proper attribution of authorship for any non-commercial use. (Commercial uses will require a specific license.)

Initial funding support for OCW has been provided by the William and Flora Hewlett Foundation and the Andrew W. Mellon Foundation, with a long-term commitment by MIT to build a sustainable infrastructure

The implications. It is expected that other universities will produce their own variations of open course archives, and one of the goals of the MIT project is to help ensure that OCW is easily replicable. To that end, the multi-university Open Knowledge Initiative (OKI) aims to develop structures that are compatible with diverse "learning management system" software.

OpenCourseWare is conceptually straightforward: put course material on the Web and give it away as a worldwide educational resource. The consequences for higher education institutions, both in the US and internationally, are anything but clear:

- Transparency of course materials and methods will allow easier comparison of educational approaches. Will such openness spur beneficial competition, both within and across institutions, to yield improved pedagogical effectiveness?

- With minimal control over copying and adapting material, OCW represents a new approach to exercising the protections of copyright. How will the resulting intellectual property issues be confronted and solved?

- Among the most important beneficiaries may be universities in the developing world. How can OCW materials be made maximally useful for countries with different languages, cultures, and economies?

Such topics comprised the agenda of a forum convened in December 2001, the results of which are summarized here. (See list of participants at the end of the report.)

The Program: OpenCourseWare at MIT

Administrative structures. In April 2001, the OCW concept was announced by MIT president Charles M.Vest. While acknowledging that it "looks counterintuitive in a market-driven world," Vest argued that the program would be "a natural marriage of American higher education and the capabilities of the World Wide Web."[1]

Immediately following the president's announcement, an OCW Implementation Task Force was formed and subsequently recommended the following:[2]

- creation of a professional publishing and service organization to produce OCW materials;

- that organization to be run by an Executive Director with a small core staff;

- coordination of OCW production centrally, with strong ties directly into MIT departments;

- OCW web designers to reside within the departments they serve; and

- a faculty Advisory Board, appointed by the MIT Provost, to provide guidance and coordination to the OCW organization.

Implementation timetable. A pilot phase for OCW was established for the period October 2001 - March 2002, to explore the varying course-related requirements and develop preliminary production processes. A test site was prepared for up to 30 pilot courses, limited to an internal audience for evaluation.[3]

With the transition to a permanent staff in spring 2002, the program moves toward its planned schedule of online milestones:

- September 2002: course materials from 100 subjects on the OCW Web site;

- March 2003: release of course materials from 250 subjects released; and

- September 2003: release of course materials from 500 courses, representing all five of MIT's schools.

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[1] As cited by Michael Schrage, "Brave New World for Higher Education," Technology Review, October 2001. http://www.technologyreview.com/articles/insight1001.asp
[2] From "The OCW Organization," at http://web.mit.edu/ocw/
[3] From "OCW Milestones," at http://web.mit.edu/ocw/

During the initial implementation period, one of the tasks will be to "[a]ssess utilization of OCW materials by users inside and outside of MIT, and establish best practices."[4]

Steady state goals. The production phase, during which the substance of essentially all MIT courses will be posted, is projected to take six years, after which a steady state operation continues and the full cost of OCW is assumed by MIT.[5] It is anticipated that the materials for nearly all of MIT's courses will be included in the OCW program.

While the program's foundation-based funding is for the external applications, those at MIT expect OCW to bring significant internal improvement, department by department. The program is also expected to increase communication across the disciplines and improve transparency across the departments. For example, when instructors of upper division classes can easily access the content of lower division required courses, they can better understand what students can be expected to know.

While the OCW offering is worldwide, the course materials will be provided in English only. MIT will encourage other educational institutions to undertake translations. Outside groups have already expressed interest, with initial prospects for Chinese, Portuguese, Arabic, and Spanish.

Other Institutional Approaches

Other higher education institutions are also exploring innovative programs made possible by new computing and communications technologies. Carnegie Mellon University (CMU), for example, has launched two major educational technology projects, both geared to changing the nature of educational experiences and access.

The first CMU program is oriented toward building a set of high quality, web-based courses emphasizing active learning techniques. The classes, in high-demand subject areas such as microeconomics and statistics, are intended both for post-secondary and advanced high school students. A key part of their development is an ongoing emphasis on ways to improve online learning and to make it sustainable.

One of these courses, in Causal and Statistical Reasoning, is taught largely through online exercises, open-ended experimentation, and assessments. It has already reached a thousand students at four major universities: CMU, the University of Pittsburgh, the University of California San Diego, and the University of Washington. Those students appear to be learning better from this approach than from the traditional lecture-discussion format.

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[4] "MIT OpenCourseWare: A Proposal Submitted to the William and Flora Hewlett Foundation, April 27, 2001," p. 14.
[5] Ibid.

The goal of the second (and much larger) project is "to make the university a learning organization." The Carnegie Mellon Information Space (CMIS) is described as "a knowledge management system for instructional information designed to improve both student and institutional learning." Its implementation involves a major research and development program for the management of large information archives – lectures, demonstrations, workshops, assessments and other course materials – stored for years, but made easily accessible by intelligent search engines.

Princeton University is producing a basic Web site for each of its courses (approximately a thousand per semester), providing a foundation for further development by interested faculty members. In most cases, the non-interactive elements of the site (e.g., discussion sections, grade book access) are to be made available to the public.

To be sure, course Web sites are a common feature at most universities today, and many more institutional examples could be provided. But the comprehensiveness of the practice varies widely, as does the quality of the presentations. The degree of openness to public inspection is even more variable. MIT, CMU and Princeton are part of the first wave in an on-going experiment about the intra- and inter-institutional consequences of the transparency that Web-based materials can permit.[6]

More than technology is involved. Advanced programs involving everything from instructional design to institutional infrastructure imply changes in teaching, collaboration, institutional and individual assessment, privacy, intellectual property, intellectual freedom, institutional strategies, and access to institutions and to learning.

Supportive Technology: The Open Knowledge Initiative

MIT's OpenCourseWare program is described primarily in terms of its goal to make available the basic content of nearly all courses. But MIT and other universities are also concerned with the development of underlying learning management systems (LMS) and related educational tools, to help institutions adapt materials from programs like OCW to their individual circumstances. To this end, MIT is one of several institutions collaborating on OKI: the Open Knowledge Initiative.[7]

OKI's goal is develop public domain software for a robust "course management system" (a.k.a., learning management system), that would provide tools to supplement the many existing commercial CMS/LMS offerings now commonly found on US campuses.

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[6] See, for example, the "World Lecture Hall" free courseware portal of the University of Texas (Austin) at www.utexas.edu/world/lecture

[7] The effort is led by MIT and Stanford University, with partner institutions including Dartmouth College, North Carolina State University, and the Universities of Pennsylvania and Wisconsin. For more information about OKI go to http://web.mit.edu/oki/

Because the software will be "open source," anyone will be able to use or adapt the computer code freely, provided that they make their work available to others. In a sense, the project creates a virtual software-production shop that combines the talents of programmers from campuses across the country. Because the software will be free, it may provide a more affordable alternative for institutions that want to offer online courses but not to invest in a large system.

OKI participants are working closely with affiliates of projects such as the IMS (initially the Instructional Management System) Global Learning Consortium and the Advanced Distributed Learning (ADL) Initiative to comply with emerging courseware standards.

OCW Implications for Traditional Institutions

Traditional colleges and universities – which includes most of US higher education – have long followed a "cottage industry" model: those within each individual institution have defined, designed, implemented, and assessed the entire process of teaching, research, and service as conducted within those walls.

New computing and communications technologies have been used to enhance the existing cottage-based product, rather than to transform production and delivery processes.

In recent years there has been pressure to change that model. The University of Phoenix, other entrepreneurial specialized institutions, and commercial vendors of post-secondary courseware have demonstrated key characteristics of the new approach:

- oriented toward broader (sometimes global) markets;

- focused on functions in which they excel and can compete effectively; and

- building on the strengths of new technology platforms.

Gradually, many old-line colleges and universities are moving into the mode defined by Arthur Levine of Columbia Teachers College as "brick-and-click": to the traditional structure they have added a significant layer of technology-based services. Some have launched virtual universities that operate entirely online.[8]

With its OpenCourseWare initiative MIT is using the same technologies to pursue a different path. Other institutions seek to enroll students in *their* courses and programs; MIT is giving the substance of its courses to others, inviting them to make appropriate local adaptations.

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[8] See, for example, OnlineLearning.net, a joint effort of the University of California at San Diego and the University of California at Los Angeles Extension, at http://onlinelearning.net/

It has been suggested that that many will face pressure to use the MIT material, on the assumption that courseware from an institution of MIT's stature must be the best available choice. MIT, of course, makes no such claim: material prepared by *its* faculty for *its* students will not be appropriate for all others. It is offered as a potentially useful library of ideas, examples, and references.

Furthermore, those who are creating the MIT program envision the advent of comparable initiatives by other major universities. One can imagine a virtual global intellectual community, made up of a worldwide network of participating institutions.

In many ways the success of OCW will be measured by the skill of local instructors who use the courseware as a professional resource, building it appropriately into courses designed for *their* population of students, the cultures reflected in *their* institutions, and advancing *their* specific curricula.

In designing their courses these faculty members now incorporate textbooks and audiovisual materials. MIT, and the other institutions which follow it with OCW-like efforts, will provide a wealth of courseware for the consideration of faculty users.

The adaptations required will vary from population to population. Models or benchmarks appropriate to specific instructional situations will be developed by interested faculties. OCW does not aspire to be a master curriculum. It is an academic resource, one of many.

Independent students may also use the OCW materials. OCW potentially removes geographic and economic barriers to such self-directed learning. It remains to be seen, however, how successfully individual learners will be able to navigate portions of the MIT curriculum with little or no guidance. And students who master MIT course content through OCW may become frustrated because they are not eligible for MIT course credit or degrees.

OCW Implications for Copyright Law

Balancing incentives and benefits. Publication of OCW materials on the Web does not constitute a full transfer to the public domain. Rather, the copyright owner(s) will grant blanket permission for a wide range of non-commercial uses, with only a requirement for proper attribution. Any commercial uses will still require an explicit written license.[9]

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[9] Consistent with traditional MIT policies, the intellectual property agreement concerning OCW guarantees MIT the right of free distribution. When members of the MIT faculty prepare OCW materials without requiring significant MIT resources, they retain the copyright over the materials but grant MIT a perpetual, non-exclusive right to use and distribute them for noncommercial purposes. If significant Institute resources are required, MIT retains the copyright. If someone other than a faculty member prepares OCW materials – for example, a student taking notes – MIT will retain the copyright, and the faculty member will be granted perpetual, non-exclusive rights to use the materials. If a student's course work is placed on the OCW site, with the permission of the student, the copyright will remain with the student, and the

OCW fits very well in the long tradition of American copyright law. That law has as its purpose the advancement of knowledge. So does academe.

Copyright achieves its purpose by balancing the interests of copyright owners with the interests of the public. It provides an incentive to authors to encourage them to create; however, the works must be distributed and available for use so that the public may build on the increased knowledge.

Academe holds out the incentives of promotion and tenure in exchange for the creation of knowledge. It also requires the application of that knowledge to pedagogical ends, so that future generations of scholars are also produced.

The copyright owner's incentive is that set of exclusive rights we grant authors to control the use and exploitation of their works, exercised for the most part through control over production and distribution of copies and over public performance and displays.

Control over copies and distribution is critical to the creation of works when costs of production and distribution must be recovered from sales of copies or of opportunities to experience the work. On the other hand, the number of works created irrespective of the direct economic incentive is staggering and far exceeds those created because of the incentive. For this latter group, reimbursement has little effect on supply.

Any original work is protected from the moment it is fixed in a tangible medium. Everything is protected automatically, even works the author cares nothing about protecting. Relaxation of those automatic rights can serve the public, often at little opportunity cost for the creator. In OCW a policy decision was taken that control over copies and distribution would be minimal.

Technological gains and losses. Today it is more urgent than ever to examine reasons why works are created and distributed. The easy, essentially perfect replication that digital technology now affords has made it very difficult for owners to control copying of their works. As a consequence, many are now seeking legal mandates for technical countermeasures that would, if effective, dramatically restrict the public's access to and use of copyrighted works.

It is not at all clear that granting copyright owners such increased levels of control will actually benefit most authors substantially. But it could dramatically undermine the advancement of knowledge that is copyright's central concern.

OCW can be thought of as an experiment in taking copyright controls in another direction: making available a generous quantity of high quality copyrighted works

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student must grant MIT a perpetual, non-exclusive right to use the materials as part of OCW. "MIT OpenCourseWare: A Proposal Submitted to the William and Flora Hewlett Foundation, April 27, 2001," pp. 7-8.

without control over copies.[10] If OCW demonstrates that controlling copies is not always necessary to the advancement of knowledge – *or* making a living, at least in this sector of the economy – it may be the most valuable lesson that the project provides.

This is not to say that there will not be losers, costs, and disadvantages to this undertaking. By foregoing control over copies, authors will in some cases risk a loss of attribution. Authors can try to control this, but they may be only partly successful. Similarly, authors may wish to control commercial exploitation of their works, but this may be difficult.

Indeed, some exploitation will be legally uncontrollable – the use of ideas described in freely accessible works – but this kind of exploitation is precisely what is contemplated when we acknowledge that ideas are the common property of us all.

Offering OpenCourseWare Worldwide

Web distribution will make OCW materials available everywhere, not just in the US. While adding to the stock of free course content available to all can have obvious benefits anywhere, many questions remain.

Navigating around problems in the availability of telecommunication services and the economics of Web access, arranging for language translation and adjusting for cultural differences, adapting to variations in education systems, overcoming legal and regulatory constraints, and a host of other related issues, will all present challenges.

Technology infrastructure issues. One of the constraints on the global distribution of OCW will be the disparity in bandwidth available to diverse populations. Approximately three billion people have no telecommunication network connection, and nations are attempting to catch up by applying everything from packet radio and multipoint microwave to small aperture satellite networks.

None of these new technologies guarantees simple Web access for the individual user, nor assures the availability of computers and training in their use. In many areas telecommunication service can be available but not affordable for ordinary citizens; publicly available computer facilities can be very limited or non-existent. In spite of pressures to reduce costs for educational applications, the limited support available for such services continues to be a basic fact of life.

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[10] John Lienhard, an MIT professor of mechanical engineering, noted that by publishing his undergraduate heat transfer textbook online, the reach of his ideas is much broader than would have been the case had he published the book in the traditional way. (That is, treating his book as a commodity, controlling copies to recover the costs of production and distribution and earning a profit for his publisher.) He, of course, will not receive any royalties. These are not, however, what he depends on to make his living.

OCW developers recognize the problems inherent in bandwidth limitations in particular. Many types of course material can be expected to use bandwidth generously. Text-only versions of Web sites, often necessary to make it possible for disabled persons to access the material, may provide an alternative for some courses. Distribution of CDs rather than online media may also help, although some course materials change frequently enough that using fixed media would introduce another set of logistical and cost concerns.

The availability of appropriate and affordable software is another potential problem. Among developing countries there is understandable interest in the rise of open source software, when both cost and availability are chronic concerns. Initiatives like OKI may be very important in meeting this challenge.

Politics, culture, and language. While one can anticipate that MIT's open courseware will be widely welcomed, a range of political and cultural factors related to individual countries, regions, or beliefs are likely to arise:

- MIT will make OCW available only in English. Groups are already expressing an interest in translations, but completion of such efforts may delay initial adoption, and limit the diffusion of subsequent course revisions.

- Some countries restrict the import of information-related material from the US, as part of resistance to perceived "cultural imperialism." Even with adjustment of materials by local adopters, the "made in US" label may impede wider use.

- Relatedly, some material may be found offensive in some countries. MIT has taken the position that it will not alter content, but local adapters may of course choose to do so to meet local sensibilities.

Those responsible for the OpenCourseWare initiative recognize that the ideas and images in OCW material might not be acceptable in every country with Web access or to every potential user in any country. It will be possible for users to register comments, objections, and observations for any OCW material. But the right to free academic expression remains with the individual professor who creates the course.

Differences in educational systems. Materials from OCW and related projects may come to be a valuable resource worldwide, but it can never offer a cookie-cutter pattern for local courses. The reasons are straightforward:

- The OCW materials are designed with the general profile of the MIT student in mind. That profile doesn't fit most other students, in the US or elsewhere.

- Different systems take different approaches to coursework. In some countries, for example, there is more emphasis on classroom-based work, with correspondingly less expected outside.

- It will be important for MIT not to become an overwhelming presence vis-à-vis the local university in a developing country (or indeed local universities in the US).

As noted, OCW success in a developing country will depend on technical access. But it also requires users who are informed of its availability, acquainted with its content, and prepared to adapt it appropriately to the *their* needs, within the context of *their* institutions.

Significant commitment by local faculty, learners, and institutions is required. Additional technical solutions, such as "courseware portals" that provide an index into materials from multiple OCW-like projects, may also be needed.

International copyright issues. As noted, OCW materials may be freely used for non-commercial purposes, provided there is appropriate attribution; an explicit license will be required for any commercial applications.

This seemingly straightforward arrangement is complicated by the differences in various nations' statutes, as well as the need to make the copyright owner's intent clear to individuals and institutions wherever they are and whatever languages they use.

The legal differences can be important. For example, many applications of copyrighted material by classroom teachers in the U.S. are protected under the law's provisions for "fair use." Such a provision is largely unknown elsewhere (and it is under pressure in the US as well, for reasons discussed previously).

A process being fostered by UNESCO may ease the problem for users of OCW and a multitude of other programs, particularly in developing countries. Late in November 2001 UNESCO convened in Paris the Consultation on Facilitating Access to International Information Resources in Developing Countries. Leading its concluding "Recommendations and Declaration" document was a statement recognizing that "Securing copyright permissions is often onerous and complex, particularly for users in developing countries."

The group proposed that a standardized set of copyright permissions, indicated by a set of internationally recognized symbols, should be agreed upon and promulgated.[11] One of the virtues of such a system would be that the ground-rules could be made clear without the need for prospective users to contact copyright owners or their surrogates.

Protecting – and perceiving – quality. The OpenCourseWare program will not be alone in the international intellectual marketplace. How can potential users decide among the

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[11] Consultation on Facilitating Access to International Information Resources in Developing Countries: Recommendations and Declaration, Legal Framework for Access, Sec. 1.1, UNESCO House, Paris, 29-30 November 2001.

options offered? Some will recognize the MIT brand; others will be attracted by the price; many will follow the advice of colleagues; some will carefully determine whether the material matches the local requirement.

Among the recommendations from the UNESCO Consultation is a section on "Promoting availability of information on quality." With particular reference to developing countries it recommends:

> 5.1 Methodologies for ensuring and evaluating information quality should be catalogued and analysed. UNESCO should exercise a clearinghouse function for quality standards, and make an inventory of best practices for methods used for identifying the quality of information resources.
>
> 5.2 Indications of the quality of information (e.g. peer review, user evaluation, etc.) should be provided for in metadata or otherwise.
>
> 5.3 UNESCO should mobilize other agencies and other concerned parties in defining essential information and achieving universal access to it through the appropriate means.[12]

(Capabilities for the measurement of quality will obviously be important for the US market as well.)

Measuring the Effects of OpenCourseWare

If OCW is to be freely available, intended for use worldwide with as little constraint as feasible, how will its creators measure its effects? How is the material actually used, and by whom? Are other open courseware projects linking to it – and if so, are they links that MIT would welcome?

OCW at MIT. As noted, there are several expectations for the program within MIT:

- improve teaching and learning by encouraging reflection about course substance, since much of it will be publicly online;

- permit more effective upper division course design, since so much information about lower division required courses will be readily available; and

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[12] Ibid. Sec. 5, Promoting availability of information on quality.

- improve transparency of the departments, increasing communication across disciplines.

Evaluation methods to capture improvements in these dimensions will need to be refined.

OCW beyond MIT. As the OpenCourseWare offerings become available globally, it will be critical to understand how they are received.

Is the content useful (for whom, under what conditions)? Is the technical and pedagogical approach to the material useful? What models must be developed to understand the costs, virtues and flaws, and local impacts of OCW and its associated systems?

It will be important to understand the uses made of OCW material by a wide range of users. But how does one collect the information? Requiring users to register, even if they incur no cost in doing so, creates barriers. Some will fear loss of privacy; others may have cultural concerns or issues related to local politics. (Even if registration is used, it can be expected that in some situations one individual will register on behalf of a group.)

Several methods of data collection have been considered:

- In spite of the difficulties, some form of free registration may turn out to be necessary if sufficient information is to be generated. Users might be induced to register voluntarily in order to gain access to an OCW discussion forum or receive a newsletter.

- Perhaps subnets of OCW users could be identified, some required to register and others not, in order to make possible a reasonable inference concerning the extent of the problem.

- Including questions on an OCW Web site could result in useful responses.

- Some valuable information might be gained by surveying groups of faculty members who make use of the material. Other kinds of "quasi-partnerships" could also be helpful. Discussion forums could be established for participating user groups.

- Ongoing surveys of higher education institutions could include questions concerning OCW: Are their faculties aware of it? Are they using it? How? What are their reactions to it?

- Consortia of institutions or professional groups exist in many areas of the world. Some of them could be used to facilitate evaluative research.

- Specific experiments could be conducted, such as following the effects of key courses over time using search engines (and relying on embedded "digital watermarks" in course materials).

Quality control. As the ideas behind MIT's program of freely available material take root, links and alliances can be anticipated. Many will advance the cause of sharing important educational information. But some could verge on fraudulent use, as those with questionable motives offering products that appear to have the endorsement of MIT.

While protecting its goal of widespread free use, it will be necessary for MIT to establish firm standards and criteria for the further use of its courseware. A watchful eye on the evolving marketplace will be necessary.

Conclusion

College students increasingly expect Web-based materials for their courses, and higher education institutions across the US are in the process of implementing structures to meet that demand. But such publication can be – indeed, often is – limited to the institution's own users. The Web *can* be an open medium, but it is not always used that way.

MIT's OpenCourseWare program represents an alternative, open approach to Web publication. That contribution alone is likely to have great value, simply from the availability of MIT's own course offerings. It remains to be seen whether that openness will spur a new openness in the approaches of other institutions, and, as a consequence, a new wealth of instantly available, free course materials.

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Gary Whitehouse, University of Central Florida

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Web links

Advanced Distributed Learning Initiative	www.adlnet.org
Andrew W. Mellon Foundation	www.mellon.org
Carnegie Mellon University	www.cmu.edu
IMS Global Learning Consortium	www.imsproject.org
MIT OpenCourseWare	web.mit.edu/ocw
MIT OpenKnowledge Initiative	web.mit.edu/oki
OnlineLearning.net	onlinelearning.net
Princeton University	www.princeton.edu
Sharable Courseware Object Reference Model (SCORM)	www.adlnet.org
UNESCO Communication and Information	www.unesco.org/webworld
UNESCO Web Portal for Higher Education	unesco.uaeu.ac.ae/wportal/default.htm
University of Texas at Austin World Lecture Hall	www.utexas.edu/world/lecture
Western Interstate Commission for Higher Education	www.wiche.edu
William and Flora Hewlett Foundation	www.hewlett.org