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Moving to Open Educational Resources at Athabasca University: A Case Study

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Article abstract

Since the birth of the World Wide Web, educators have been exchanging ideas and sharing resources online. They are all aware of the turmoil in higher education created by freely available content, including some hopeful developments charted in this issue. Interest has grown steadily over the past decade in making a university-level education openly available to students around the globe who would otherwise be overlooked, and recommendations for how to do this are well documented (e.g., UNESCO, 2002; OECD, 2007). Initiatives in the United States (Thille, 2012), Canada (Stacey, 2011b), Africa (OER Africa, n.d.), and the United Kingdom (JISC, 2012) are easily accessed and case studies abound (e.g., Barrett, Grover, Janowski, van Lavieren, Ojo, & Schmidt, 2009). Supporting the widespread availability of OER is a goal that Athabasca University (AU) has embraced through association with the Commonwealth of Learning and by becoming a charter member of the OER University (OERu, 2011). The use of OER in AU programs has strategic local implications that go beyond the five reasons for institutions to engage in OER projects described by Hylén (2006). Recently at AU explorations have begun into the potential of using OER in course design and production.

Moving to Open Educational Resources at Athabasca University : A Case Study

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Keywords : Open education resources; course design; course production

Introduction

As leading open education advocate Stephen Downes (2007) notes, understanding the sustainability of OER includes knowing "what they are, who creates them, how we pay for this, how we distribute them, and how we work with them" (p. 29). This article reviews briefly what they are and looks at the other questions with respect to the AU case. It describes the context within which AU provides teaching and learning services, including the challenges and opportunities that have led it to consider moving to OER. It outlines the design theory and instructional principles underpinning completed OER projects, with a brief illustration using two examples. The article concludes with a description of the current plan and expected next steps towards including OER in large numbers of AU online courses.

The AU Context

As is the case for all Canadian universities, Athabasca University is provincially accredited. It is a comprehensive research university with distance education as its mandate. AU is also an open university. When it was founded in 1972, "open" meant primarily that the university was committed to removing barriers that restricted learner access. But the notion of openness as a philosophical stance has continued to influence policy on diverse matters. For some time, in addition to open admission, the university has had a philosophical and practical commitment to using open source software; it also supports open-access scholarship and research publishing.

Reflecting its mission to serve non-traditional students in Alberta and beyond, AU is one of the small number of universities that have no entrance requirements for undergraduate programs. The university does provide screening self-tests to help students decide which level they are prepared for in subjects such as math and English, and individual courses do have prerequisites. The year-round registration policy enables learners to begin courses on the first day of any month, completing them at their own pace. This open, continuous admissions policy is the first degree of openness at AU, "which admits students without regard to their previous educational background or achievements. To enter Athabasca University as an undergraduate student, you must be 16 or older. No other conditions apply" (Athabasca University, 2009).

The second area of AU's commitment to openness is the use of open source software. As an institution for which technology is the infrastructure for teaching and learning—AU classrooms are virtual—open software, such as Moodle, Alfresco, Mahara, and Elgg, allows systems to be customized to meet backend integration needs that are fundamentally different from those of most universities. Athabasca University is active in the international Moodle community; for example, AU's adaptations of the base code have been added to the Moodle resource pool, and AU has hosted three Moodle Moot conferences since 2007.

A third category of openness at Athabasca University is open access to scholarship. In 2006 an open access research policy was established that encourages faculty and staff to deposit their publications in a digital repository conforming to international open access standards. Currently AUSpace, an institutional configuration of DSpace, is used for this purpose. Athabasca University Press — "the first scholarly press to be established by a Canadian university in the twenty-first century" — is an open access scholarly press "dedicated to the dissemination of knowledge and research through open access digital journals and monographs, as well as through new electronic media" (Athabasca University, 2008). In further support of the AU mission of overcoming barriers, AU Press also encourages emerging writers and researchers by publishing their scholarship.

AU researchers collaborate with academic colleagues across the world in projects that share data and results. Under the auspices of the Technology Enhanced Knowledge Research Institute (TEKRI), research resources are being dedicated to open education as well as support for the massive open online courses (MOOCs) that George Siemens and his colleagues have pioneered (McAuley et al., 2010).

Initiatives in course development using OER commenced with an external grant (2009–2011) that funded the development of 25 digital enhancements for 17 high-enrolment courses. Many of these enhancements are licensed through Creative Commons and available in learning object repositories for others to use or adapt. The award in 2011 of the UNESCO/Commonwealth of Learning Chair in Open Educational Resources (Athabasca University, 2011) to Athabasca University has been a further catalyst, inspiring recent development and implementation activities related to OER. Responsible for capacity building on institutional, national, and international levels, the Chair collaborates with partners and networks to support awareness, training, and research activities as well as the use of OER.

Challenges and Opportunities

Athabasca University is facing a number of challenges related to its transformation from a twentieth-century distance education university delivering mainly print-based course materials with tutor support to an innovative online university that engages students in dynamic and interactive learning environments. Digital learners in the twenty-first century have high expectations for anywhere, anytime service (Gabriel et al., 2012; Oblinger & Oblinger, 2005). Academic and administrative systems at AU need to be completely re-conceptualized to support online learning. Some faculty and staff are reluctant to embrace the changes needed to move teaching and learning into a digital environment. Others lack the skills needed to adopt new practices. Opportunities to address these challenges are being sought while courses are being redesigned for the online world.

The cost of course materials, particularly textbooks and online learning resources, is rising faster than enrolment revenue and is contributing to already tight budget pressures of declining provincial funding, inadequate ICT infrastructure, and rising

employment services costs. Another challenge to course development is the recent threat from the Canadian copyright collective, ACCESS Copyright. Its new fee structure is proposed to increase the licensing cost to include third-party materials in online courses from $3.38 to $45.00 per full-time-equivalent student. AU is unwilling to pass the increased costs on to students and unable to incorporate the new tariff into existing practices, especially as ACCESS proposes to include charges for internet resources and links to Web sites that are already openly available. While educational publishers now offer digital learning resources through companion Web sites and learning support systems, the terms of access frequently cannot accommodate AU's continuous enrolment practices. Access agreements tend to be based on the semester or academic year typical of traditional universities. And the cost of these resources is often prohibitive for courses with lower enrolments.

Regarding intellectual property, AU owns all aspects of all its courses; copyright concerns are limited to the use of third-party materials embedded in courses (any source can be linked to without obtaining copyright clearance). In response to uncertainty in the permissions arena, AU is moving away from third-party resources that cannot be directly accessed in digital form—this is a long-term strategy which is quite different from historical practice. Advocates of OER within the university have proposed including priority for OER in the course development policy currently under review to bring it up to date with online teaching and learning. They believe it will speed up production and reduce costs significantly. The possibilities are just beginning to be tested.

Thus OER have become an attractive option. For a university in transition from print-based to digital course development, the prospect of having conversations in the academic community about digital resources is a real advantage. OER offer us a chance to collaboratively explore new ideas and to test new course development and production approaches that better support an online teaching and learning environment. These discussions are helping course developers at AU consider alternative sources for content and activities in support of learning outcomes. Improved quality in our courses is already evident. For example, faculty members are adding RSS feeds of free online information that provide updates on rapidly changing topics; students are motivated by the invitation to contribute resources they have found to the course content; rich image and video illustrations help to create an appealing, supportive learning environment. And members of course development teams are now working collaboratively on the development of engaging learning objects to make these environments more interactive with the idea that these may be shared as OER.

Designing Open Educational Resources

AU course designers and developers are influenced by a number of learning and instructional theories, and have established design principles aligned to these models. While much of the potential value of OER is expressed as easier, less costly access to content (Caswell et al., 2008; D'Antoni, 2009) AU learning designers also focus on the

potential of OER as resources for learning *activities*. One reason for this strategy is the desire to address a traditional weakness of distance education – low learner persistence. It is well established that interactive learning can enhance student motivation in an online world (Keller & Suzuki, 2004; Hamada, 2008; Clark & Mayer, 2011). Another reason emerges from a conception, supported by various learning theories, of learners as active co-constructors of their own knowledge rather than as passive recipients of the knowledge of others (Jonassen & Land, 2000).

AU learning designers do not emphasize the structuring and presentation of content; rather, the course design process begins with an exploration of the most difficult concepts and content in the course to be revised or created. Attention and resources are focused where they will support students' learning outcomes most effectively as well as address overarching needs for various literacy and lifelong learning skills. Since online courses are easily updated, formative evaluation is incorporated in an iterative design process (Scriven, 1996) for ongoing improvement.

The learning design approach at AU consciously attempts to apply design principles that can be inferred from recent research in learning sciences. To structure interaction, the guidelines for increasing motivation advanced by Keller's ARCS framework are followed: attention, relevance, confidence, and success (Keller & Suzuki, 2004). Since attention is often captured through images, multimedia, and other visual features including page layout, Mayer's (2005) principles of multimedia learning are considered good practice for online design. Application of the learning design approach to educational resource development is influenced by the work of Graínne Conole and her colleagues in the UK and Australia (Conole, 2010).

Suggesting that learning is enhanced for students when interaction is present, Anderson (2003) proposes a three-part model. Learning requires student interaction with instructors, classmates, and/or content. Tutors are encouraged to demonstrate teaching presence (Anderson, Rourke, Garrison, & Archer, 2001), but the current AU tutor model limits student–instructor interaction. Interaction with classmates has been difficult to facilitate in AU's self-paced courses. New students can enter the course every month, so there is no stable cohort. Therefore in the past, course design resources were focused primarily on interaction with content. However the development of the Landing, Athabasca University's Elgg-based social learning environment, has provided a way for course professors to add a significant social learning dimension to AU courses. Students can interact with one another and with instructors to share ideas and resources in a dynamic virtual meeting place. Inviting students to informally contribute course content via the Landing seems to be both motivating and engaging. It is anticipated that interactive content that can both be used by AU and shared as OER will increasingly be complemented by social learning activities on the Landing.

Storytelling and linking to resources that connect content with real-life experiences are encouraged. Quizzes and self-tests that allow students to assess their new knowledge are produced in collaboration with subject matter experts. Through opportunities to

practice with automatic feedback (Kluger & DeNisi, 1998), learners are gradually led to a sense of accomplishment that will stick through their assignments and examinations. While students' learning needs are supported as much as possible, mental effort is necessary, and students need to commit to working on their learning. The motivation that comes from engagement (Clark, 1999) will help support students' success. The research results on self-regulation in education (Weinstein, Husman, & Dierking, 2000; Winne, 1995; Zimmerman, 2008) have inspired AU learning designers to explore opportunities to embed learning strategies that support this in self-paced courses. Other design principles underpinning course development work include attention to inclusive design (Treviranus & Coombs, 2000) through simple navigation, captioning of audiovisual material, and other techniques that allow students with disabilities to successfully learn from AU courses.

With respect to OER specifically and other generally innovative approaches to course development, design-based research methods (Sandoval & Bell, 2004) are used to guide pilot projects. Design-based research provides several methodological advantages for the design and assessment of innovations in education. It is systematic and iterative, in line with emerging understanding of how people learn; it is based in real-life educational situations and is therefore relevant to teaching and design practitioners; and it encourages researchers and practitioners to work collaboratively to create and assess the impact of solutions to learning problems. This approach provides opportunities to monitor the progress of organizational change against goals for enhancing learning success.

Examples

As a first step towards using OER consistently in course development across the disciplines and to learn more about the potential of OER, AU piloted their creation and use in three projects. In 2007–2009 a set of five just-in-time learning activities for calculus students having difficulty with basic algebra concepts was produced, licensed with Creative Commons, and shared in learning object repositories. With funding from the Inukshuk Foundation, Carnegie Mellon University's open source Cognitive Tutor Authoring Tool (part of the Open Learning Initiative [Carnegie Mellon University, 2011], funded by the Hewlett Foundation) was adapted as the Athabasca University Tutor Authoring Tool (AUTAT). This tool allows instructors to insert their own variables, creating an infinite pool of practice questions. The algebra activities were contributed to the Merlot, Currriki, and WikiEducator OER repositories, as was the code for the AUTAT tool itself. In 2009, a physics course on waves was created using MIT open courseware adapted to the needs of AU students. And finally, in 2010, a group of researchers from TEKRI collaborated with colleagues at the University of the West Indies to find and aggregate open materials for adaptation and inclusion in a graduate program in instructional design (Richards, Marshall, Elias, Quirk, Ives, & Siemens, 2010).

The success of these initial experiments led to a much larger scale project in 2010−2011. Funded by the Community Adjustment Fund through the government of Canada's Western Economic Diversification program that supported the digitization of course materials, 25 online enhancements for 17 of AU's highest-enrolment undergraduate courses were designed and developed. The subject areas included management, accounting, finance, calculus, biology, music, communications, psychology, nursing, and languages. Teams of learning designers, subject matter experts, visual designers, and programmers collaborated on digital learning enhancements following the design guidelines described above. The enhancements included podcasts, interactive tutorials, crosswords, videos, visualization exercises, and multimedia learning objects of various types. While not all of the learning objects qualify as OER due to the nature of their content or format, several of them have already been repurposed for use in other courses. Most of them have been licensed with CC-BY licenses and, in line with UNESCO (2002) recommendations, are available to anyone on AU's open courseware site at http://ocw.athabascau.ca. Eventually they will also be contributed to the same learning object repositories as the algebra modules.

Expert reviews of most of the OER produced have been completed, and authoring interfaces for many of the resources are currently being developed. Later, with the results from formal formative evaluations with students, they will be improved using these authoring interfaces. These interfaces, or "editors," will be released as well, since they are being designed to support future development and improvement by non-programmers.

Two examples will illustrate the value of attention to the authoring interfaces and openness to the process of ongoing improvement. First, the functionality of the AUTAT and usability of the open source MathML editor used to generate Flash tutorials were increased, and an AU XML editor was created. This editor simplifies the process of adapting the tool to alternate topics or disciplines. This new tool was demonstrated at the Open Education Conference in Utah in October 2011 (Ives, Graham, & Manuel, 2011), and several potential beta testers were identified. The source code and documentation will be provided to them so they can explore the possibilities of repurposing the learning activities and authoring interfaces in their own context. It is anticipated that suggestions for improvement will emerge from these tests.

The second example is a decision tree initially created for a psychology course in counseling. While the application turned out to be too complex for learners in this course to use, it was adapted as a different kind of learning tree for a biology course. It now lives as a bacteria classification tool, complemented by case studies that lead students through the interactive identification exercises. Since the project ended, the object has been further developed as an iPad app in an exploration of AU's capacity for developing mobile learning applications. Further development is planned for Android devices. It is hoped that testing with students and tutors will help confirm the observation that the tactile element of this learning resource engages students and helps them learn. The authoring interface for this tool will also be made available soon.

The investment in institutional and individual learning about OER to date has been substantial, but further commitments of time and training are necessary to approach sustainable practice (Wiley, 2007). In time AU will be in a position to determine how fully the promise of OER is likely to be realized in this context.

Next Steps

In response to the challenges facing AU as it transforms the university and to the opportunities offered by open educational resources, an OER plan that captures AU's strategic and operational approach over the next couple of years has been prepared. The plan includes a series of workshops and community conversations designed for internal learning and capacity building across the university. AU has already hosted visiting OER advocates, including Rory McGreal and Wayne Mackintosh, and sponsored group participation of AU faculty and staff in the Educause Learning Initiative fall 2011 virtual seminar "Open Educational Content: Addressing Challenges and Seizing Opportunities". In future sessions, learning designers and academics will be exploring the potential of OER in their disciplines. They need to learn how to effectively search for, identify, evaluate, and determine whether to use or repurpose open resources as content and activities for online courses. They may need to acquire technical skills to accomplish the re-use of what they find.

The plan also includes a series of showcases and demonstrations of OER already developed and integrated into courses, with results from student and tutor feedback. These presentations will share experience gained to date and stimulate ideas about how using OER in course design may improve productivity (Thillle, 2012) by reducing costs, speeding up development, and offering students opportunities for engagement with learning resources in ways that should keep them interested in their studies and focused on their learning.

Newly created web resources to be linked from a variety of AU Web sites, including the Centre for Learning Design and Development (CLDD), the Research Centre, TEKRI, and the Library, will support the virtual and in-person showcases and workshops. An inventory of existing OER is being developed for general access through an open repository. Other visiting experts and OER champions will present lectures and seminars. Open Access Week 2011 and 2012 activities showcased the current state of affairs in all things open at AU. Staff members with expertise in open access are encouraged to participate in conferences and other opportunities for professional development in this area and to share their new learning with colleagues across the university. Design-based research projects are under way, and a survey of the perspectives of university faculty and staff on OER was delivered in the fall of 2012. The results not only provide a benchmark against which we are able to measure awareness and adoption, but also serve as an OER readiness tool.

Conclusion

As an open university, AU observes openness through commitment to open administration (which includes open admission and continuous enrolment). Other practices include the use of open source software, the provision of open access to scholarship, the prioritization of open educational resources, the practice of open research, and the exploration of open pedagogies (including hosting of massive open online courses). This characterization, inspired by the key components of Stacey's "University of Open" (Stacey, 2011a), adapts his ideas to the AU context and extends the definition of what it means to be an open university.

To date most of the activity at AU in OER has been uncoordinated and unreported. This article aimed to gather information on advancements together in one place to provide a benchmark against which to measure future progress. The AU experience so far has shown that the shift from static proprietary content to dynamic learning environments populated by openly available learning resources needs to be approached as a systemic change with complex and often unanticipated ramifications. Like a brain developing new neural connections, the institution has to open new channels of communication amongst faculty, course designers, course developers, and copyright officers. For example, it is now more acceptable to link directly to an online video or open tutorial whereas in the recent past, all required course content had to be housed on University servers. The focus has shifted to evaluating the reliability of free resources and accepting a certain level of risk with respect to permanence. For externally produced OER such as Carnegie Mellon's Cognitive Tutor Authoring Tool that can be appropriated and repurposed, the necessary staff technical expertise needs to be fostered. In addition to basic quality of OER, features such as availability of base code, ease of repurposing, and appropriate Creative Commons licensing all must be considered.

Building on the research and practice of online educators and proponents of open educational resources around the world, Athabasca University is positioning itself for greater involvement in the development, adoption, and inclusion of OER into its courses. Wiley (2007) points out that "open educational resource projects must be explicit in stating their goals and tenacious in focusing on them." AU's recent pilot projects are consistent with its mission to remove barriers that restrict access and limit success in university-level study. Through a commitment to both increased equality and quality of educational opportunity for adult learners worldwide, AU is opening up many aspects of university practice, including course development. Issues such as sustainability (Wiley, 2007) and productivity (Thille, 2012) will guide the strategy for future OER practices at AU.

References

Anderson, T. (2003). Getting the mix right again: An updated and theoretical rationale for interaction. *International Review of Research in Open and Distance Learning, 4*(2). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/149/230

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context. *Journal of Asynchronous Learning Networks, 5*(2). Retrieved from http://sloanconsortium.org/sites/default/files/v5n2_anderson_1.pdf

Athabasca University. (2011). UNESCO/COL Chair in Open Educational Resources (OER). Retrieved from https://unescochair.athabascau.ca

Athabasca University. (2009). About AU: Open university. Retrieved from http://www2.athabascau.ca/aboutau/openuniversity.php

Athabasca University. (2008). Athabasca University Press: About the press. Retrieved from http://www.aupress.ca/index.php/about/

Barrett, B. F. D., Grover, V. I., Janowski, T., van Lavieren, H., Ojo, A., Schmidt, P. (2009). Challenges in the adoption and use of OpenCourseWare: Experience of the United Nations University. *Open Learning: The Journal of Open and Distance Learning, 24*(1). Retrieved from http://www.tandfonline.com/doi/full/10.1080/02680510802627803

Carnegie Mellon University. (2011). Open Learning Initiative. Retrieved from http://oli.web.cmu.edu/openlearning

Caswell, T., Henson, S., Jensen, M., & Wiley, D. (2008). Open educational resources: Enabling universal education. *The International Review of Research in Open and Distance Learning, 9*(1), 1–11.

Clark, R. C., & Mayer, R. E. (2011). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (3rd ed.). John Wiley & Sons.

Clark, R. E. (1999). The CaNE model of work motivation: A two-stage process of goal commitment and mental effort. In J. Lowyck (Ed.), *Trends in corporate training*. Leuven, Belgium: U of Leuven Press.

Conole, G. (2010, June). *Learning design – Making practice explicit*. Paper presented at the ConnectEd Conference, Sydney, Australia. Retrieved from http://cloudworks.ac.uk/cloud/view/4001

D'Antoni, S. (2009). Open educational resources: Reviewing initiatives and issues. *Open Learning: The Journal of Open and Distance Learning. Special Issue: Open Educational Resources, 24*(1), 3–10. doi: 10.1080/02680510802625443

Downes, S. (2007). Models for sustainable open educational resources. *Interdisciplinary Journal of Knowledge and Learning Objects, 3*, 29–44. Retrieved from the National Research Council Canada website: http://nparc.cisti-icist.nrc-cnrc.gc.ca/npsi/ctrl?action=shwart&index=an&req=5764249&lang=en

Gabriel, M., Campbell, B., Wiebe, S., MacDonald, R. J., & McAuley, A. (2012). The role of digital technologies in learning: Expectations of first year university students. *Canadian Journal of Learning and Technology, 38*(1). Retrieved from http://www.cjlt.ca/index.php/cjlt/article/view/637.

Hamada, M. (2008). An integrated virtual environment for active and collaborative e-learning in theory of computation. *IEEE Transactions on Learning Technologies, 1*(2), 117–130.

Hylén, J. (2006). *Open educational resources: Opportunities and challenges* (Report for OECD). Retrieved from www.oecd.org/dataoecd/5/47/37351085.pdf

Ives, C., Graham, R., & Manuel, C. (2011, October). Online learning enhancements at Athabasca University. Poster presented at Open Education 2011. Park City UT.

JISC. (2012). Academy/JISC Open Educational Resources Programme Phase 3. Retrieved from http://www.jisc.ac.uk/whatwedo/programmes/ukoer3.aspx

Jonassen, D. H., & Land, S. M. (Eds.) (2000). *Theoretical foundations of learning environments.* Lawrence Erlbaum Associates.

Keller, J., & Suzuki, K. (2004). Learner motivation and e-learning design: A multinationally validated process. *Journal of Educational Media, 29*(3), 229–239.

Kluger, A., & DeNisi, A. (1998). Feedback interventions. Toward the understanding of a double-edged sword. *Current Directions in Psychological Science, 7*(3), 67–72.

Mayer, R. E., (Ed.). (2005). *The Cambridge handbook of multimedia learning.* New York: Cambridge University Press.

McAuley, A., Stewart, B., Siemens, G., & Cormier, D. (2010). The MOOC model for digital practice [Web log post]. Retrieved from http://davecormier.com/edblog/wp-content/uploads/MOOC_Final.pdf

Oblinger, D., & Oblinger, J. (Eds.). (2005). Educating the net generation. *EDUCAUSE*. Retrieved from http://www.educause.edu/educatingthenetgen/5989

OER Africa (n.d.). OER initiatives in Africa. Retrieved from http://www.oerafrica.org/OERInitiativesinAfrica/tabid/296/Default.aspx

OER University (2012). OER University. Retrieved from http://wikieducator.org/OER_university/Home

Richards, G., Marshall, S., Elias, T., Quirk, D., Ives, C., & Siemens, G. (2010). Developing university courses with OERs. In *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2010* (pp. 1069-1073). Chesapeake, VA: AACE.

Sandoval, W. A., & Bell, P. L. (2004). Design-based research methods for studying learning in context: Introduction. *Educational Psychologist, 39*(4), 199–201.

Scriven, M. (1996). Types of evaluation and types of evaluator. *Evaluation Practice, 17*((2), 151–161.

Stacey, P. (2011a). The university of open [Web log post]. Retrieved from http://edtechfrontier.com/2011/01/04/the-university-of-open/

Stacey, P. (2011b). Evolution of an OER initiative: An eight year retrospective [Web log post]. Retrieved from http://edtechfrontier.com/2011/02/28/evolution-of-an-oer-initiative-an-eight-year-retrospective/

Thille, C. (2012). *Changing the production function in higher education*. Washington DC: American Council on Education. Retrieved from acenet.edu/go/MPR2/#312767.

Treviranus, J., & Coombs, N. (2000). Bridging the digital divide in higher education. In *Educause 2000: Thinking IT Through. Proceedings and Post-Conference Materials*. Nashville, TN.

UNESCO. (2002). *Forum on the impact of open courseware for higher education in developing countries* (Final Report). Retrieved from http://unesdoc.unesco.org/images/0012/001285/128515e.pdf

Weinstein, C. E, Husman, J., & Dierking, D. R. (2000). Self-regulation interventions with a focus on learning strategies. In Boekaerts, Pintrich, & Zeidner (Eds.), *Handbook of self-regulation* (pp. 727–747). San Diego, CA: Academic Press.

Wiley, D. (2007). *On the sustainability of open educational resource initiatives in higher education* (Paper commissioned by the OECD Centre for Educational

Research and Innovation (CERI) for the project on Open Educational Resources). Retrieved from www.oecd.org/edu/oer

Winne, P. H. (1995). Inherent details in self-regulated learning. *Educational Psychologist, 30*(4), 173-187.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal 2008, 45,* 166-183*.*

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