The growing influence of Open Educational Resources (OER), including Open Source Software (OSS), on the thinking of academics and academic administrators is now impacting the operations of colleges and universities (Caswell, et. al., 2008; Vest, 2006; Wiley, 2006). Developing systems to promote the reuse of learning material is a social phenomena that changes some of the core relationships among content and software developers and users, including teachers, learners, program managers, learning designers, and technology managers. This paper will explore the theme of OER use and reuse from these multiple perspectives made available through a presentation series hosted by the Penn State World Campus and supported by contributions from numerous leaders in education. The paper will further describe the early work being done to integrate the concepts of use and reuse into course material design and production at the Penn State World Campus.

Sustainable OER as a Goal

There are several compelling reasons for sustainable use of OER at the World Campus. One is the economics of community; we benefit from sharing in ways that are more than just financial. We increase our profile and enhance our reputation, which in theory attracts better quality students, faculty, and employees. In addition, we are doing public service, which is culturally consistent with the values of a public and Land Grant university. Another benefit that is more practical is the idea that we are distributing the load when it comes to content maintenance. With community-driven development, the work of revising a course is theoretically spread out over a greater number of entities, lessening the burden for any one stakeholder.

Beginning on March 12, 2007, and continuing today, postings from a collection of international authors sharing their perspectives on the impact of OER and OSS on education appeared biweekly on Terra Incognita, the official blog of Penn State’s World Campus (http://blog.worldcampus.psu.edu). The Impact of Open Source Software on Education series has been organized to elicit a variety of perspectives from across the globe. Topics presented and discussed have ranged from how OER and OSS have impacted pedagogy, the cost of eLearning, access to education, and the value that open content provides educators and institutions.

While forming our approach we have referred to some of the ideas expressed and discussed in the larger OER community. In the Terra Incognita series, a number of the postings addressed sustainability of OER, including OSS. In broad strokes, the recurring messages were that sustainable OER must be valuable to potential consumers, accessible, and plentiful. Examples of these characteristics that were articulated in series postings included

- the ability to modify open content and software to meet local needs (valuable),
- open licensing that allows for free and unambiguous distribution, modification, sharing, and mixing of OER and OSS (accessible), and
- attaining a “critical mass” of open content that serves as the infrastructure for an open economy (plentiful).

Within the series, Michael Feldstein (2007) and Kim Tucker (2007) best illustrate these characteristics in their posts about Free and Libre Open Source Software (FLOSS) and Commons-Based Peer Production (CBPP). It should, however, be noted that FLOSS is a more restrictive term than OSS, requiring more than Open Source code, but free software, as used in “free” speech. The distinctions between OSS and FLOSS are well addressed at the Free Software Foundation Web site http://www.fsf.org/.

Yochai Benkler (2002, 2005) has addressed the failure of traditional theories of the market and firm to account for the growth and sustainability of OSS and OER. From his perspective, community development and community sharing are integral to why OSS and OER work. Benkler’s Commons-Based Peer Production Model (CPBB) describes why groups of varying sizes will create information and cultural assets with a net common-good impact for non-monetary rewards. The model is based on the assertion that information resources are truly public-good resources in that they are non-rival; that is, the use of an information resource by an additional individual does not
reduce the source of information, unlike physical resources. The model helps explain the nature of motivation and incentives that would normally be provided by restrictive intellectual property licensing, and identifies the circumstances under which CBPP is more efficient than other forms of organization. Benkler identifies the importance of low barriers for contribution and use (modularity, granularity, and cost of integration) and ample supply of open assets and contributors as success factors to sustainable CBPP.

Following Benkler's work, the first steps at the World Campus are intended to reduce barriers to contribution, sharing, modification, and reuse. One of the fundamental questions this raises is how to take this big idea and make it real on the organizational level. This question points to one major objective: How do we change? Like every big idea that is full of potential, use of OER bumps against other objectives and ways that things are done—the systems that support operations, accustomed workflows, and more fundamentally, how we have viewed ourselves as well as how we view the value we add for others. World Campus is exploring means to reduce barriers to the creation and reuse of OER within our course materials design, development, and management systems.

**World Campus’ Current Workflow**

Penn State has been involved in distance education for over 100 years, offering one of the first correspondence study programs in the country. The World Campus was launched in 1998 with the goal of providing educational access to learners throughout the world. To do so, the World Campus partners with departments throughout Penn State to offer over 60 online degrees and certificates through distance and online education. A new course typically has a one-year development cycle, and is developed much like a book, with all of the content in place before the course is launched. In a typical year, approximately 30 courses are in development and approximately 50 courses are undergoing review and revision. Given World Campus production requirements, finding sustainable ways to incorporate OER materials is vital.

World Campus’s current design/production process and management systems are optimized to produce course content for use by Penn State students. The material is overwhelmingly created by Penn State faculty members (and designers) who have differing expectations about how this content will be used and subsequently, how faculty will be compensated, for the work. The material is locked behind a course management system. Learning objects are used, developed, and permissioned with the assumption that access will be limited. In some cases, material is shared between instructors and courses, but this process is cumbersome. The methods we employ must also be scalable across a wide range of courses and programs.

In our current model, a learning designer works with the content author to develop a course. Course materials are initially created in the form of Word documents, PowerPoint presentations, or basic HTML. The designer or a learning design assistant cuts the content into chunks, and uses a Dreamweaver template to arrange it as it should appear in the course. The material is then uploaded to a server where it can be processed with the in-house content management system, CASE.

When a course is exported from CASE, the system constructs an XML document out of the content pages and pulls in various metadata specific to the course. CASE then uses this XML document as the starting point for constructing a set of navigation tools to wrap around the content, providing a seamless course experience to the user. Once the course navigation component is built, we have the option to direct the student either to a stand-alone version of the course, or to a version closely integrated into Angel, our current LMS. See Figure 1.

![Figure 1. Current Workflow of the World Campus](image-url)
There are a few obvious inefficiencies this workflow creates. One problem is that there is a bottleneck where the author, usually a busy faculty member, hands off the content to the designer. The content may be late, incomplete, or sometimes it may be subject to change. On a broader level, questions can also be raised as to whether the design methods being employed really are sustainable and scalable. If we are constantly recreating content rather than reusing existing content or making use of quality content produced by others, at some point the production process becomes untenable.

The World Campus uses this model because the organization evolved along with the rest of the Web, which very much grew up in the publishing paradigm. “Publishing a book” is something that we understand very well; it fits the way we deliver content and it aligns with our business model. Part of the impetus behind the shift to OER is not because our model is flawed—obviously we still create capacity and serve learners—but because the Web paradigm is itself in the process of shifting. Like the transition from radio to television, the Internet is growing into a medium that transcends and transforms the way we think about information, and in turn, knowledge itself. This is manifesting practically everywhere you look as a democratization of knowledge. As educators, we no longer hold the keys to the information kingdom, but we can still act as a facilitator to help people decide what content is valuable and use it to learn. Today, anyone can publish a technically accurate description of a given process, call it content, and get people to pay to learn it, or even give it away for free. In order to compete in this new paradigm, we have to re-examine what it is we are selling.

**Moving Toward Sustainable OER**

In moving toward OER as a goal, our approach is to actively engage in activities that move us closer to our objectives in short and incremental cycles. To do this, we need to transform our current processes, but in ways that minimize disruption. Part of this transformation includes forming partnerships within and outside of Penn State with groups actively involved with developing and implementing frameworks, standards, and applications in related areas such as content management, open educational resources, and sharable learning designs.

World Campus began its OER exploration with Connexions, an OER project from Rice University (http://cnx.org). Initially, we chose this system because it did a good job of removing the barriers for participation. The requirements for involvement were minimal, i.e., there were no requirements for submission of a certain number of courses or modules. This system also offered the opportunity to experiment with an authoring environment. This meant that we did not have to build a system to export our content or solve some of the more difficult problems involved in matching our workflow to system requirements. Connexions also had the advantage of visibility, reliability, and a critical mass of participants as well as learning objects.

In Summer 2007, we manually entered two courses into the Connexions system (63 modules total). The first, OL 2000: Best Practices in Online Teaching (http://cnx.org/content/col10453/latest/), is a course for faculty who are new to teaching in an online environment at World Campus. The second was a compilation of Terra Incognita postings (http://cnx.org/content/col10431/latest) exploring open source software and open educational resources. We imported the materials into the Connexions system using built-in functionality (e.g., content from a marked-up Word or Open Office document) and manually created material that could not be imported as it was. The material for the OL2000 course needed to be adapted by removing some references to processes that are specific to Penn State. We also replaced some of the graphics used in the course with material that allowed for reuse (e.g., images with a creative commons license and graphics produced in-house). The Terra Incognita collection was already appropriately licensed, so the material did not have to be adapted for Connexions.

It was extremely valuable to get involved in OER through Connexions. The experience gave World Campus staff a tangible experience with OER, in that it made us begin to think about the kinds of material that we could make available—a significant shift. It caused us to start thinking about how we might need to design differently if we start with the assumption that course content will be open. The experience also made us think more about the relationships we have with faculty and how we might broach the subject of making material more widely available. We also received feedback from people who used the material, making some of the outcomes of OER more concrete.

The experience with Connexions also caused us to redefine the outcomes that we wished to achieve and to develop some requirements. One concern with manually developing OER courses is that it does not take advantage of our robust course creation and revision process. When manually creating courses, material needs to be created twice—
the first time for our own purposes and the second for Connexions, a process that did not seem scalable given the number of courses that we produce. Working with Connexions helped to clarify our desire to make the production of OER materials a natural extension of our workflow.

Currently, we are experimenting with finding ways of producing open versions of courses and learning objects that flow from our existing production process in order to output a version of a course for our own students as well as an OER version. We have begun to explore how we can produce a version of a course that can be imported into a single—or several—OER repositories. Figure 2 gives a high level overview of our intent to include OER repositories into the World Campus learning design, materials production, and content management workflow. One output would be the direct contribution of appropriately marked content elements into external repositories. Another feature is the introduction of open content from an OER repository with appropriate tagging that allows identification of content elements, associated licenses, and points of origin. The goal is to facilitate modification, reuse, and sharing of content into the appropriate repository. Automating this workflow represents our first step toward participating in sustainable CBPP of OER.

![Figure 2. Potential OER Workflow](image)

Connexions is the first alternate end point we are trying to provide for our content—one of potentially many outputs. We are starting with Connexions, because on a technical level, the Connexions Markup Language (CNXML) workflow so closely matches our own. There are two ways we can use this equivalence to our advantage:

1. Since we are already building an XML file out of our content, it is a simple matter to alter the XML slightly to become a validated CNXML document. At this point we already have an export function in place that exports validated CNXML. Once a file is exported, it is straightforward to include metadata such as Author, Creation Date, and Licensing, among others, and import it into Connexions.
2. Since we are building a wrapper for our content out of an XML document, it should again be a simple matter to take the XML from a different source, a CNXML document, and use that to construct what we know as a course.

**OER and Sustainability: Next Steps**

Our efforts with Connexions represent a starting point in our work with OER. A shift toward the effective contribution, use, and sharing of OER will require that we examine our existing design and production practices in order to remove some of the barriers to sharing and reuse. On a broader level, we must also find ways to contribute meaningfully to the overall sustainability of the OER movement. Pragmatically, if we make an investment in OER, we want learners to be able to find our materials. If we make use of OER materials in our courses, we also need to contribute materials back to the community. We would also like access to quality material that we could potentially reuse in courses. These objectives require that we go beyond putting a few courses online and find ways to contribute to existing OER repositories (e.g., Merlot, Connexions, OER Commons, WikiEducator, etc.).

World Campus must find ways to meet our objectives through learning design, workflow management, technology solutions, materials formatting, and tagging. Some of the areas we are exploring include
• identifying other partner repository projects that are similar to our workflow and experimenting with making contributions (e.g., Connexions, OER Commons, Merlot, WikiEducator);
• examining/adapting our workflow so that we can contribute to repositories;
• making digital asset management an important step in the workflow;
• identifying content that can be exported under various creative commons licenses and examining our own license practices;
• finding ways to work with faculty members so that sharing is part of the course development process;
• designing with reusability in mind (e.g., selection of graphics, photos, multimedia objects; documentation and systems for distribution; chunking materials so they can more easily be reused; conversion to open file formats; using open source software when possible);
• experimenting with tagging our content so that it is findable and so we can isolate portions of courses that can be shared broadly;
• communicating incentives for participating in CBPP; and
• determining different ways to evaluate and measure the impact of our work.

In doing this work, our goal is to very easily pick and choose both content that we want to use from OER repositories in our own courses, and share content back into the community as a way to spread goodwill, meet our land-grant mission, and increase our reputation as a provider of quality content.

References


