
References

- Amin, M., & Mabe, M. A. (2003). Impact factors: Use and abuse. *Medicina (Buenos Aires)*, 63(4), 347–354.
- Ashmore, M., & Reed, D. (2000). Innocence and nostalgia in conversation analysis: The dynamic relations of tape and transcript. *Forum: Qualitative Social Research*, 1(3), Article 3.
- Corby, K. (2001). Method or madness? Educational research and citation prestige. *Portal: Libraries and the Academy*, 1(3), 279–288.
- Corti, L. (2000). Progress and problems of preserving and providing access to qualitative data for social research — the international picture of an emerging culture. *Forum: Qualitative Social Research*, 1(3), Article 2.
- Corti, L., Day, A., & Backhouse, G. (2000). Confidentiality and informed consent: Issues for consideration in the preservation of and provision of access to qualitative data archives. *Forum: Qualitative Social Research*, 1(3), Article 7.
- Harzing, A. (2011). *Publish or Perish*, version 3.1; <http://www.harzing.com/pop.htm>.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage.
- Markle, D. T., West, R. E., & Rich, P. J. (2011). Beyond transcription: Technology, change, and refinement of method. *Forum: Qualitative Social Research*, 12(3), Article 21; <http://nbn-resolving.de/urn:nbn:de:0114-fqs1103216>.
- Mathison, S. (1988). Why triangulate? *Educational Researcher*, 17(2), 13–17.
- Opthof, T. (1997). Sense and nonsense about the impact factor. *Cardiovascular Research*, 33(1), 1–7.
- Ritzhaupt, A. D., Sessums, C., & Johnson, M. (2011, November). Where should educational technologists publish? An examination of journals within the field. Paper presented at the Association for Educational Communications and Technology, Jacksonville, FL. An article based on this study is in-press at *Educational Technology* (see in this issue — Ed.).
- Seglen, P. O. (1997). Why the impact factor of journals should not be used for evaluating research. *British Medical Journal*, 314(7079), 498–502.
- Stratford, M. (2012, March 4). 'Predatory' online journals lure scholars who are eager to publish. *The Chronicle of Higher Education*; <http://chronicle.com/article/Predatory-Online-Journals/131047>.
- West, R., & Rich, P. J. (in press). Rigor, impact, and prestige: A framework for evaluating scholarly publications. To be published in *Innovative Higher Education*.
- Zaugg, H., West, R. E., Tateishi, I., & Randall, D. (2011). Mendeleev: Creating communities of scholarly inquiry through research collaboration. *TechTrends*, 55(1), 32–36.

Towards Networked Knowledge: The Learning Registry, an Infrastructure for Sharing Online Learning Resources

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In this article, the authors describe an open-source, open-data digital infrastructure for sharing information about open educational resources (OERs) across disparate systems and platforms. The Learning Registry, which began as a project funded by the U.S. Departments of Education and Defense, currently has an active international community working on use cases, pilot implementations, and specifications. This article discusses key benefits to using the Learning Registry, and introduces pioneering uses of the resource distribution network by some of the early adopters.

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Introduction

A growing audience for scholarly communications lies in the Open Educational Resources (OER) movement, which puts scholarship directly into the hands of educators and learners. As OERs, scholarship not only reaches a wider audience, but details of its extremely varied uses by this audience can be followed and studied. This article will discuss the effort to facilitate this wider distribution of OERs and the study of their use by enabling the sharing of resource information across diverse educational systems.

With the proliferation of OERs, educators are increasingly turning to the Internet to find content that they can adapt and integrate into their instructional practices. Many organizations have invested time and resources in building portals, online communities, and repositories of OERs to help educators locate resources and connect with one another. Yet, a great deal of useful knowledge about resources remains underutilized or inaccessible because resources are dispersed and information about them is locked up inside a single system or platform. The Learning Registry enables systems to share, aggregate, and amplify information about learning resources and thereby builds ways to connect organizations and educator communities.

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In technical terms...

Technically, the Learning Registry is a decentralized content-distribution network, a collection of peer-to-peer nodes that can store and forward information about learning resources. The core purpose of this technology is to enable sharing of resource metadata—both descriptive data and social usage data—across diverse educational systems.

The Learning Registry is an open-source project. It provides the technical infrastructure and community practices for sharing and transporting information about learning resources across systems, such as learning object repositories, resource portals, community portals, and learning management systems. The Learning Registry does not impose standards for how to represent data but provides opportunities for communities to come together and find agreement around real-world practices.

Imagine the benefit to locating OERs if we could widely share, in addition to standard descriptions of resources, data about resource usage and use contexts. For example, if a state or district determines that a particular Khan Academy video is useful for teaching a specific standard in math, that alignment information can be captured using a machine-readable format that other systems can also understand. That alignment relationship can then be shared into the Learning Registry and used by states, districts, or even teachers to locate learning resources. At the K–12 level, the sharing of standards alignment data represents a unique opportunity to accelerate the shift to digital learning. As many states adopt the Common Core State Standards for language arts and mathematics, the potential for sharing OERs across state borders will expand dramatically. Consider this: If 20 states each aligned just 50 digital resources to standards from the Common Core and share that information with other states through the Learning Registry, teachers in every state would have access to 1,000 standards-aligned resources.

Standards alignment is certainly not the only criterion that educators can use when seeking learning resources. Educators are influenced by the opinions of trusted peers who rate resources on such factors as usability and student engagement. Those who administer educator portals and repositories are beginning to collect social data like this, but most often the data are not shared beyond the local organization. Just as with commercial companies who aggregate social data to personalize consumer offerings, digital

learning could be much more effective if such information was more widely shared.

Many educational organizations already have portals and repositories that serve curriculum specialists and teachers. In contrast to these *Web destinations*, the Learning Registry is like a road *network* that helps cars and trucks—information—get from place to place. The Learning Registry helps deliver the learning resource information created by one site to another behind the scenes and thereby enables each site to find information about resources contributed by others. This “delivery system” represents a significant advance over the manual hyperlinking of resources from one Website to another. Using the Learning Registry, existing Websites can be enabled to routinely share the information created by other organizations.

Where the Learning Registry Is Today

The Learning Registry began as a project funded by the U.S. Department of Education and the U.S. Department of Defense to widely share information about learning resources from federal repositories such as the Smithsonian, the National Archives, and the Library of Congress. It has since evolved into a mechanism for freeing up data and building ways to connect information from more disparate organizations and user communities, including educator-generated or commercial resources.

At present, the Learning Registry community is exploring new and interesting ways to use shared data, such as recommending resources, visualizing trending resources, and analyzing connections among resources. California’s Brokers of Expertise and CTE (Career and Technical Education) Online sites and Florida’s CPALMS site are now part of the Learning Registry network, sharing resources, ratings, and alignment data through the registry. The Public Broadcasting System (PBS), the National Science Digital Library (NSDL), and OER Commons have also connected to the Learning Registry network. JISC has been pioneering the use of the Learning Registry in higher education in the U.K.*

Table 1 provides a snapshot of what is in the Learning Registry as of May 2012, including the organization who published, a link to a sample resource from that publisher, an approximate number of resources they published, and a link to an interactive visual browser of their published resources.

How Educational Agencies Benefit from Using the Learning Registry

Early advisors to the Learning Registry project—representatives from federal agencies, state education departments, district and local educational agencies,

* A list of early collaborators can be found at www.learningregistry.org.

nonprofit organizations, and the private sector—envisioned several key benefits of using the registry:

1. Expanded access to trustworthy descriptive data on educational resources.
2. Pooling contextualized knowledge about learning resources.
3. Providing tools and services to make use of “big data” about resources.

We describe each of these in turn, below.

1. Expanded Access to Descriptive Data on Educational Resources

The Learning Registry provides an easy-to-adopt and easy-to-operate mechanism for disseminating and consuming resource information.

Generalized search engines are not optimized to answer questions that are important to educators, such as: What resources are available to teach a specific topic to a particular set of students? What kinds of students are those resources suitable for? Are any standards associated with those resources? Online learning resources that are stored in specialized systems (e.g., portals and repositories) are often described using different data formats and are obtained through different access mechanisms. Educators have limited time and resources to directly access and search each source to find content that meets their needs. Specialized search engines that search across collections may provide single points of access to different sources, but maintaining and updating data about each learning resource in each source can be challenging.

The Learning Registry supports an alternative model of connecting states and organizations in an open, distributed network. No single entity owns or controls the Learning Registry network. Anyone can freely publish data to the Learning Registry for any interested party to consume anytime, anywhere. The resources are thus made available to a broader network of educators. As a consumer of Learning Registry data, each organization can determine its set of trusted partners in the registry and consume data only from them. Such trust networks greatly reduce problems with quality and safety that are sometimes found with content on the Internet.

2. Pooling Knowledge About Learning Resources

The Learning Registry enables sharing and aggregating resource usage data across disparate systems and platforms.

Table 1. What is in the Learning Registry today.

Publisher	Sample Resource or Resource Data URL	Number of Resources Published to the Registry (Approximate)	Link to the Learning Registry Resource Browser
BetterLesson	<i>Identity & Equalities Homework Sheet</i>	24,000	http://goo.gl/J1mYW
Brokers of Expertise	<i>Standards Matching</i>	19,500	http://goo.gl/h4xz2
CPALMS	<i>Differences Between Climate & Weather</i>	1,600	http://goo.gl/weCGb
CTE Online	<i>Intro to the Digestive System</i>	2,300	http://goo.gl/2nWjE
Doing What Works	<i>College Readiness Framework</i>	700	http://goo.gl/lvuKp
European Schoolnet	<i>World War I Quiz</i>	273,000	http://goo.gl/EPhRM
Federal Resources for Educational Excellence (FREE)	<i>A Tour of the Cell</i>	1,700	http://goo.gl/Ge5ht
Library of Congress	<i>Civil War Photographs</i>	350	http://goo.gl/2DDfQ
National Archives	<i>Road to Revolution: Patriotism or Treason?</i>	35	http://goo.gl/HDnpD
National Science Digital Library	<i>Ask a Scientist!</i>	102,000	http://goo.gl/BUPzx
OER Commons	<i>Ratings Data</i>	2,700	http://goo.gl/LBcyk
PBS LearningMedia	<i>Sailboat Design</i>	150	http://goo.gl/UI1Zi
Shodor	<i>Pendulum Motion Lesson</i>	1,860	http://goo.gl/DAkDp
Smithsonian Education	<i>Women Breaking Musical Barriers</i>	1,900	http://goo.gl/btVQX

As educators interact online with portals and repositories, they generate useful information about resource usage and contexts of use, such as how often a resource is downloaded; what sort of users downloaded it; the classroom context the resource was used in; and for what kinds of students it was used.

Commercial sites like *Amazon.com* have proven the value of collecting this kind of social data across many users. In the digital resources sector, the terms *social metadata* or *paradata* are used to refer to this kind of data about resource usage (in contrast with metadata, which describes unchanging features of the resource). For resources to be used and reused more effectively, this kind of information must be shared widely and aggregated across many users, systems,

and platforms. The Learning Registry enables this sharing. The following are some examples of paradata that may be captured in the registry:

- This resource has been aligned 214 times with Math Common Core Standard 5.G.2.
- A fourth-grade science teacher bookmarked this National Geographic volcano diagram.
- An eighth-grade math teacher shared this Khan Academy video with her students.
- An anonymous user commented on this Common Core standard.
- A subject-matter expert matched this resource to three academic content standards.
- A resource was downloaded from the NSDL (National Science Digital Library) repository 1,354 times during May 2011.

3. Providing Tools and Services to Create Applications that Make Use of Big Data About Resources

The Learning Registry enables sharing and aggregating resource usage data across disparate systems and platforms.

The Learning Registry provides a core set of services on which applications and tools can be built. In this way, applications can be designed to explore, analyze, and amplify big data in the Registry, using such techniques as customized filtering, trend analysis, social network analysis, and more.

One valuable service under development is sharing data about curricular standards that match across states. States have the ability to publish the cross-walks of their own state standards to the Common Core Standards into the Learning Registry. As state agencies move toward a common framework for expressing academic standards, pathways must exist to transition legacy standards alignments to the Common Core. California is one of many states working on establishing cross-walks that identify which existing learning competencies align with those described in the Common Core. By using the Learning Registry to publish these cross-walks, learning communities will be soon be able to connect standards alignment data from one state to another. Such cross-walk data can then be used to effectively share *en masse* resources that have already been aligned with different state standards.

In the next section, we introduce how our collaborators in the U.K. have taken the Learning Registry to a different context—higher education.

The Learning Registry in Higher Education: JISC U.K.

The higher education sector in the U.K. sees potential benefits in the Learning Registry. JISC CETIS (the U.K.'s Centre for Educational Technology and Interoperability Standards) has followed the development of the Learning Registry since its inception on behalf of U.K. Higher and Further Education. In December 2011, JISC also funded a trial node project called the JLeRN Experiment, based at the Mimas national data service at the University of Manchester. From May–October 2012, JLeRN supported a new node at Liverpool University, and six JISC-funded OER Rapid Innovation projects related to the Learning Registry. We introduce two of the key OER Rapid Innovation projects (RIDLR and SPAWS) below, along with the University of Liverpool (ENGrich) work.

Rapid Innovation Dynamic Learning Maps-Learning Registry (RIDLR). In today's digital environment, it can be difficult to find open educational resources (OERs) related to specific topics. Subject keys (or tags) are insufficient for those in search of more personalized learning materials. RIDLR will test the release of contextually rich paradata to the Learning Registry, and harvest back paradata about both prescribed and personally collected resources used in the MBBS medical curriculum.

Based at Newcastle University, this project will build on their Dynamic Learning Maps work, and their FavOERites social bookmarking project, to develop open APIs to harvest and release paradata on OERs from end users, including bookmarks, tags, comments, ratings and reviews, etc., from the Learning Registry and other sources, for specific topics within the context of curriculum and personal learning maps.

Sharing Paradata Across Widget Stores (SPAWS). As we have seen in previous sections, the same learning resource can pop up in many different sites and contexts, but as the resource is used away from its point of origin, we lose the ability to track its usage beyond the walls of local organizations. Educational apps face the same challenge: Stores hold many of the same Web widgets and gadgets for educators, but their usage data lie scattered across multiple stores. It makes sense to share comments and ratings, thus adding value for users and avoiding the possibility of having usage data scattered across multiple stores.

SPAWS—a collaboration of the University of Bolton, the Open University, KU Leuven in Belgium, and IMC—aims to share usage data, such as reviews, ratings, and download stats, between educational widget stores. SPAWS will build on the Learning Registry and Activity Streams to connect together several app stores that share Web widgets and gadgets for educators. Each time a user visits a store and reviews, rates or embeds a particular widget or gadget, that information will be syndicated to other stores in the network.

ENGrich. Search engines return a great deal of resources of unknown quality and relevance when we search for educational media. The problem is only exacerbated when we look up resources tied to a complex information domain such as engineering. Key engineering terms (e.g., stress, current, loop, etc.) present ambiguities that can lead to search results containing a large number of false hits, which then require a lot of time to sift through.

ENGrich, a JISC-funded project based at the University of Liverpool, is leveraging the Learning Registry to design and develop a customized search

engine for visual media relevant to engineering education. Using Google Custom Search (with applied filters such as tags, file types, and sites/domains) as a primary search engine for images, videos, presentations, and Flash movies, the project will pull and push corresponding metadata and paradata to and from the Learning Registry. A user interface is also being developed to enable end users (students and academics) to contribute further data relating to particular resources and their usage. This information is also published to the Learning Registry. The Learning Registry data is then used to help order any subsequent search. Thus, the Learning Registry plays a central role in “enriching” the visual engineering content beyond the basic results provided by Google search.

How Educational Agencies Can Support the Learning Registry Effort

As we have seen, the Learning Registry is designed to be flexible to accommodate different needs, user communities, and contexts. Learning Registry data are now ready to be consumed and put to use in a variety of ways. Excellent learning resources are being developed every day by public education agencies that are in need of finding the right audience. Publishing resource metadata descriptions to the Learning Registry gets that information out to the education community that needs it the most. Additionally, publishing activity and usage information completes the feedback loop that public and private learning resource publishers need in order to provide us with the most effective content.

As described previously, Learning Registry services are being developed on an open-source code base, ensuring transparency, flexibility, and long-term viability free of corporate fees. Especially for organizations interested in running their own node and developing custom services, working with the open community of developers contributing to the Learning Registry is essential to their immediate success and that of the network itself.

For more information, visit www.learningregistry.org. □

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A New Key to Scholarly Collaboration?

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The American Academy of Religion, in concert with the Sakai Foundation, has envisioned a scholarly use of the new Sakai Open Academic Environment open-source software. Currently working under the title *Biosphere*, the program would put a rich collection of collaborative tools in the hands of AAR members, their colleagues in related scholarly societies, and interested parties outside academe. This article explores the history of the *Biosphere* vision and enumerates several challenges the project may face.

Technology and Scholarship: The Current Landscape

“Scholarly Communications in a New Key,” the title of this special issue of *Educational Technology*, is wonderfully rich and marvelously multivalent. In the contemporary academy, where the notions of boundaries, access, intellectual property, and interpersonal networking are being constantly reshaped, largely by technology, one could interpret the title in any number of ways. Take “Scholarly Communications,” for example. On one reading, the phrase suggests that contemporary scholars are communicating *with one another* in ways fundamentally different than their predecessors. On another reading, however, it suggests that today’s scholars are communicating the results of their intellectual work *to their audiences, stakeholders, and consumers* differently than they used to do.

The “New Key” is a nice turn as well; it is evocative but ambiguous. On one hand, the expression suggests that scholars—either among themselves or with their audiences—have begun communicating in ways that are arranged around a common tone or pitch, or organized around a note recognized by everyone, and that this

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