Guest Editorial: Open Educational Resources

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THE term "open educational resources" (OER) was first proposed at UNESCO's 2002 Forum on the Impact of Open Courseware for Higher Education in Developing Countries. Open educational resources are learning content or tools that are offered free of charge under a copyright license granting permissions for users to engage in the "4R" activities: reuse, revise, remix, and redistribute. In essence, open educational resources are learning objects that use an open source license.

Although there are different licensing schemes (most notably the Creative Commons suite—see http://creative commons.org), they all focus on removing at least one source of friction for "share and reuse" of learning resources: the apprehension of reusing material for which the license is unclear or difficult to adhere to. This is certainly not the only problem related to reuse [3]: findability, technical interoperability of content fragments, pedagogical constraints and affordances, and design for reuse are some of the other barriers. Still, the field of OER has gained considerable momentum and the abundance of content that it helps to unlock for reuse has acted as a platform for innovation in many respects. The papers in this issue present some of the early results of research around that innovation.

Historically, much of the scholarly discourse around open educational resources has focused on nontechnological issues like legal aspects around licensing, the moral imperative of sharing educational materials for the benefit of individuals in rural areas and developing nations, and business model problems with sustaining enterprises whose primary activity is giving things away for free. Like the discourse around its conceptual predecessor, the learning object, relatively little attention has been paid to specific pedagogical implications of the open educational resources approach to educational media.

Unlike the vibrant technical discourse around learning objects, relatively little scholarly attention has been paid to the technical aspects that do or should underpin the open educational resources movement. This is partly because those working in the open educational resources area have inherited a rich body of technical work from learning objects researchers (e.g., the IEEE Learning Technology Standards Committee (LTSC) Learning Objects Metadata standards work). However, the open educational resources assumption that content and tools can be freely revised, remixed, and redistributed creates new opportunities and challenges not present in prior learning objects work [1].

Some of the technical challenges that OER enable us to research further include:

- Detection of reuse: Using, for instance, plagiarism detection technologies, it is possible to identify reused instances of fragments of educational resources. This is important information in many ways. First of all, as researchers, it enables us to investigate what kind of resources are more reused than others, how these resources are reused, etc. On a more pragmatic level, information about reuse of resources can help to rank more relevant candidate resources higher, either in search results or in a more proactive setting as recommendations.

- Distribution aspects: As we are nearing a critical mass of open educational resources, it will be possible to analyze whether there is a Long Tail effect in terms of topics covered, authors and institutions contributing, downloads, reuse, etc. [4]. This "Web science" perspective on open educational resources can help to understand their longer term evolution and sustainability.

- Context based recommendation: The abundance of learning material that the OER movement is unlocking leads to a paradox of choice where the multitude of options may actually make it more difficult for teachers or learners to select the most relevant material at the appropriate time. Recommendation techniques can help suggest resources based on information about the context of the user, including time, location, interest, goal, background knowledge, mood, etc.

This special issue includes reports of research work in the new spaces of technical possibility created by open educational resources.

- In "A Frankenstein Approach to Open Source: The Construction of a 3D Game Engine as Meaningful Educational Process," Brett E. Shelton, Jon Scoresby, Tim Stowell, Michael R. Capell, Marco A. Alvarez, and K. Chad Coats describe and analyze a case study that focuses on the collaborative development of an open educational game engine by students, reusing existing open educational resources in the process. This "design research" approach is quite appropriate for studying the educational value that such a process can provide.

- Rafael de Santiago and André L.A. Raabe describe an architecture for sharing OER in "Architecture for

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Learning Objects Sharing among Learning Institutions—LOP2P." It is interesting that they follow a peer-to-peer approach with a plug-in to make OERs available from within the Learning Management System (LMS). It is nice to see peer-to-peer architectures for sharing learning material discussed again after early systems like Edutella, LOMster, and Lionshare.

- Hugh C. Davis, Leslie Carr, Jessie M.N. Hey, Yvonne Howard, David Millard, Debra Morris, and Su White analyze two projects on sharing resources in higher education. "Bootstrapping a Culture of Sharing to Facilitate Open Educational Resources" deals with two communities, one in a more formal organizational setting and the other in a more informal community of practice. The focus on "design for the user" rather than on "design for other systems" is a particularly welcome contribution to the research in this area.

- "Bridging the Bandwidth Gap: Open Educational Resources and the Digital Divide" by Björn Haßler and Alan McNeil Jackson focuses on the problems caused by lack of affordable bandwidth in the developing world, which creates a rather difficult barrier for access to OERs. As explained in the paper, caching and reduction in size of resources can help to address this issue.

- Teemu Leinonen, Jukka Purma, Hans Poldoja, and Tarmo Toikkanen discuss design decisions for the LeMill system in "Information Architecture and Design Solutions Scaffolding Authoring of Open Educational Resources." This paper is a nice case study on the design of and experience with an authoring environment specifically intended for a "share and reuse" approach to educational content production.

All in all, we are very happy with this special issue on the research issues surrounding OER—a movement that continues to gather momentum. We are grateful that the prestigious *IEEE TLT* agreed to host this issue. And, most of all, we hope that it will help you, dear reader, in your research on this and related topics. Your feedback is most welcome!

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