

Collaborative Learning 2.0: Open Educational Resources

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Chapter 3

Knowledge Sharing and Collaboration as Indicators of Learning in OER Communities

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ABSTRACT

This work specifically sheds light on the ways that OER impacts teacher professional development, knowledge building, and interactive problem solving around teaching practice. Drawing on key findings from several studies, their results reveal the potential of OER to spark new conversations among teachers about how they can be proactive in enhancing their teaching practices. The authors also present a framework for assessing how new teaching practices emerge as a result of collaborative participation in OER. The discussion has implications for engaging teachers in adopting new OER use practices, and for how OER can be integrated as a model for innovation in teaching and in resource development.

INTRODUCTION

The field of education offers insights into the ways that open educational resources (OER) create accessibility and cost benefits for teachers, learners and the institutions of which they are a part (Bateman, 2006; Allen, 2008; Seidel, 2009). Through non-restrictive licensing and accessible technology, OER are also

cited for their potential to facilitate a community of users who share, critique, use and continuously add to and improve educational content (Benkler, 2005; Petrides & Jimes, 2006; Frydenberg & Matkin, 2007; Huberman & Wilkinson, 2007; Petrides et al., 2008; Casserly & Smith, 2008). Drawing on learnings from the open source movement, others further posit that it is through the collaboration of groups of users that the necessary critical mass of content is created and through which OER is sus-

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tained (Benkler, 2005; Stephenson, 2006; Petrides et al., 2008). Petrides et al.'s (2008) longitudinal study of content creation and use behaviors of 247 authors on the open platform Connexions supports this argument; the study revealed that when authors joined collaborative workgroups around OER, they contributed more content (and more regularly) than individual authors who worked alone.

A nascent, yet growing body of literature further contends that OER has the potential to align with enhanced student learning (Livingston & Condie, 2006; Conole & Ehlers, 2010). In particular, Livingston and Condie (2006) sought to assess the efficacy of a Scottish online learning program comprised of a variety of OER materials on high school students' learning. The materials were offered as supplemental content to teachers and learners in all school districts in Scotland, but only some districts chose to adopt them. Through analysis of student test scores, as well as interviews and surveys with teachers and students, the study found that achievement improved in all subject areas for students who used the materials. Students who accessed the open resources did so autonomously, and engaged in self-initiated and self-directed learning—transitioning from passive knowledge recipients into independent knowledge creators.

Others have begun to argue the importance of teacher engagement in collaborative communities around digital resources and OER, and of the role that OER use plays in supporting teacher professional development (Garrison, Anderson, & Archer, 1999; Tornaghi, Vivacqua, & De Souza, 2005; Albright, 2005; Bateman, 2006; Balcean & Hirtz, 2007; Chai & Tan, 2009; Petrides, Jimes, & Middleton-Detzner, 2010). Albright's (2005) analysis of 700 discussion postings on a UNESCO facilitated discussion forum—comprised of experts, researchers, project leaders and others working on OER use and sustainability issues—revealed that participants viewed OER as a mechanism for providing users with insight into culture-specific approaches to teaching by offering exposure to the way courses are taught in other contexts. Several

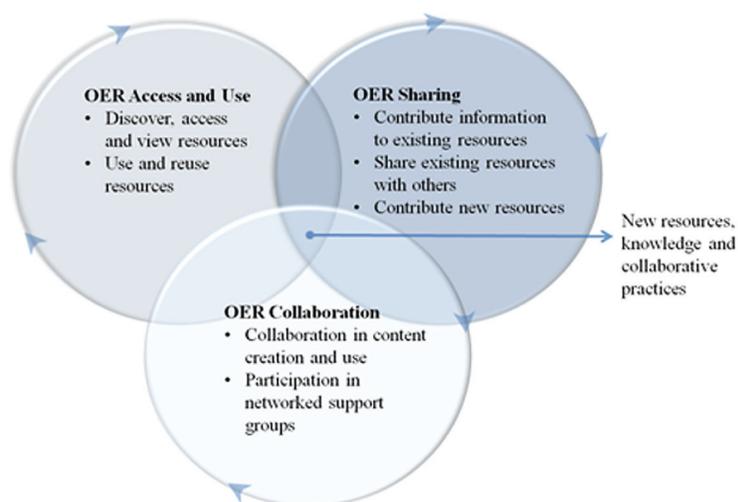
empirical studies within this realm have begun to provide early evidence of conclusions such as these. For example, a study of OER localization and use among South African teachers revealed that nearly one-half of the 27 teachers who participated in a survey about their OER use viewed OER as a means to enhance their curriculum development skills (Middleton-Detzner, 2011). Additional studies within this realm—discussed in more detail later in this chapter—have revealed how teachers joining communities focused on OER leads to new conversations about pedagogy and new collaborations with peers that extended beyond the teachers' existing ways of working with colleagues and students (Metros & Bennett, 2002; Petrides et al., 2011)

Building on these arguments, this chapter posits that because OER is intended to be adaptable and sharable, it not only facilitates the creation of new, higher quality and more usable resources, but also opens up possibilities to create and share knowledge about use of those resources and inspires new collaborations. The chapter specifically sheds light on the ways that OER impacts teacher professional development, knowledge building, and interactive problem solving around teaching practice. Drawing on key findings from several studies, the chapter reveals the potential of OER to spark new conversations among teachers about how they can be proactive in enhancing their teaching practices. The chapter also presents a framework for assessing how new teaching practices emerge as a result of collaborative participation in OER. The discussion has implications for engaging teachers in adopting new OER use practices, and for how OER can be integrated as a model for innovation in teaching and in resource development.

OER: FROM RESOURCE TRANSFORMATION TO KNOWLEDGE AND COLLABORATION

Collis and Strijker (2004) conceptualized the activities that users cycle through as they discover

Figure 1. OER knowledge activities



and use digital learning resources. The first step of their resource lifecycle begins with an original author obtaining, or creating the resource in a digital form for distribution and use. After a learning object is created, it is labeled with information, or metadata, that facilitates others' ability to find and use it, including items such as the title of the resource, the author, and the subject it covers. The learning resource is then offered to a wider community of users, where they may select the resource based on their own needs and interests. Once selected, users may use the resource “as is”, or adapt or modify it in some way. Finally, users retain the resource, and, based on new insights or experiences, may create new versions or revisions of the resource. In this sense, the resource lifecycle is an iterative process whereby creators and users of the resource cycle through activities that can result in the continuous transformation of the original learning resource.

In building on this model, we argue that OER supports transformation of resources, as well as knowledge sharing and collaboration among its users. In short, because OER is intended to be adaptable and sharable, it not only facilitates the creation of new, higher quality and more usable resources, but also opens up possibilities to create

and share knowledge about use of those resources and inspires new collaborations. In this view, knowledge emerges when users cycle through a series of iterative, OER “knowledge activities” that include discovering, browsing, accessing and viewing resources, using and reusing resources, as well as sharing and collaboration that potentially sparks knowledge and informs the creation of new resources, both individually and collaboratively. Figure 1 illustrates these knowledge activities in three independent and overlapping categories, and implies that where they intersect, new resources, knowledge, and collaborations may be sparked.

OER Access and Use

Participation in an online OER community is in part defined by individuals who discover, search, browse and gain a general understanding of what is necessary to use OER, and the resources and tools available to them. Individuals may also download or save resources offered by the community—either to view them, to use them “as is”, or to reuse or adapt the resources to meet their local teaching and learning needs. Reuse and adaptation behaviors can include, for example, simple edits, language translations, visual or technical changes,

and remixing the resources by combining them with other materials.

Studies examining participants' activities in OER communities vary in their findings. Duncan's (2009) study of the level reuse occurring on the OER platform Connexions revealed that of the 3,519 resources analyzed, 25 percent were reused or modified and the remainder was used as is. Petrides et al.'s (2008) study of reuse activities of Connexions authors over a five-year period, however, revealed that OER reuse and adaptation activities increased over time on Connexions, as augmented versions of content that were added by authors back to the platform increased at an annual percentage rate of 153 percent. Additionally, in a survey of 247 participants across multiple teaching and learning communities, Margaryan (2006) found that 70 percent of participants had reused resources created by others, while 48 percent used them as is.

In turning to the reasons by users for accessing and using resources, a survey of instructor users of the Massachusetts Institute of Technology's OpenCourseWare collection revealed that 45 percent of higher education instructors accessed the collection to improve their personal knowledge, and approximately 15 percent accessed the collection to learn new teaching methods or to incorporate OER into their own teaching materials (Massachusetts Institute of Technology, 2009). Petrides et al.'s (2008c) survey of Teachers' Domain users found that of the 464 primary and secondary school teachers who had responded to a question about reasons for visiting the OER site, 66 percent did so to find materials to supplement existing coursework or to get ideas for new lessons. Thirty-seven percent indicated they visited the site to improve their teaching methods, while 33 percent reportedly visited the site in order to stay current on a specific topic area. Although less prevalent, five percent of respondents reportedly visited Teachers' Domain to connect to other teachers or learners who shared similar interests. Though more research is needed to draw substan-

tive conclusions, these two studies bring questions to light around the differences in the ways that school teachers and higher education instructors draw on OER.

The literature points to several obstacles to the use and reuse of OER. Richter and Ehlers (2010) exploratory study of teachers' use of OER in four German schools revealed the lack of quality assurance—in terms of the accuracy and trustworthiness of the resources—as a central obstacle to OER use for teachers. Richter and Ehlers further found that teachers' lack of experience in knowing how to adapt resources to meet their own teaching and learning contexts served as an additional barrier. Additional studies point to technological hurdles as limiting factors in OER use and reuse, especially in countries with lower technological self efficacy among users or with limited technology resources available (Bateman, 2006; Middleton-Dezner, 2011).

Sharing

OER sharing behaviors can be multi-layered, and include users sharing data about resources as well as sharing actual resources with others—both inside and beyond the community. Users may share descriptive data, or metadata, about the resources in the form of tags, ratings or reviews. They may also share information about the actual use (and usefulness) of the resources in their local classrooms, or about the outcomes of the use of those resources. Sharing behaviors also include sharing an original resource with peers or others, or sharing a new version of an existing resource once adapted or modified.

The importance of sharing user-generated descriptive data about resource use has been cited in work by the European Schoolnet (EUN). Through a survey of 27 teachers across five countries, the EUN (2010) examined the factors that facilitate resource reusability in contexts and cultures other than those they were originally created in. After self-selecting a set of open

educational resources, the teacher participants answered a series of questions, including several that sought to assess what would inspire them to use the resources. A key finding from the analysis of the survey data was that teachers are more likely to use resources that were recommended or rated by other teachers. Likewise, an exploratory study by Petrides and Jimes (2008b) on the factors contributing to higher education instructors' decision to use OER revealed the importance of knowledge of how other instructors had used the resources, the obstacles or challenges other instructors had faced in using the resources, and whether their expert colleagues in particular had used the resources.

Charlesworth et al. (2007), in a review of literature on OER sharing, concluded that most resource sharing among teachers occurs informally with colleagues, and through email or personal websites. Margaryan's (2006) study of 247 online community participants provides empirical evidence of this conclusion: 87 percent of the participants surveyed in the study indicated that they shared their own, unfinished resources with others, while 92 percent shared their completed resources for comment and collaboration—although primarily through email, face-to-face channels, or personal websites rather than repositories. Furthermore, Petrides et al.'s (2008) survey of developmental education instructors who taught courses online found that while 67 percent of the 452 instructors who responded to the survey were willing to share their course materials with others online, only 25 percent were actually making their course materials available. Similarly, Harley et al.'s (2006) study of online practices revealed that while instructors maintained private digital collections on their personal computers, and were willing to share those materials, they were only doing so minimally. Reasons cited within the literature for the low prevalence of online sharing behaviors include author concerns about distortion or misuse of their materials once shared, as well as concerns about receiving correct attribution

or recognition for the work as the original author (Charlesworth et al., 2007).

Collaboration

In addition to using, sharing and contributing information and resources, OER participants may form or join collaborative workgroups to develop resources. Collaborative workgroups, as defined here, are groups that work toward a jointly determined goal—such as creating a set of resources to fill a specific content gap, or translating a set of existing resources into another language to meet the needs of teachers in a specific cultural context. Within the workgroups, there is a commitment to share expertise, and, as Benkler (2005) notes, work is not organized around a system of “command and control.” Instead, work is organized through the social norms created by the workgroup members themselves, as well as the structures within the given OER platform—for example, the technical ability to assign functional roles such as authors, co-authors and editors to workgroup participants.

Lin's (2006) analysis of the online language translation community, OpenSource Opencourseware Prototype System (OOPS), shows how the collaborative content creation process can be structured to facilitate division of work activities within a group. Through examination of community members' online discussion threads, Lin found that collaborative content creation requires a governance structure to support shared decision making and shared ownership of work responsibilities; however, it also requires limits on that structure in order to encourage use by members outside of the community. Petrides et al.'s (2008) study of author behaviors on the OER platform Connexions supports Lin's findings. Through interviews with authors who participated in content creation workgroups on Connexions, the study revealed that the ability to structure their work through assignation of roles on the platform improved workflow and concurrently allowed the workgroup to expand across geographic and

language boundaries as new members could be easily invited and assigned roles.

Petrides and Jimes' (2008a) case study of the Free High School Science Texts (FHSST) project revealed several additional factors of importance to facilitating workflow within collaborative workgroups. By supporting online collaborative workgroups of volunteers, FHSST created four, freely available open textbooks in physics, chemistry, life sciences, and mathematics for grades 10 to 12 in South Africa. Through interviews with the FHSST project leaders, the case study revealed the importance of a system for matching work assignments to participants' expertise and interests, as well as the necessity of breaking assignments into small manageable segments—such as portions of textbook chapters, illustrations, or examples rather than whole chapters—in order to support volunteers' ability to consistently complete assignments within expected timeframes. The study also revealed the importance of supporting a hybrid structure for the collaborative work by offering both online, collaborative tools such as discussion forums around the work, as well as local meeting opportunities so that volunteers could meet to communicate and offer feedback to each other.

Alongside examinations that shed light on the structures that support collaborative workgroups around OER, there is a limited yet growing body of empirical work that seeks to assess the activities of existing collaborative workgroups within OER communities, and the challenges and incentives to engaging users in these workgroups. For example, Margaryan's (2006) work, mentioned earlier, sought to assess the ways that OER community participants collaborate on the improvement of each others' resources. Margaryan's study revealed that participants primarily provided feedback on each others' resources through face-to-face channels (71 percent of users surveyed); although nearly one-half (44 percent) of participants who responded to the survey reportedly used an automated, online collaboration feature to provide

feedback on other authors' resources. Petrides et al.'s (2008) Connexions study also revealed how formal role structures within OER workgroups, while facilitating workflow, served in some cases to exclude contributions. Specifically, the approval process, based on role assignment, prevented or slowed down more spontaneous contributions on behalf of workgroup members. The study further found that technology hurdles served as a barrier to workgroup contributions for less technologically proficient workgroup members.

The following section provides evidence from research showing that as OER users cycle through a series of activities, new conversations and practices can and do emerge. Specifically addressing the role of teachers, the section reveals how OER, as a potentially collaborative process, supports teachers as social learners—learning both from how others have already learned, and learning in situ from each other as they use, share, and ultimately collaborate around resources. As part of their OER use and reuse activities, OER participants participate in other knowledge activities, including discovering and using existing resources to inform their own content creation work. This may ultimately result in sharing the new resources or information about those resources with the wider community. In this way, the activities that OER users participate in become part of a cycle of continuous learning, which emphasizes feedback and community knowledge.

HOW OER CONTRIBUTES TO TEACHING PRACTICE

Scholars within the realm of education have begun to explore the role that OER play in supporting new and often more collaborative, teaching and learning behaviors. Metros and Bennett's (2002) work points to the notion that participation in online digital resource environments facilitates role shifts and brings new, non-traditional users into the content creation process. Their informal

web-based survey of digital resource practices at 97 higher education institutions revealed that instructors had begun to assign their students the role of co-producers of digital content. Richmond (2006) underscores these findings, arguing that OER portals and collections facilitate the removal of traditional hierarchical roles to inspire information sharing and reuse, while offering structures to help organize activities in the absence of those roles. In short, this work demonstrates how OER has the potential to enable new role structures that inspire information and knowledge sharing among participants.

Several other scholars argue the importance of teacher engagement in collaborative communities around resource use and pedagogy, in which they share and learn from their colleagues' experiences (Garrison, Anderson, & Archer, 1999; Tornaghi, Vivacqua, & De Souza, 2005; Bateman, 2006; Balcean & Hirtz, 2007; Chai & Tan, 2009; Petrides, Jimes, & Middleton-Detzner, 2010). For example, a mixed-method study of an online community of art teachers collaborating around use of OER in their classrooms revealed that participation in the community led to solutions for participants to their current teaching and curriculum challenges, ideas for ways to collaborate with teachers on projects, and opportunities to share knowledge and develop professionally and creatively (Petrides, Jimes, & Middleton-Detzner, 2010). In this way, collaboration and sharing around OER were found to help expand teachers' roles and to become more active innovators as they shared and learned from one another and from their students.

Similarly, Petrides and Jimes' (2010) survey of South African teachers using and reusing OER revealed that the teachers valued the ability to participate in online, collaborative communities around resources. Specifically, the teacher survey respondents reported that participation in the communities supported their professional development as teachers—providing forums for peer mentorship around teaching practices, curriculum development, and problem solving

around classroom challenges. Finally, Petrides et al.'s (2011) study of the impact of open textbook use on teaching and learning found that faculty's adoption and use of an open textbook in their statistics courses lead to new workgroups of colleagues who focused on ways to use and integrate the open textbook into their existing course plans. Based on interviews with faculty users of open textbooks, the study further found that the new workgroups, in turn, led to additional collaborative work with those same colleagues to talk about and share lesson plans for other courses they were teaching. Taken together, these studies shed light on the importance of considering the ways in which knowledge sharing and collaboration in OER communities can foster new conversations about pedagogy, innovations in teaching, and enhanced collaborative teaching practices.

KNOWLEDGE SHARING AND COLLABORATION AS INDICATORS OF LEARNING

This chapter has argued that as users access, use, reuse, and share and collaborate around OER, they learn from their own contributions and activities, as well as from interactions with resources and other users in the community of which they are a part. Congruent with socio-cultural learning theorists including Cook and Yanow (1993) and Sandberg and Targama (1998), this approach views learning as a continuous, social process, facilitated through the meeting between socio-cultural meanings and contextual meanings during communication and interactions with those around us. OER, as potentially adaptable and collaborative resources, provide a forum for users to build new meanings through discussion, experience, sharing, and action. The development of action and new practices can result from people within the community meeting and deliberating on the knowledge, information and data available to them. These new actions or practices, in turn,

provide fertile ground for new questions. In this way, OER knowledge activities emphasize a feedback mechanism necessary to either produce an action step or reassess the type of information needed to take effective action.

From this perspective, assessing the learning that occurs within OER communities extends beyond understanding the impact and outcomes of OER use, to the activities that are integral to the creation of knowledge within OER communities. Based on nascent evidence presented in this chapter showing how OER use leads to new conversations, learnings and practices, the importance of assessing and measuring OER knowledge activities to provide insight into where and how learning occurs becomes important. Indicators for learning therefore include, for example, the ways and extent to which teachers are accessing, analyzing and utilizing resources and the information about the resources (metadata) to inform their work. Indicators also include how OER community members are sharing and receiving information and knowledge, and the types of collaborative activities they are participating in, both within the community and outside of it. Table 1 provides additional examples of these indicators.

Sources of data for these indicators can include web analytics data and user log files that are tied to the OER community under examination. Web analytics tools such as Google Analytics provide data on, for example, the number of visitors to an OER site daily and over time, top resources viewed on the site, and the predominant keywords that users use to search for resources on the site. Google

Analytics may also be used to set up “funnels,” which are a series of predictable steps users may take to arrive at a “goal,” or desired landing page. Funnels and goals are created to allow for analysis of site behaviors. Log files often provide more in-depth data, and can be used to record and study individual user behaviors, including how individual users navigate through a site, what they click on, and what specific actions they take. For example, when students use Carnegie Mellon’s Open Learning Initiative courses, their actions are logged and the information fed to the instructor as a way to assess student learning methods and identify areas where additional support is needed (Albright, 2005).

The artifacts posted and created by OER participants provide additional data to measure OER learning. For example, on OER platforms that allow users to participate in discussion forums, the discussion threads can be examined to assess the types of resources being discussed and shared, challenges encountered in the use of OER, as well as the types of information that is being shared among users about OER and OER use. Finally, data for the above indicators may also be collected through questionnaires, interviews and focus groups with users to provide both quantitative and qualitative information on user behaviors and perceptions, as well as the impact of OER use on teaching and learning.

The Institute for the Study of Knowledge Management in Education (2008), in collaboration with four foundations who fund OER projects globally, created a toolkit that projects can use to

Table 1. Examples of OER indicators of learning

<i>OER Access and Use</i>	<i>OER Sharing</i>	<i>OER Collaboration</i>
<ul style="list-style-type: none"> • Resources viewed and downloaded (%) • OER use and reuse (% of resources used “as is”, edited, remixed and modified) • OER classroom use behaviors (% of teachers using OER to prepare for lessons, % using OER in presentations, % having students use OER) 	<ul style="list-style-type: none"> • User-generated metadata, including tags, ratings and reviews (Number) • Resource sharing (% of users who share) • Channels for sharing (% of users who share through online platform tool, % through social networking tool such as Twitter, % through email, % face-to-face) 	<ul style="list-style-type: none"> • Collaborative workgroups (Number, Size) • Collaborative roles (% who are editors, authors, contributors, etc.) • Collaborative partners (% of workgroup members and overall who are teachers, students, administrators, parents, researchers)

assess OER knowledge activities and OER learning. Based on case studies of six OER projects, the toolkit provides sample interview, survey, and analytics protocols intended to capture data to inform a range of OER issues—from supporting collaborative authorship of resources, to facilitating use and reuse of resources, to sustaining projects financially, to the impact of OER on teaching and learning practices. Additionally, the National Science Digital Library (NSDL) is working to create indicators and frameworks for OER projects and platforms to assess and share the ways that users interact with resources. Building on the term *paradata*, which the NSDL has defined as data that describe how OER are used, reused, and shared by users, the NSDL also offers a framework that seeks to answer which elements of *paradata* should be collected, and which are of value to collect (NSDL, 2010).

IMPLICATIONS FOR THEORY AND PRACTICE

This chapter emphasizes the importance of a framework that positions OER as a transformative process for teaching and learning. In viewing OER as a series of knowledge activities that have the potential to open up new knowledge, collaborations and insights into teaching practice, the chapter argues for a move beyond OER creation, findability and reuse, toward further research that focuses on the intersection of OER and pedagogical practice. In short, future research is needed to build theory in this realm—specifically in terms of providing additional, substantive evidence of the relationship between OER knowledge activities and enhanced teaching and learning, as well as further narrowing in on the concrete components that best support that relationship. For OER projects in practice, such a view on OER requires paying heed to the necessary infrastructure for encouraging and capturing comprehensive data on OER communities, and making that data available

for research purposes as well as for continuous improvement of the projects and communities being examined. These data may include, for example, web analytics data, log file data, and emergent artifacts that can serve as indicators of OER access, sharing, creation use and reuse behaviors, as well as collaborative activities within OER communities.

Furthermore, in light of the findings presented in this chapter that OER encourages conversations and practices that may not traditionally be available through professional development, additional research is needed to inform the identification of ways to inspire teachers to form workgroups and communities around OER use, reuse, localization and collaborative problem solving. Such research has implications for how OER can be integrated as a model for innovation in teaching, particularly in terms of the design and implementation of professional development and training models. In light of the innovations and knowledge sharing that resulted through the network of teachers engaged around OER, continuing this model of teacher collaboration and supporting teachers through professional development becomes central.

CONCLUSION

If we look at OER as resources that lend themselves to collaboration, knowledge sharing about practices, adaptation and reuse, then the use of OER can be said to support dialog and practice in teaching and learning that is not traditionally available through proprietary resources or through existing institutional supports. While initiatives around the globe are beginning to make progress in their efforts to provide access to and knowledge of OER, institution-wide adoption and use of OER remains limited, as does knowledge about how OER can contribute to the enhancement of teaching as well as to new, learner-centric pedagogical approaches for students. Therefore, there is a timely opportunity to situate OER within the mainstream

of education, particularly with a renewed focus on institutional measures of excellence and a growing need to understand and support the factors essential to teacher quality and learner success.

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KEY TERMS AND DEFINITIONS

Collaborative OER Workgroups: Groups of teachers, students and others that work toward a jointly determined, OER-related goal—such as creating a set of resources to fill a specific content

gap, or translating a set of existing resources into another language to meet the needs of teachers and learners in a specific cultural context. Within the workgroups, there is a commitment to share knowledge and expertise. Work is organized through the social norms and common interest created by the workgroup members themselves, as well as the established structures (including technology-based structures available through a given OER workspace) that guide the work.

Collaborative Teaching Practices: Teaching practices in which teachers work with colleagues and/or students based on common, agreed upon goals. Collaborative teaching practices may include, for example, informal or formal workgroups that meet to discuss curriculum materials, or to co-create resources within or across disciplines. Collaborative teaching practices may lead to teachers becoming more active innovators as they learn and share from one another and from their students.

Learner-Centric Pedagogical Approaches: Teaching approaches that put the learner and the learner's needs at the forefront of instruction. In such an approach, teachers and instructors often serve as facilitators of learning as opposed to serving as the sole creators and purveyors of knowledge. As such, students become active co-authors in their own learning and learning practices.

OER Community. A Community of OER discoverers: viewers, users, reusers, sharers, creators and collaborators who participate in an OER platform, and whose OER behaviors and intensity of those behaviors may shift according to their OER needs at any given time. An individual OER user may be a member of several, overlapping OER communities, or only one.

OER Knowledge Activities: Activities that include discovering, browsing, accessing and viewing OER, using and reusing OER, and sharing and collaboration activities that potentially sparks new knowledge, collaboration and resources.

OER Indicators of Learning: Indicators that provide measurements for determining the extent to which OER users are accessing, using, sharing and collaborating around resources. Examples of indicators include percent of resources viewed, downloaded and used, percent of users who share resources or information about resources (metadata), and collaborative roles and make up of workgroup members.

Paradata. Initially defined by the National Science Digital Library (NSDL): Paradata is data that describe how OER are used, reused, and shared by users. Paradata differs from metadata in that metadata is descriptive data about a resource, while paradata is data about use of the resource.

Peer-to-Peer Learning Environment. An environment in which students interact: form workgroups, and discuss with peers who share a common interest towards a common learning goal. Built on a sense of communal responsibility, this type of learning encourages peer based feedback and exchange, as well as sharing of expertise and skills.

Resource Lifecycle: Collis and Strijker's lifecycle of digital resources which suggests that users cycle through a series of stages with resources, from obtaining and labeling them, to using and offering them before finally retaining them, ultimately resulting in resource transformation.