

Developing a Reliable Method to Assess the Efficacy of OER on Lifelong Learning Competencies

East Central University's (ECU) Linscheid Library in partnership with Oklahoma State University Libraries (OSU), Redlands Community College (RCC) and the Oklahoma Council of Online Learning Excellence (COLE) request \$428,304 in National Leadership Grant funding for a three-year project to create and disseminate a research methodology for evaluating the efficacy of Open Educational Resources (OER) in increasing lifelong learning competencies. This exploratory, research in service to practice project aligns with the Lifelong Learning project category and all objectives in IMLS's Strategic Plan Goal 1. The project will include diverse participants from ECU (a rural regional university), OSU (a research university) and Redlands Community College. The deliverables will be a research toolkit for studying the efficacy of OER on increasing lifelong learning competencies and an OER for librarians on how to create robust research methodologies for studying teaching and learning. The research toolkit will include an instrument to measure the effect of OER on lifelong learning competencies, information for administering and scoring the instrument, and potential study designs using the instrument. These deliverables will benefit faculty, students and librarians nationwide.

Statement of National Need

The project was created to address the lack of robust research methodology in OER efficacy studies and the lack of librarian knowledge in conducting research. The lack of reliability in OER efficacy studies can significantly impact OER adoption because OER efficacy is a primary concern for faculty. The lack of librarian knowledge of conducting research limits librarians' potential to collaborate with faculty and to further promote OER. Addressing these problems through the lens of lifelong learning creates opportunities for librarians to promote and evaluate OER across disciplines and contexts. The phase for this project is exploratory because no known research on measuring OER efficacy in impacting lifelong learning competencies currently exists.

Need for Improved OER Efficacy Studies

In a recent literature review of OER efficacy studies, only five of 22 efficacy studies attempted to control for student and teacher variables.¹ Most current OER efficacy studies are conducted using the COUP model, which measures Cost, Outcome, Usage or Perception.² Only one of these categories, Outcome, addresses student learning outcomes and within that outcome, most studies only use GPA, final exam grades, and retention rates³, which limit OER outcome studies to higher education environments. These outcomes are particularly difficult to study as they have many confounding variables such as student socioeconomic status and the difficulty of the course. The Open Education Group has identified complications that often accompany OER efficacy studies⁴, however the recommended solutions for controlling them are impractical for most researchers. There is a need for a unified method of study that applies across different contexts and that has variables that can be easily controlled. A replicable study design across context and disciplines can increase the overall reliability and validity of OER efficacy studies. More evidence on OER efficacy can impact adoption. Despite the abundance of OER available, a recent survey of 3,288 faculty reports adoption rates of OER among faculty at 13%, which may be inflated due to faculty's lack of understanding of what defines OER.⁵

Need for Librarian Research Skills to Promote OER

Libraries are the leaders of OER initiatives at many academic institutions because OER support

¹ Hilton, J. (2019). Open educational resources, student efficacy, and user perceptions: A synthesis of research published between 2015 and 2018. *Educational Technology Research and Development*, 1-24.

<https://doi.org/10.1007/s11423-019-09700-4>

² Hilton, J., Wiley, D., Fischer, L. & Nyland, R. (n.d.). Guidebook to research on open educational resources adoption. [PDF file]. Retrieved from <http://openedgroup.org/wp-content/uploads/2016/08/OER-Research-Guidebook.pdf>

³ Hilton, 2019

⁴ Hilton et al., n.d.

⁵ Seaman, J.E. & Seaman, J. (2018). Freeing the textbook: Educational resources in U.S. higher education, 2018. Babson Survey Research Group. Retrieved from www.onlinelearningsurvey.com/oer.html

libraries' mission to provide equitable access.⁶ Libraries are already equipped to handle many aspects of OER, such as assisting with publishing and discoverability, but librarians are less prepared to assist faculty in evaluating the quality of OER, which is the top factor in faculty's decision to adopt OER.⁷ In a 2014 survey of 2,144 faculty, 59.2% of faculty reported being unable to judge the quality of OER.⁸ In a survey of 218 faculty, 36.7% reported needing more information about OER before incorporating OER into their courses, including studies on the efficacy of OER.⁹ There is a need for librarians to conduct OER efficacy studies and gain the skills needed to help faculty evaluate OER.

Few librarians receive training in research methodology as part of their education.¹⁰ Knowledge of robust research methodology is especially important in studying teaching and learning, which has many influencing factors that are difficult to control, such as student demographics and teaching styles.¹¹ The IMLS funded Institute for Research Design in Librarianship (IRDL) also acknowledges the need for more research training for librarians. The proposed project would address the same need as IRDL with a different approach. The combination of an OER about research methodology customized for librarians and a research toolkit for evaluating OER would provide librarians with background knowledge to conduct research and a toolkit to apply that knowledge. Most importantly, both the OER and the toolkit would accommodate different library contexts and would be accessible to librarians who are not able to travel to conferences or workshops.

Opportunity for Lifelong Learning to Address the Needs

This proposal suggests a lifelong learning lens as a solution to the need for improved OER efficacy studies and the need for research training for librarians. Lifelong learning competencies are a measurable outcome that is valuable to every discipline and context in a variety of educational institutions, from K12 schools to adult learning centers. Universities need to cultivate lifelong learning opportunities to meet the needs of an aging population navigating a workforce driven by constantly changing technology.¹² Therefore, lifelong learning can serve as a common language between librarians, faculty and universities in providing evidence for the necessity and effectiveness of OER. Other educational institutions serving adult learners such as public libraries and career technology centers are also driven by lifelong learning. Both libraries and the open education movement value and promote lifelong learning. UNESCO's OER webpage states OER "has increasingly been recognized by the international community as an innovative tool for meeting the challenges of

⁶ Anderson, T., Doney, J. Hendrix, B., Martinez, J., Stoddard, R. & Wright, M. (2019). The five laws of OER: Observations from Ranganathan. *Journal of Librarianship and Scholarly Communication*, 7(General Issue). <https://doi.org/10.7710/2162-3309.2299>

⁷ Green, K. (2016, February 19). *Going digital: Faculty perspectives on digital and OER course materials*. Encino, CA: Campus Computing. Retrieved from <https://www.campuscomputing.net/content/2016/2/19/going-digital-2016>

⁸ Allen, I. E. & Seaman, J. (2014). Opening the curriculum: Open Educational Resources in U.S. higher education. Babson Survey Research Group. Retrieved from <http://www.onlinelearningsurvey.com/oer.html>.

⁹ Belikov, O. M., & Bodily, R. (2016). Incentives and barriers to OER adoption: A qualitative analysis of faculty perceptions. *Open Praxis*, 8(3), 235–246. doi:10.5944/openpraxis.8.3.308

¹⁰ Kennedy, M. R. & Brancolini, K. R. (2018). Academic librarian research: An update to a survey of attitudes, involvement, and perceived capabilities. *College & Research Libraries*, 79(6), 822. <https://doi.org/10.5860/crl.79.6.822>

¹¹ Gurung, R. A. R. (2018, Nov. 14). Open educational resources: What we don't know. Retrieved from <https://www.insidehighered.com/digital-learning/views/2018/11/14/what-we-dont-yet-know-about-open-educational-resources-opinion>

¹² Yang, J., Schneller, C. & Roche, S. (Ed.s) (2015). The role of higher education in promoting lifelong learning. Hamburg, Germany: UNESCO Institute for Lifelong Learning. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000233592.locale=en>

providing lifelong learning opportunities for learners from diverse levels and modes of education worldwide.”¹³ OER are an excellent tool for increasing lifelong learning opportunities because they can be adapted and retained in multiple formats, allowing each context to customize the learning material.

One of the defining frameworks of lifelong learning was identified by Delors as the four pillars of lifelong learning: Learning to know, learning to do, learning to live together and learning to be.¹⁴ These pillars acknowledge that lifelong learning consists of basic knowledge combined with the ability to work with others, appreciate diversity, and identify and fulfill one’s potential. Researchers have identified several competencies that capture individuals’ propensity to be lifelong learners that include technical skills like information literacy and personal attributes like internal motivation.¹⁵ These competencies can be accurately captured through instruments and do not require longitudinal study.¹⁶ Instruments allow studies to be easily replicated and allow for the identification and controlling of confounding variables through statistical analysis. Thus, an instrument that measures lifelong learning competencies and student and teacher differences would be a robust study design that can be applied in multiple contexts.

Connection to IMLS Goal for Lifelong Learning

This project meets all objectives in IMLS’s goal to promote lifelong learning. The first and third objectives are met in the project’s broad goal to increase OER adoption. OER provide opportunities to enhance digital literacy and other types of literacies. They also provide opportunities to publish diverse voices and extend learning opportunities across various socio-economic statuses. The second and fourth objectives are met by more specific goals of this project. Providing resources for librarians to more easily enter the conversation on OER efficacy aligns with IMLS’s objective to further libraries’ role as dependable sources of information. By tying the conversation about OER efficacy to lifelong learning, this project can help position libraries to have considerable influence on a variety of educational institutions in addition to colleges and universities. Since lifelong learning appeals to university administration and the values of faculty across academic disciplines, using this approach allows for cross-disciplinary collaboration between librarians and faculty. Finally, this project promotes IMLS’s objective to increase inquiry-based methods of learning by providing a resource for librarians to learn more about conducting research in the Study of Teaching and Learning (SoTL) and thus becoming practitioners and promoters of inquiry-based learning. SoTL involves the researcher assuming the role of a learner through a process of inquiry on how teaching methods impact student learning. Providing a resource for librarians to conduct their own SoTL research can give librarians more credentials to assist faculty in adopting inquiry-based learning practices.

Project Design

The goals of the project are to 1. Develop a replicable research methodology (research toolkit) for measuring the impact of OER on lifelong learning competencies and 2. Develop an OER for librarians on conducting research. The project assumes that OER will affect lifelong learning competencies and that an OER will meet librarians’ needs for further training in research design. As with any data collection, there are some risks related to the accuracy of the data. These risks and how they will be mitigated are outlined in the methods section of this proposal. The anticipated benefits are to increase the number of reliable OER efficacy studies, establish lifelong learning as a key outcome of OER use, increase the diversity of OER study populations and make conducting research more accessible to librarians.

The first goal of the project will be completed in three phases as outlined in Table 1.

¹³ UNESCO. (n.d.) Open educational resources (OER). Retrieved from <https://en.unesco.org/themes/building-knowledge-societies/oer>

¹⁴ Delors, J. (1996). Learning: The treasure within; report to UNESCO of the International Commission on Education for the Twenty-first Century (highlights). <https://unesdoc.unesco.org/ark:/48223/pf0000109590>

¹⁵ Bath, D., & Smith, C. (2009). The relationship between epistemological beliefs and the propensity for lifelong learning. *Studies in Continuing Education*, 31(2), 173–189. <https://doi-org.library.ecok.edu/10.1080/01580370902927758>

¹⁶ Bath & Smith, 2009

Table 1

Phase	Year	Research Question	Steps
1	September 2020- August 2021	RQ1: What competencies of lifelong learning can be measured through self-report data?	Conceptualize the constructs of lifelong learning competencies. Conduct expert analysis for construct validity.
		RQ2: What are the student and teacher variables that impact OER efficacy studies?	Conduct literature review to identify measures to control for student and teacher differences in conducting OER research.
2	September 2021- August 2022	RQ3: Can the identified competencies of lifelong learning and student/teacher variables be accurately measured through a self-report instrument?	Compile the lifelong learning competencies constructs and control measures for student/teacher differences into a measurement scale. Conduct a pilot test. Measure construct validity with exploratory factor analysis. Measure internal consistence reliability with Cronbach Alpha. Conduct the pilot test with the same population to measure test-retest reliability.
3	September 2022- August 2023	RQ4: Do OER increase students' lifelong learning competencies?	Conduct a multi-institutional study testing the hypothesis that OERs are effective in building students' lifelong learning competencies.

Since the first goal of the project will depend on the collaboration of faculty, students and experts who follow an academic calendar, work towards the second goal will occur during the extended breaks when class is not in session in December, May, June and July as outlined in Table 2. External feedback will be gathered at each stage of the process from COLE and the advisory board. An invitation to provide feedback will also be extended through professional listservs and social media. Those who respond with interest will be given access to the COLE Moodle site, which will house the project's documents and facilitate document collaboration.

Table 2

Year	Steps
December 2020	Search for existing openly licensed research methodology resources.
May- July 2021	Outline topics.
	Remix content from existing OERs that pertain to identified topics.
December 2021	Create sections related to phase 1 (identifying and controlling for variables, conceptualizing constructs, etc.).
May- July 2022	Create sections related to phase 2 (testing for validity and reliability).
December 2022	Begin creating remaining sections.
May- July 2023	Finish creating all sections. Disseminate the finished product.

This project will require a project lead at each participating institution (the PI and Co-PIs), graduate student assistants to help with the research and an advisory board. Ms. Marla Lobley is the PI and will be the primary Project Coordinator and IMLS point of contact. She is the Public Services Librarian at East Central

University (ECU), co-chair of COLE OER subcommittee, and leader of OER initiatives at ECU. Ms. Lobley possesses demonstrated project management and leadership skills as outlined in her attached resume. Ms. Lobley will coordinate all aspects of the project, recruit ECU faculty to participate in the study, lead the dissemination efforts and supervise a graduate student assistant. Ms. Kathy Essmiller is a Co-PI and OER Librarian at Oklahoma State University (OSU), co-chair of COLE OER subcommittee, ACRL OER Roadshow design team member, a 2019/2020 OER Research Fellow and a PhD candidate in educational technology/instructional design. Ms. Essmiller will supervise a graduate research assistant, provide research and OER expertise, help gather COLE and other external feedback, and recruit OSU faculty to the study. Ms. Rose Marie Moore is a Co-PI with Redlands Community College where she is the Chief Academic Officer. Ms. Moore will recruit Redlands faculty to participate in the study, provide expertise on the community college context, and help gather external feedback through community college related listservs and social media. Graduate student assistants (GRAs) will be recruited from the Education Departments at ECU and OSU. The criteria for recruitment will be completion of one semester of a graduate program, a recommendation from a faculty member, and research skills as demonstrated through previous coursework. The project requires \$428,304 in funding over three years, including \$56,643 in personnel/salary, \$18,692 in benefits, \$27,700 in travel, \$21,000 in supplies, \$203,488 in subawards, \$62,400 in student support, \$9,000 in other costs and \$29,381 in indirect costs.

The advisory board will be composed of:

- OER experts
 - Jamie Holmes, Reference and Instruction Librarian, Tulsa Community College
 - Alesha Baker, Ph.D., Assistant Professor, Northeastern State University
- Research/ teaching & learning experts
 - Precious Elmore-Sanders, Ph.D., Associate Vice President for the Division of Institutional Diversity
 - William Crowell, Instructional Designer, East Central University
- Stakeholders
 - Brad Griffith, Director of Online Learning Initiatives, Oklahoma State Regents of Higher Education
 - Cari Lousch, Manager- Career & Academic Connections, Oklahoma Department of Career & Technical Education
 - Seminole State College representative- TBD
 - Oklahoma Department of Libraries representative- TBD
 - Todd Hobson, Department Head, Redlands Community College
 - Student- from ECU (due to the nature of student turnover, the student will be selected during year 1 and may change throughout the project)

The composition of the advisory board provides the expertise needed for the project's success and enables a range of stakeholders to provide input and diverse, relevant, and important perspectives; to facilitate dissemination of materials and information to broad and diverse populations; and to directly and indirectly benefit from the project and its deliverables. This will help ensure broad national impact at not only colleges and universities but also other educational institutions and organizations such as Native American tribes who put education, life-long learning and personal improvement at the forefront of their mission.

The Oklahoma Council of Online Learning Excellence (COLE) will serve as a major asset to the project in gathering external feedback and disseminating the project results. COLE consists of approximately 95 members from over 30 education institutions in Oklahoma. The COLE OER subcommittee meets regularly to strengthen and promote OER use in Oklahoma higher education institutions. COLE also provides input for the Online Consortium of Oklahoma, which is a new initiative that provides funding and a full-time position (Director of Online Learning Initiatives) to implement the ideas generated in COLE. Beginning in summer 2020, COLE and OCO will share a website (<https://ocolearnok.org>) that will be the primary resource for listing the OER efforts happening in Oklahoma. Therefore, their website will serve as the project website and house the project's digital products. The project website will allow for collaboration and input from other institutions

in Oklahoma and will be promoted through professional listservs and social media to gather input from professionals nationwide.

The target community for each goal is listed below.

- Goal 1
 - Phase 1 & 2: Researchers and potential researchers of teaching, learning and lifelong learning
 - Phase 3: Students, faculty, librarians using or interested in using OER
- Goal 2
 - Librarians interested in conducting research on teaching and learning

The advisory board consists of representatives from initially identified target communities in order to incorporate multiple perspectives and external consensus building. The PIs represent three different types of institutions, each with different levels of OER implementation, to ensure the project deliverables will be applicable to a variety of contexts. Another advantage of the three participating institutions is the availability of a diverse student population for testing the research toolkit and conducting the multi-institutional study. Students will be recruited to the pilot testing study and the multi-institutional study based on the courses they enroll in. The primary requirement for student participation in the study is enrollment in a course taught by a faculty member who commits to adoption of OER in the course and who is a participant in the project as a faculty researcher. Faculty scheduled to teach general education courses with large enrollments will be considered first preference as faculty researchers in the project, due to the demographical and academic diversity of the students enrolled, and because a broad spectrum of disciplines and academic fields are represented in these courses. Each institution has varying existing OER efforts and the PIs have established relationships with faculty related to OER, setting a strong foundation with faculty and for faculty recruitment to the project. The project will also provide a \$750 incentive to participating faculty which will be distributed through each institution. In years 2 and 3, 12 faculty from each institution will be recruited for the pilot testing and multi-institutional study, totaling 36 courses each year. Considering the average course size at each institution, this method will generate 800-1000 student participants each for the pilot testing and multi-institutional study. The community college population will consist largely of non-traditional students. The regional university population will have many first generation, lower SES, international and tribal students. The research university population will have representation of diverse racial and ethnic backgrounds.

The indicators of success include 1. Development of a reliable and valid research methodology that is applicable in various contexts and 2. Development of an OER for librarians that is effective in scaffolding the development of research skills. The performance measures will include completion of the deliverables according to the timeline outlined in the grant schedule and the amount of interaction with the professional community through the dissemination efforts. Measuring interaction with the professional community through the project website, social media and at conferences will provide evidence of awareness of the project and allow the community to give feedback on how applicable the research toolkit is to their context and how helpful the OER is in scaffolding the development of research skills. The goals for the project in terms of performance measurement is to 1. Have increasing awareness of the project each year as shown by increasing views of the project website and interaction on social media and 2. Have documented meaningful interactions with the professional community that shows how their feedback has shaped the project results. Evaluation will occur throughout the project by consulting the advisory board for input and gathering feedback from COLE. The project will use an iterative method to gather input, create the product, request feedback on the product and then make changes to the product as needed throughout the process. The advisory board will provide input before the creation of deliverables based on their expertise and COLE will provide feedback after the deliverables are created based on their applicability to practice. Ongoing evaluation is suitable in an exploratory phase so that the project can be informed by feedback since there is no foundational research that can inform the project. Using input from people who are representative of different contexts is suitable to the creation of resources that are intended to be applicable to different contexts due to the tacit knowledge involved in determining if something is practical for a certain context.

Dissemination of the project will occur in several traditional and non-traditional ways. The PIs will create a Twitter account for the project and use hashtags to reach communities for open education, higher education, community colleges, K12 schools, adult learning centers, and lifelong learning researchers. In Year

2, the PIs will write a scholarly article about the creation of the instrument used to measure lifelong learning competencies and student and teacher differences. In year 3, they will write a scholarly article about the results of the multi-institutional study and create a video summarizing the results that can be shared with faculty. They will submit the articles to open access publications such as the *Journal of Librarianship and Scholarly Communication*, *Open Praxis*, *Journal of The Scholarship of Teaching and Learning*, and *The International Review of Research in Open and Distributed Learning*. Also in year 3, the project planners will apply to present at the Association of College & Research Libraries Conference and the Open Ed Conference. The PIs will submit proposals to other conferences as available and request to be featured on podcasts relating to open education, higher education and lifelong learning. The results of the project and all non-personally identifiable data will be made available through the COLE/OCO website. The data will be left unaggregated so that researchers can study the impact of OER on various student demographics as recommended by Colvard, Watson, & Park¹⁷ and Hilton.¹⁸ The research toolkit and OER will be made available through the COLE/OCO website and will be disseminated through OER Commons, various professional listservs, social media, and submitted to the Open Education Group for linking on their website page for OER research (openedgroup.org/review). COLE/OCO will continue to host the project products after the completion of the project so that the links distributed through the various channels will remain active. Key definitions and decisions on the research process will be documented as needed and provided with the project data to inform future researchers using the data.

Methods

The theoretical framing for the project is Carneiro's generativism, which views learning as a "constant co-creation and re-creation of knowledge."¹⁹ This theory views learner competencies in lifelong learning in light of the potential of OERs to create a socially constructed, shared body of knowledge, which makes this theory applicable to educational institutions outside higher education such as public libraries, career technology centers, and continuing education programs.

Table 3 provides the method of study, data collection and analysis for each research question.

Table 3

Research Question	Method of Study	Data Collection	Data Analysis
RQ1: What competencies of lifelong learning can be measured through self-report data?	Literature review Construct validity analysis	Literature searches Experts on lifelong learning review the identified competencies	Factor analysis
RQ2: What are the student and teacher variables that impact OER efficacy studies?	Literature review Construct validity analysis	Literature searches Experts in teaching and learning review the identified variables	Factor analysis
RQ3: Can the identified competencies of lifelong learning and student/teacher variables be accurately	Measure for convergent/discriminant validity Test-retest reliability	Pilot test Pilot test with the same	Factor analysis Pearson

¹⁷ Colvard, N.B., Watson, C.E., & Park, H. (2018). The impact of open educational resources on various student success metrics. *International Journal of Teaching and Learning in Higher Education*, 30(2), 262-276. <https://eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=EJ1184998>

¹⁸ Hilton, 2019

¹⁹ Carneiro, R. (2011). Discovering the treasure of learning. In J. Yang & R. Valdés-Cotera (Eds.), *Conceptual evolution and policy developments in lifelong learning* (pp. 3–23). Hamburg: UNESCO Institute for Lifelong Learning. <http://uil.unesco.org/lifelong-learning/conceptual-evolution-and-policy-developments-lifelong-learning>

measured through an instrument?		population	Correlation Coefficient
RQ4: Do OER impact students' lifelong learning competencies?	Pre/post-test design	Instrument of self-report data on students' lifelong learning competencies and demographics Instrument of self-report data from faculty on teaching variables	T-test ANOVA

The specific data points to be measured for RQ3 and RQ4 will not be identified until after the first two research questions are addressed. In order to make the research method easily replicable, the data points identified in RQ1 and RQ2 will be limited to what can be gathered through self-reporting or through data points that are commonly available through institutions' course catalog, such as course size, length and discipline. The data will be analyzed using SPSS software, which is available at ECU and OSU.

The project will require IRB approval from ECU. The project has been pre-reviewed by the chair of the ECU IRB and he estimates the approval time will take 2 weeks. The IRB will be submitted in September 2020 as there are several months before any testing with human subjects is needed. Once approved, the IRB information will be sent to Redlands and OSU to keep on file. The IRB application will be amended in year 2 after the instrument is developed.

This project is informed by a recent literature review of OER efficacy research²⁰, which identified a need for more robust methods to determine the efficacy of OER. It builds on the COUP model by providing a different avenue for collecting data in the Outcome portion of the model. The OER for building librarians' research skills will incorporate existing OER as appropriate, including *Social Science Research: Principles, Method and Practices*.²¹ The project deliverables can greatly further professional practice by making it easier for researchers to conduct OER efficacy studies and by giving librarians the skills they need to conduct studies in the broader field of teaching and learning.

An instrument with self-reported data is the most easily replicable across contexts. Self-report data is preferred over gathering data from institutions because institutions collect and disseminate different data and may have different definitions for the same data point. Creating a new instrument is preferred rather than using an existing instrument. A new instrument will allow for the inclusion of control measures for student and teacher differences and allow for the testing of reliability and validity in diverse populations. There are risks with using self-report data, such as the social desirability bias where participants report incorrectly so that they will be better perceived by others and the reference bias where participants have different internal definitions for the same concept. These biases can be mitigated through careful wording on the instrument and statistical analysis.²²

A pre-/post-test design will be used in the multi-institutional study because it is the design that is most replicable for faculty researchers. Although the research toolkit will be designed so it could be used in a variety designs, such as a correlational design, the pre-/post-test design is easier for faculty to replicate because it only requires the recruitment of one population rather than an additional population to serve as a control group.

²⁰ Hilton, 2019

²¹ Bhattacharjee, A. (2012). *Social science research: Principles, methods and practices*. Textbooks collection 3. http://scholarcommons.usf.edu/oa_textbooks/3

²² Demetriou, C., Ozer, B.U., & Essau, C.A. (2015). Self-report questionnaires. In R.L. Cautin & S.O. Lilienfeld (Eds.), *The Encyclopedia of Clinical Psychology*. doi:10.1002/9781118625392.wbecp507

Diversity Plan

Colvard et al.²³ found that OER had a positive impact on academic outcomes for students receiving Pell grants, non-White students and part-time students at a greater rate than their counterparts. Studying the effect of OER on underserved students has been identified as a need in recent literature.²⁴ The results of this project will reveal if that positive impact extends to lifelong learning outcomes and will make it easier to conduct more research with diverse populations.

ECU is located in Ada, population 17,269, the commercial, industrial, service, educational, cultural, and medical hub of an 11-county, 7,727 square-mile region. ECU's 11-county service area, population 573,952, is largely unincorporated, based on U.S. Census Bureau thresholds for "mostly rural" or "completely rural." ECU's approximately 3,600 students, 2,965 of whom are undergraduates, come from 35 countries and 22 states. Almost 93% of ECU students are from the 11-county service area, 14.7% are Native American, 61% are female, 26% are part-time, and more than 50% are Pell-eligible/high-need. ECU's student population is approximately 39% minority. Additionally, as an affordable regional university in a rural area, ECU has a very high number of first-generation and/or low-income students and non-traditional students.

Redland's Community College has approximately 2,500 students enrolled, of whom 63% are of racial or ethnic minority, 78% are part-time, and 32% are Pell-eligible. Native Americans are the largest minority group at 12%. The Cheyenne-Arapaho, Kiowa, and Caddo tribes are headquartered within the Redlands service area. Redlands primarily serves rural students and many are first-generation, non-traditional, and/or concurrent high school students. As a testimony to this diverse population, Redlands has qualified and received multiple Federal Title IV TRiO grants (Upward Bound, Student Support Services, and Veterans' Upward Bound) and two Federal Title III NASNTI grants (Part F and Part A). Oklahoma State University has approximately 25,500 students enrolled. One-third of OSU's student population is multiracial, Hispanic, international, black or Asian American. OSU is recognized as a "Diversity Champion" by *INSIGHT Into Diversity* magazine. OSU is one of eight institutions in the country that has been recognized with the Higher Education Excellence in Diversity Award for eight consecutive years. These statistics and other inclusivity efforts clearly demonstrate that this multi-institutional collaboration provides a very diverse and appropriate population for the study.

Both deliverables of the project seek to make conducting research on OER more accessible to librarians and faculty. These resources will significantly benefit faculty and librarians who cannot afford outside trainings or conferences and can empower them to conduct research that would otherwise not be possible due to lack of resources. ECU and Redlands are institutions who prioritize teaching over research and the PIs from these institutions will play a key role in making sure the deliverables can be practically implemented in the environment of a teaching-focused university. COLE will also be a regular source of feedback in identifying needs and opportunities as it consists of librarians, faculty and administrators from a variety of higher education institutions in Oklahoma. The advisory board is a second source of feedback from organizations in higher education and others whose missions value education and lifelong learning. The advisory board members were selected because of their perspectives working with and serving diverse communities, ranging from underserved populations to non-traditional students, to other adult learners. The advisory board members and PIs are leaders in their organizations and among their communities and state, who have direct contact with the populations they serve and can speak to the applicability of an idea to their daily practice.

Another advantage of the advisory board is the likelihood that the deliverables will be implemented outside higher education communities. The advisory board includes representatives from organizations that will potentially use OER but are not currently using them, providing this project extensive opportunity to expand its reach. This includes two-year colleges, career technology centers, tribal education departments, and public libraries.

Each partner institution has existing relationships with various community organizations enabling them to promote and provide exposure to OER and OER implementation resources. Redlands has many concurrent

²³ Colvard et al., 2018

²⁴ Colvard et al., 2018; Hilton, 2019

enrollment partnerships with area high schools, a partnership with Canadian Valley Vocational Technology Center, and multiple grant programs targeting underserved populations such as low-income students, first generation college students and students with disabilities. ECU's standard, 11-county service area includes eight Native American tribes, including the Chickasaw, Choctaw, Citizen Pottawatomie, Kickapoo, Muscogee Creek, Sac and Fox, and Seminole Nations, and the Absentee Shawnee Tribe, with strong, long-time, ongoing partnerships with their education departments. Through various federal grant programs and institutional programs, ECU has strong working relationships with higher education departments and K-12 educational offices within the vast majority of the remaining 30 tribes in Oklahoma as well as others across the nation. ECU also serves minority, under-represented, and high-need students through grant programs and institutional efforts such as the Louis Stokes Alliance for minority students program, Ronald E. McNair Scholars program, Veterans Student Support Services, and the Native American Serving Non-Tribal Institution (NASNTI) grant program. ECU has a strong disability services office and deaf and hard of hearing services (and academic program), an active and fully staffed international student services office, a Native American student resource officer, and programs serving students who are single mothers.

National Impact

This project explores OER efficacy in a way that will make conducting OER efficacy research more accessible to teachers, faculty and librarians across the nation. It also provides a resource to make research and findings more accessible to librarians, even if they are not currently working with OER. The potential impact of this project extends beyond the faculty and librarians who are willing to conduct research on OER. Academic librarians who are promoting OER often find it difficult to persuade faculty that adopting OER is worth the time investment. The exploratory work of this project opens the door for stronger research and valid, reliable, findings that can help convince faculty and administrators that OER are crucial to the viability of higher education institutions and the educational experiences of students, especially those who are part-time, non-traditional, or are otherwise under-represented. It also provides a platform for other stakeholders to promote the research and OER usage to their peers within the state and especially nationally.

One of the primary goals of the project is that the deliverables are adaptable by other institutions. This goal was the driving factor in choosing a research university, a regional university and a community college to participate in the project. The PIs have several years of experience at their institutions and a deep understanding of the context and factors that impact individuals working at similar institutions. Consulting with the advisory board which represents a variety of different institutions and requesting ongoing feedback from COLE furthers the diversity of voices in the project and therefore the applicability to other institutions and communities. By selecting lifelong learning competencies as the lens for the project, the deliverables will allow OERs to be studied in contexts that do not provide grades or GPAs. The project data will not be aggregated as much as possible while still protecting privacy so that other researchers can study OER's effects on underserved populations as suggested by researchers.²⁵

As an exploratory project, there are abundant opportunities to sustain the project after the grant period. The dissemination efforts will focus on increasing awareness of and engagement with the project in the broader professional communities of open education, higher education and lifelong learning so that after the grant period is ended, other individuals and institutions can use the research toolkit and OER. The project deliverables and data will be openly licensed and housed on the COLE/OCO website. Links to the project deliverables from the Open Education Group and OER Commons will increase the discoverability of the project well after the funding period. The PIs contact information will also be available in the deliverables to facilitate contact by other researchers wishing to use the materials. The PIs will continue to give presentations on the research toolkit and the research methodology OER as part of their job responsibilities. The PIs will also promote the use of the deliverables at their home institutions and in COLE, with the hopes of empowering faculty and librarians to conduct their own OER efficacy studies.

²⁵ Colvard et al., 2018; Hilton, 2019



DIGITAL PRODUCT FORM

INTRODUCTION

The Institute of Museum and Library Services (IMLS) is committed to expanding public access to digital products that are created using federal funds. This includes (1) digitized and born-digital content, resources, or assets; (2) software; and (3) research data (see below for more specific examples). Excluded are preliminary analyses, drafts of papers, plans for future research, peer-review assessments, and communications with colleagues.

The digital products you create with IMLS funding require effective stewardship to protect and enhance their value, and they should be freely and readily available for use and reuse by libraries, archives, museums, and the public. Because technology is dynamic and because we do not want to inhibit innovation, we do not want to prescribe set standards and practices that could become quickly outdated. Instead, we ask that you answer questions that address specific aspects of creating and managing digital products. Like all components of your IMLS application, your answers will be used by IMLS staff and by expert peer reviewers to evaluate your application, and they will be important in determining whether your project will be funded.

INSTRUCTIONS

If you propose to create digital products in the course of your IMLS-funded project, you must first provide answers to the questions in **SECTION I: INTELLECTUAL PROPERTY RIGHTS AND PERMISSIONS**. Then consider which of the following types of digital products you will create in your project, and complete each section of the form that is applicable.

SECTION II: DIGITAL CONTENT, RESOURCES, OR ASSETS

Complete this section if your project will create digital content, resources, or assets. These include both digitized and born-digital products created by individuals, project teams, or through community gatherings during your project. Examples include, but are not limited to, still images, audio files, moving images, microfilm, object inventories, object catalogs, artworks, books, posters, curricula, field books, maps, notebooks, scientific labels, metadata schema, charts, tables, drawings, workflows, and teacher toolkits. Your project may involve making these materials available through public or access-controlled websites, kiosks, or live or recorded programs.

SECTION III: SOFTWARE

Complete this section if your project will create software, including any source code, algorithms, applications, and digital tools plus the accompanying documentation created by you during your project.

SECTION IV: RESEARCH DATA

Complete this section if your project will create research data, including recorded factual information and supporting documentation, commonly accepted as relevant to validating research findings and to supporting scholarly publications.

SECTION I: INTELLECTUAL PROPERTY RIGHTS AND PERMISSIONS

A.1 We expect applicants seeking federal funds for developing or creating digital products to release these files under open-source licenses to maximize access and promote reuse. What will be the intellectual property status of the digital products (i.e., digital content, resources, or assets; software; research data) you intend to create? What ownership rights will your organization assert over the files you intend to create, and what conditions will you impose on their access and use? Who will hold the copyright(s)? Explain and justify your licensing selections. Identify and explain the license under which you will release the files (e.g., a non-restrictive license such as BSD, GNU, MIT, Creative Commons licenses; RightsStatements.org statements). Explain and justify any prohibitive terms or conditions of use or access, and detail how you will notify potential users about relevant terms and conditions.

A.2 What ownership rights will your organization assert over the new digital products and what conditions will you impose on access and use? Explain and justify any terms of access and conditions of use and detail how you will notify potential users about relevant terms or conditions.

A.3 If you will create any products that may involve privacy concerns, require obtaining permissions or rights, or raise any cultural sensitivities, describe the issues and how you plan to address them.

SECTION II: DIGITAL CONTENT, RESOURCES, OR ASSETS

A.1 Describe the digital content, resources, or assets you will create or collect, the quantities of each type, and the format(s) you will use.

A.2 List the equipment, software, and supplies that you will use to create the digital content, resources, or assets, or the name of the service provider that will perform the work.

A.3 List all the digital file formats (e.g., XML, TIFF, MPEG, OBJ, DOC, PDF) you plan to use. If digitizing content, describe the quality standards (e.g., resolution, sampling rate, pixel dimensions) you will use for the files you will create.

Workflow and Asset Maintenance/Preservation

B.1 Describe your quality control plan. How will you monitor and evaluate your workflow and products?

B.2 Describe your plan for preserving and maintaining digital assets during and after the award period. Your plan should address storage systems, shared repositories, technical documentation, migration planning, and commitment of organizational funding for these purposes. Please note: You may charge the federal award before closeout for the costs of publication or sharing of research results if the costs are not incurred during the period of performance of the federal award (see 2 C.F.R. § 200.461).

Metadata

C.1 Describe how you will produce any and all technical, descriptive, administrative, or preservation metadata or linked data. Specify which standards or data models you will use for the metadata structure (e.g., RDF, BIBFRAME, Dublin Core, Encoded Archival Description, PBCore, PREMIS) and metadata content (e.g., thesauri).

C.2 Explain your strategy for preserving and maintaining metadata created or collected during and after the award period of performance.

C.3 Explain what metadata sharing and/or other strategies you will use to facilitate widespread discovery and use of the digital content, resources, or assets created during your project (e.g., an API [Application Programming Interface], contributions to a digital platform, or other ways you might enable batch queries and retrieval of metadata).

Access and Use

D.1 Describe how you will make the digital content, resources, or assets available to the public. Include details such as the delivery strategy (e.g., openly available online, available to specified audiences) and underlying hardware/software platforms and infrastructure (e.g., specific digital repository software or leased services, accessibility via standard web browsers, requirements for special software tools in order to use the content, delivery enabled by IIIF specifications).

D.2. Provide the name(s) and URL(s) (Universal Resource Locator), DOI (Digital Object Identifier), or other persistent identifier for any examples of previous digital content, resources, or assets your organization has created.

SECTION III: SOFTWARE

General Information

A.1 Describe the software you intend to create, including a summary of the major functions it will perform and the intended primary audience(s) it will serve.

A.2 List other existing software that wholly or partially performs the same or similar functions, and explain how the software you intend to create is different, and justify why those differences are significant and necessary.

Technical Information

B.1 List the programming languages, platforms, frameworks, software, or other applications you will use to create your software and explain why you chose them.

B.2 Describe how the software you intend to create will extend or interoperate with relevant existing software.

B.3 Describe any underlying additional software or system dependencies necessary to run the software you intend to create.

B.4 Describe the processes you will use for development, documentation, and for maintaining and updating documentation for users of the software.

B.5 Provide the name(s), URL(s), and/or code repository locations for examples of any previous software your organization has created.

Access and Use

C.1 Describe how you will make the software and source code available to the public and/or its intended users.

C.2 Identify where you will deposit the source code for the software you intend to develop:

Name of publicly accessible source code repository:

URL:

SECTION IV: RESEARCH DATA

As part of the federal government's commitment to increase access to federally funded research data, Section IV represents the Data Management Plan (DMP) for research proposals and should reflect data management, dissemination, and preservation best practices in the applicant's area of research appropriate to the data that the project will generate.

A.1 Identify the type(s) of data you plan to collect or generate, and the purpose or intended use(s) to which you expect them to be put. Describe the method(s) you will use, the proposed scope and scale, and the approximate dates or intervals at which you will collect or generate data.

A.2 Does the proposed data collection or research activity require approval by any internal review panel or institutional review board (IRB)? If so, has the proposed research activity been approved? If not, what is your plan for securing approval?

A.3 Will you collect any sensitive information? This may include personally identifiable information (PII), confidential information (e.g., trade secrets), or proprietary information. If so, detail the specific steps you will take to protect the information while you prepare it for public release (e.g., anonymizing individual identifiers, data aggregation). If the data will not be released publicly, explain why the data cannot be shared due to the protection of privacy, confidentiality, security, intellectual property, and other rights or requirements.

A.4 What technical (hardware and/or software) requirements or dependencies would be necessary for understanding retrieving, displaying, processing, or otherwise reusing the data?

A.5 What documentation (e.g., consent agreements, data documentation, codebooks, metadata, and analytical and procedural information) will you capture or create along with the data? Where will the documentation be stored and in what format(s)? How will you permanently associate and manage the documentation with the data it describes to enable future reuse?

A.6 What is your plan for managing, disseminating, and preserving data after the completion of the award-funded project?

A.7 Identify where you will deposit the data:

Name of repository:

URL:

A.8 When and how frequently will you review this data management plan? How will the implementation be monitored?