Creating Systems of Sustainability:

Four Focus Areas for the Future of PK-12 Open Educational Resources

NEW AMERICA

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Contents

Preface

Over the past few years, state and school district education leaders have renewed their focus on the quality of learning materials available in our nation's classrooms (Chiefs for Change, 2017; RAND Corp., 2016; RAND Corp., 2017). Many leaders have been dismayed to find that existing proprietary textbooks and supplementary resources often do not match their teachers' and students' needs (Ishmael, 2018a). Fortunately, there is a growing recognition of teachers and school leaders who are addressing this challenge head-on through open educational resources.

Simply put, open educational resources, or OER, are "high quality teaching, learning, and research resources that are free for others to use and repurpose" (Hewlett Foundation, 2015). OER range from entire curricula and textbooks to smaller grain-size learning materials, including assessments, videos and images.

OER enhance teaching and learning in several ways. First and foremost, OER can empower teachers. Unlike most proprietary educational resources adopted by state and local educational agencies, which are static or prohibit educators from altering them, OER can be regularly updated and personalized to ensure that materials continue to be relevant for students. Enabling those teaching in the classroom on a daily basis to decide which resources most support the unique needs and challenges of their students recognizes teachers as creative professionals with subject matter, design and pedagogical expertise. Second, OER can serve as a tool for educational equity. Given that open licenses permit free distribution, quality learning materials can reach all student populations. Lastly, OER can allow state and school district leaders to reinvest funds otherwise budgeted to purchase proprietary materials. The dollars saved can be used instead to support critical professional development for teachers, expand personalized learning opportunities for students, and maintain a robust technology infrastructure to aid digital learning.

After observing the many potential benefits of OER adoption and a general lack of awareness about the relevance and usefulness of OER, the Office of Educational Technology (OET) within the United States Department of Education (ED) launched the #GoOpen Campaign on Oct. 29, 2015. The goal of #GoOpen was to increase educators' awareness of OER, catalyze communities of practice, encourage infrastructure investments, and identify sustainable models for OER implementation beyond its use by a single teacher working alone in his or her classroom. This initiative highlighted states and school districts successfully using OER, recruited key partners such as educational nonprofits and private-sector companies, coordinated opportunities for collaboration through national and regional summit events, and provided essential resources for educators new to using OER. In the nearly three years since the inception of #GoOpen, ED has recognized 116 school districts (OET, 2018a) that have officially joined the campaign, all committing to replace at least one proprietary textbook with OER. Furthermore, 20 #GoOpen States (OET, 2018b) have also joined ED's campaign, committing to support school districts in this transition. As this work has continued to grow, OER stakeholders have tracked the progress (Ishmael, 2018b) of this movement and uncovered a growing number of districts (Ishmael, 2018c) outside the #GoOpen Campaign that are also leveraging OER to benefit their students and teachers.

Within the same time period, the diverse community of PK-12 OER stakeholders, comprised of teachers, district and state leaders, researchers, and educational nonprofits, realized that merely orienting the implementation conversation around the logistics of a single textbook replacement for a single subject is not enough to sustain the growth of the nationwide OER movement. In order for educators to continue taking advantage of these new learning materials in the future, a much more systemic approach to OER is necessary.

To better understand the factors needed to ensure the longevity of OER, the International Society for Technology in Education (ISTE) and New America identified and convened members of a growing "PK-12 OER Learning Network" on March 9, 2018, and

June 23, 2018. Drawing from each member's unique perspective and expertise, this learning network identified and dove into four key focus questions.

1. What types of enabling policies remove existing systemic barriers to OER implementation?
2. What types of mentoring and support structures enable districts to benefit from the existing body of knowledge about OER?
3. What research must be conducted to identify best practices in OER implementation?
4. How can enabling policies, mentoring and support structures, and research synergize to develop coherent sustainability models?

The following sections spotlight three school districts — Liberty Public Schools in Missouri, Garnet Valley School District in Pennsylvania and Broken Arrow Public Schools in Oklahoma — that have been nationally recognized as pioneers of systemic OER implementation. Subsequent sections, authored by the learning network's education researchers, will draw out critical themes from the case studies and discussions from the two convenings to begin answering the four aforementioned focus questions. Overall, the consensus from these district leaders and researchers is clear: Ensuring the longevity of OER cannot be achieved by simply examining which proprietary textbooks can be substituted with openly licensed ones. This effort requires deliberate, coordinated, and systemic reform strategies from both states and school districts.

PK-12 OER Learning Network convening held on March 9, 2018, at the New America headquarters in Washington, DC.

PK-12 OER Learning Network convening held on June 23, 2018, at National Louis University in Chicago.
Photographs provided by New America

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District Spotlight: Liberty Public Schools

Located just north of Kansas City, Missouri, Liberty Public Schools (LPS) is a growing suburban school district of approximately 12,500 students. LPS leaders began their OER journey in late 2015 as they reviewed the district's science and social studies curricula up for renewal. Andrew Marcinek, the former open education adviser at the Office of Educational Technology, approached LPS leaders and encouraged their participation in the #GoOpen Campaign to further support this work. With guidance from Marcinek and Columbus Municipal School District in Mississippi, a #GoOpen Ambassador District with significant experience in implementing OER, LPS leaders selected 15 courses in secondary science and middle school social studies as appropriate candidates to pilot the use of OER (LPS, 2018a).

From the beginning, district leaders worked to develop a sustainable approach to their OER initiative. First, they developed a coordinated team approach, bringing together diverse voices to oversee and implement the initiative. Second, they thoughtfully considered ways to reinvest limited funds to support teachers, rather than purchase more static, proprietary content. Finally, district leaders removed potential technical and policy barriers. The success of LPS demonstrates the advantages of creating sustainable OER implementation models.

A Coordinated Team Approach

LPS leaders recruited various perspectives onto a core leadership team, which was responsible for creating a strategic rollout plan and overseeing the entire OER initiative. The leadership team included district-level administrators, who would provide policy insights, and departmental directors, who would leverage their content expertise and curriculum writing experiences to ensure the quality of OER. LPS leaders also formed implementation teams, comprised of teacher leaders who would review state standards and existing learning materials to curate or create the OER appropriate for each course. Implementation teams established standing meetings and online communication channels for teachers to regularly collaborate. Over the years, as the number of OER-using courses increased, implementation teams brought on board more teacher leaders.

Reinvesting Funds to Support Teachers

Another instrumental component of LPS' sustainability plan involved reinvesting hundreds of thousands of dollars, previously allocated for purchasing proprietary learning materials, into its teachers. Teacher leaders on OER implementation teams designed and submitted a three-year plan to propose how best to allocate the saved funds to support their efforts. As a result, district leaders provided these teachers with a stipend for taking on critical roles in OER implementation. They also created a compensation pathway to encourage new personnel to join the process; teacher leaders in their first year of OER course development were compensated for up to 160 hours of their work, up to 80 hours in their second year, and up to 40 hours in subsequent years as they maintained and updated course materials.

Another portion of the saved funds were reinvested into professional learning opportunities for teachers (e.g. attending national conferences or inviting guest speakers), where they would deeply engage with the curriculum and participate in activities to improve instructional practices. Teachers could also use the money to attend and present their knowledge of OER at national or regional #GoOpen summits. A final portion covered costs of purchasing digital resources to support OER implementation (LPS, 2018a).

Removing Technical and Policy Barriers

LPS leaders additionally sought to keep OER sustainable in their district by providing maintenance support and facilitating the initiative through necessary policy measures. IT technicians in each building troubleshooted any small glitches and difficulties with digital tools. Eric Langhorst, an eighth grade U.S. history, computer science and student broadcasting teacher on the LPS implementation team, served as

the OER coordinator and offered support for teachers publishing OER by creating a districtwide protocol for the use of Google Docs. Langhorst is also the primary point of contact for teachers accessing the OER page within LPS LEADS, a virtual hub for the district's teaching and learning resources (LPS, 2018b). Furthermore, the leadership team made joint decisions to solve macro-level issues, such as addressing the textbook adoption cycle. Local educational agencies in Missouri, including LPS, have control over their textbook adoption cycles and the LPS leadership team shortened the timeline of their digital textbook adoption cycle. District leaders had previously used a six-year cycle as suggested by publishers of proprietary learning materials, but they moved to an adoption cycle of one to three years, creating more frequent opportunities to choose OER.

Outcomes of OER Implementation

Although OER usage is not mandatory in the district, LPS leaders have observed numerous positive outcomes from their OER initiative. The number of courses that include OER has steadily grown to almost 50. OER is also embedded into other ongoing initiatives, such as project-based learning. For example, during the 2017 solar eclipse, LPS was in the geographic path of totality. The district's science teachers used this opportunity and OER's sharing capabilities to design a districtwide lesson (Wheeler, 2017) on this natural phenomenon, through which students could gain critical data collection and graphing skills (e.g., monitoring temperature changes over the course of the eclipse). The benefits of OER have also extended to LPS teachers. Because implementation teams engage in deep conversations about content and pedagogy, they have become more knowledgeable about how to improve their instruction.

LPS leaders believe in sharing details about how OER has positively impacted their teachers and students. In July 2016, Liberty held the first #GoOpen regional summit, inviting 40 school districts to learn more about OER. LPS also serves as a #GoOpen Ambassador District, mentoring others just as they had been mentored in previous years. Finally, LPS publicly shares many of its resources, published under a Creative Commons license, such as budgeting guidelines, OER development contracts, OER approval processes and OER-using courses (LPS, 2017).

Jeanette Westfall, Ph.D., executive director of curriculum, instruction, and staff development, and a key figure in the LPS OER initiative, shared that true success with OER occurs not by simply focusing on the replacement of proprietary textbooks. "OER [itself] is the not the goal of the work...it's not about blanketing everyone with just another tool," she said during an interview at the March 2018 PK-12 OER Learning Network convening in Washington, DC. Westfall explained that the transformative power of OER has been realized at LPS through the development of systems that deliberately engage, support and recognize teachers in implementing new learning materials.

Jeanette Westfall (middle) at the March PK-12 OER Learning Network Convening
Photograph provided by New America

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District Spotlight: Garnet Valley School District

Garnet Valley School District (GVSD) is a suburban school district near Philadelphia, Pennsylvania. The district's three elementary schools, one middle school and one high school serve approximately 5,000 students. Currently, GVSD teachers and leaders are redeveloping their schools, courses, programming and systems to personalize student learning. Through this innovation, district leaders aim to provide students with more control over their learning. Marc Bertrando, Ph.D., GVSD's superintendent, communicates the district's vision for personalized learning as:

"...working to set the standard to offer personalized learning opportunities for all students within and outside of [GVSD's] geographical boundaries. For GVSD students, control over the time, place, path and/or pace of their learning is the norm as students choose courses, aligned to [our] curriculum and facilitated by [our] teachers, in face-to-face, blended, online and/or in real world environments."

For GVSD leaders, the path toward personalized learning led them to discover how OER could support students and teachers. Through meetings with GVSD educators; leaders from other districts, colleges and universities; and representatives from private-sector businesses, GVSD leaders recognized several factors that would allow them to "go open" for the 2016-2017 school year. First, GVSD was approaching the end of its five-year curriculum cycles in several English language arts, social science, and world cultures courses. Second, Anthony Gabriele, GVSD's supervisor of learning, development, and professional growth, realized that although the district spent about 70 percent of its funds to purchase proprietary textbooks from an external vendor, teachers only used material found in two to three chapters they deemed to fit their instructional needs. This realization led GVSD leadership to question traditional learning materials' cost-effectiveness (Gabriele, 2017). Given this opportunity, GVSD leaders prepared for their transition to OER with guidance and mentorship

from a Virginia #GoOpen Ambassador District, Chesterfield County Public Schools, along with support of the Office of Educational Technology's #GoOpen District Launch Packet.

GVSD's commitment to empower educators through its OER initiative is evident from its actions. For example, the district's statement of purpose for choosing to use OER is centered on teachers (GVSD, 2016):

"The mission of the curriculum & OER development project is to … invest in our teachers, because we know they are the best resource we have to maximize our students' potential, give our teachers full ownership of what they teach, as well as a chance to personalize curriculum, [and] provide our teachers with the training and support they need to be up to date and successful."

District leaders also sought to ensure the sustainability of the OER initiative by assessing its digital infrastructure, developing a clear leadership structure and redistributing its annual budget.

Assessing the Digital Infrastructure

Before replacing their proprietary learning materials, GVSD leaders assessed whether their digital infrastructure had the capacity to host OER. In previous school years, the district had adopted G Suite for Education (formerly known as Google Apps for Education) to host all content and communications and provided staff and students with access to a variety of devices. Also, after GVSD leaders and teachers vetted a number of options for Learning Management Systems (LMS), GVSD leaders subscribed to Schoology to organize and distribute curated OER.

OER Leadership and Extended Teams

District leaders then formed the core leadership team, including GVSD Superintendent Marc Bertrando; Assistant Superintendent Patricia Dunn; the director for technology, innovation, and online learning, Sam Mormando; and several additional

curriculum supervisors, instructional coaches, and teacher leaders. This team was responsible for overseeing the OER implementation process by developing and monitoring the district's five-year strategic plan, an established cyclical process to review and research OER, design new courses, roll out the necessary professional development (PD), implement the new courses and evaluate the initiative. The core leadership team provided additional guidance for teachers by training them on the use of Schoology and vetting learning materials curated by the extended team. The extended team included 25 teacher leaders across the spectrum of school subjects and grade levels responsible for curating OER and designing full courses aligned to college and career ready standards.

Budget Redistribution to Support Teachers

Leveraging the funds saved by forgoing traditional learning materials, GVSD leaders invest in their teachers. Teacher leaders on extended teams receive about 31 percent of these funds for authoring content. The remaining 69 percent of the funds are dedicated to personalized professional learning opportunities informed by the Future Ready Framework. This framework emphasizes "digital professional learning communities [and] peer-to-peer lesson sharing," rather than traditional "sit and get professional development sessions [to] eliminate the confines of geography and time" (Alliance for Excellent Education, 2015). According to the Council of Chief State School Officers (CCSSO, 2016), GVSD formed a LEAP (League of Educational Advancement Professional Learning) committee of district leaders, teachers and parents, who would develop a menu of professional learning sessions for in-service teachers to choose from and attend. Furthermore, GVSD leaders collaborated with Spider Learning to design a virtual hub for OER professional development, now known as the GVSD Course Development Hub. A part of this hub includes resources to guide teachers on how to curate, evaluate and publish OER. The hub also demonstrates how to integrate OER into a specific course according to the Understanding by Design (UbD 2.0) approach to curriculum development (GVSD, 2018).

Finally, GVSD became the first public school district to partner with the Global Online Academy (2018) to provide teachers with ongoing, job-embedded professional learning in course design for face-to-face, blended, and online learning approaches.

Keeping the Spirit of #GoOpen Alive

Consistent with the #GoOpen Campaign's emphasis on creating an open educational ecosystem, GVSD publicly shares a number of resources to assist other districts seeking to implement OER. For example, the most current version of OET's #GoOpen District Launch Packet (2017) links to GVSD's five-year strategic plan. Also, the aforementioned OER Development Hub provides access to, among other resources, GVSD's repository of links where teachers can curate OER, an OER evaluation checklist, a template for curriculum development, an OER curriculum model flowchart, and a sample OER-integrated course (GVSD, 2018).

Anthony Gabriele believes that OER implementation must focus on the systemic changes necessary to maintain sustainability rather than the learning materials themselves. During the March 2018 PK-12 OER Learning Network convening, he remarked, "The most important thing that [GVSD] learned about OER is [that] it is...less...about the resources. It's really about learning design; how we design and facilitate experiences for kids that matter, are meaning-centered, are social. That [is what] will stick with them beyond the classroom."
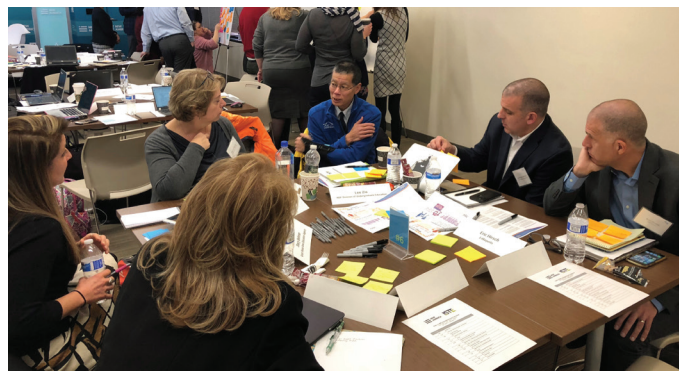
Anthony Gabriele (second from the right) at the March PK-12 OER Learning Network Convening
Photograph provided by New America

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District Spotlight: Broken Arrow Public Schools

In 2014, Rebecca Morales, the science instructional specialist at Broken Arrow Public Schools (BAPS) in Oklahoma, discovered OER when she came across the Utah Open Textbook Project, a series of openly licensed textbooks developed through a partnership among the Utah State Board of Education, the Hewlett Foundation, the CK-12 Foundation and Brigham Young University's David O. McKay School of Education (Open Education Group, 2012). Morales believed that science teachers at BAPS could similarly benefit from using cost-effective openly licensed learning materials.

Morales' suggestion to use OER in BAPS to reduce the district's financial burdens was at first met with skepticism from district leaders, who raised concerns regarding the quality of the learning materials. Teachers also wondered whether they had the necessary qualifications or the time to properly curate their own learning materials. Given these initial concerns, BAPS leaders took a cautious approach to OER implementation, opting to integrate the new learning materials into digital textbooks for a few biology and physical sciences courses in grades six through nine. According to OET's #GoOpen Story Engine, "supporters of OER [at BAPS] … promised that if quality was in danger of being compromised by pursuing … OER, they wouldn't undertake the new approach" (OET, 2017). Therefore, this pilot initiative in BAPS' science courses was under immense pressure to demonstrate both quality and sustainability.

A System for Teacher Collaboration

BAPS leaders began their preparation by developing an organized system for teacher collaboration. Instructional specialists led this effort by recruiting appropriate personnel onto implementation teams, training them on the use of open licenses, facilitating discussions about content selection, and coordinating the necessary logistics, such as reserving work spaces or ensuring substitute coverage for teachers. Implementation teams, each staffed with six teachers, were charged with unpacking the state standards

to determine the instructional scope and sequence for a given content and grade level, curating OER that matched their needs, and ultimately delivering openly licensed digital textbooks. Implementation teams established a peer-review process to ensure that the curated learning materials were aligned with state standards and invited external content experts from across the state (e.g. instructional specialists from other districts) to oversee their work.

In order for this collaborative system to maintain its consistency, instructional specialists ensured that all implementation teams agreed upon several key measures. They chose to curate from the CK-12 Foundation's free online library, which contains various openly licensed learning materials, from full textbooks to supplemental simulations and games. They also chose G Suite for Education, an integrated collection of cloud-based applications such as Google Drive, Google Calendar and Google Groups, which many BAPS teachers were already familiar with, as their online collaboration platform and OER repository. Finally, implementation teams decided on a common format for each chapter within the digital textbooks. The image below is an example of a page within such a chapter, comprised of clearly identified standards, relevant textual information, interactive media and diagnostic prompts, all of which can be altered as individual classroom teachers see fit (BAPS, 2016).

Building Participatory Classrooms

Classroom teachers using these OER-integrated digital textbooks observed a significant shift in their instructional practice. Before using OER, science courses at BAPS were vulnerable to traditional, one-sided discussions, where a teacher would directly lecture to the students. After implementing OER, however, teachers observed that classrooms became much more participatory. They received feedback from the class to incorporate learning materials into chapters that students found interesting. For example, life sciences teachers increased student engagement with

2.1 Phases of Matter

By the end of this reading...
MS-PS1-4 Students will develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

OER Features

This photo represents solid, liquid, and gaseous water. Where is the gaseous water in the picture?

Standards are identified and openly communicated to students.

Diagnostic prompts to pre-assess students' understanding are embedded.

Introduction

States of matter are the different forms in which matter can exist. Look at the figure above. It represents water in three states: solid (iceberg), liquid (ocean water), and gas (water vapor in the air). In all three states, water is still water. It has the same chemical makeup and the same chemical properties. That's because the state of matter is a physical property.

How do solids, liquids, and gases differ? Their properties are compared in the figure below and described below. You can also watch the following video about the three states at this URL: **https://www.youtube.com/watch?v=s-KvoVzukHo**

Interactive features placed to support reading text.

Graphic provided by Rebecca Morales, science instructional specialist at Broken Arrow Public Schools

microbiology topics by altering textbook content to reference underlying commonalities between a football team and the internal components of a cell. Earth science teachers enhanced their discussions by incorporating themes from local current events, such as a 2015 rockslide that closed down a portion of Interstate 35, which runs through Oklahoma. Mark Officer, BAPS' former executive director of secondary administration, also observed aspects of this classroom transformation, saying, "In comparison to standard text-based materials, student engagement improved with use of customized and locally tailored material" (OET, 2017).

Outcomes of OER Implementation

Since its inception in 2014, the BAPS OER initiative has successfully grown to cover 41 courses across several subject areas, including history, math, science and English language arts. More than 200 teachers now participate in the curation process to develop OER-integrated textbooks. In 2016, the OER initiative gained additional momentum from the state as Oklahoma joined the #GoOpen Campaign. Education leaders at the Oklahoma State Department of Education committed to, among other points, create a statewide technology strategy that emphasizes the role of OER, invest in a statewide OER repository,

and share learning and professional development resources with other states (OSDE, 2016). Because of their success, BAPS serves as a #GoOpen Ambassador District to mentor 23 school districts in Oklahoma as each develops its respective plans to use OER.

District leaders also keep their community engaged in the OER initiative. On their website, BAPS leaders provide parents and guardians with a brief description of OER and how their students can take full advantage of the openly licensed digital textbooks. Students can directly download the digital textbooks from the same webpage, print them and annotate as they would like (BAPS, 2018). Finally, BAPS leaders inform parents and guardians about OER through a video shown during the district's open house events (BAPS, 2015).

In 2016, several Oklahoma school districts, including BAPS, faced a large budget cut (OET, 2017) due to uncertain state and federal funding (Eneff et al., 2017). Because BAPS had saved $1.3 million through the transition from proprietary textbooks to OER, the district could partially offset some consequences of this financial constraint (BAPS, 2017). According to Mark Officer, these savings were used to purchase a range of instructional materials that the district oth-

erwise could not have afforded. While it is certainly encouraging that district leaders could mitigate the worst effects of the budget cut by tapping into these savings, BAPS teachers could not reap the benefits of OER adoption to the same degree as teachers in the other two districts profiled. Clearly, state and federal funding levels have a significant impact on a school district's ability to fully leverage the spending flexibilities it gains through OER adoption (e.g. additional teacher compensation and professional development opportunities).

Officer states that OER initiatives cannot be sustained unless such systemic issues are addressed first. In the #GoOpen Story Engine, he remarked, "If strong organizational processes are in place and districts invest resources to train teachers and set up consistent quality control processes, the results of [using OER] are powerful" (OET, 2017).

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Focus Area 1: District and State Policies that Support Open Educational Resources

By Susanna L. Benko, Ph.D., Emily M. Hodge, Ph.D., and Serena J. Salloum, Ph.D.

Supportive district and state policies are important to provide educators with an opportunity to fully realize the benefits of Open Educational Resources (OER). Having a dedicated OER program at the state level, which emphasizes OER as an important part of the instructional materials ecosystem, is critical to provide ongoing guidance. However, to scale the work, leaders and collaborators are needed at the district, state and national levels.

In this section, we describe district and state policy themes identified by the PK–12 OER Learning Network[1]. These themes seek to address the question, "What types of enabling policies remove existing systemic barriers to OER implementation?" We divide these themes into specific policy recommendations at the district and state levels. When possible, we also provide examples of these policies currently in practice, using the districts from the case studies earlier in this report. We conclude with two additional examples, Carlsbad Unified School District (CUSD) and Washington state, which also demonstrate these policies in action.

District Policy

Participants identified four key policy themes as critical considerations for district-level support in OER implementation: 1. Investments in teacher learning; 2. Creating supportive district structures to develop a culture of collaboration; 3. Ensuring sustainability; and 4. Providing technical assistance.

Frame OER as investments in teacher learning.

Many learning network participants representing school districts commented on the potential for

OER to serve as a strategy to invest in teacher learning. While OER is often thought of as a cost-savings measure, these educators emphasized that OER, in their respective districts, is viewed as an investment in teacher learning. Funds saved by transitioning from proprietary learning materials to OER should be redirected as such.

Policy in Practice: Liberty Public Schools

Liberty Public Schools (LPS) has reallocated funds from purchasing traditional proprietary resources to professional development through their OER initiatives. Investing in teacher learning has allowed LPS to develop openly licensed learning materials that are well-aligned to standards. Teachers also have learned to seek out OER aligned to project-based learning units. Furthermore, teachers on OER implementation teams designed their own three-year plan to propose how to use the saved funds; the plans included both professional development and compensation for teachers taking on OER implementation duties.

Create supportive district structures to develop a culture of sharing and collaboration.

Learning Network participants highlighted the importance of creating district structures that facilitate sharing and collaboration among teachers for successful OER implementation. For example, professional learning communities provided time and space for teachers to intentionally select materials that meet their learning goals. Participants also noted that educators should intentionally spread knowledge about OER both within and outside of their district and involve appropriate personnel like media specialists and librarians in this sharing process, thus creating a culture that facilitates collaboration (see "Focus Area 2: Mentoring and Support Structures" for additional details).

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[1] For a deeper analysis of how states are supporting OER, see "Navigating the New Curriculum Landscape: How States Are Using and Sharing Open Educational Resources" by the Council of Chief State School Officers and New America.

Policy in Practice: Liberty Public Schools
LPS provides regular opportunities for teachers to collaborate on resources and instructional practices, including regular meetings of the OER implementation team. LPS is also collaborating with organizations that support OER initiatives, including Institute for the Study of Knowledge Management in Education (ISKME) and the U.S. Department of Education's Office of Educational Technology. LPS has a dedicated OER coordinator to facilitate OER use throughout the district. LPS also hosted the first #GoOpen regional summit, bringing over 40 school districts together to learn about OER, and continues to freely share many of the protocols they have developed for budgeting and approval processes with other districts.

Policy in Practice: Broken Arrow Public Schools
Broken Arrow Public Schools (BAPS) used implementation teams of six teachers each as an organizing structure. Each implementation team decided on a common library of resources, a common platform and a common format for curriculum materials that could be altered by individual teachers. Teams also put collaborative quality controls into place, including a peer-review process.

Ensure sustainability.[2]
Learning network participants described the importance of having a deep bench of people (district leaders, school administrators, instructional coaches, content specialists, teacher leaders, etc.) involved in OER initiatives to ensure sustainability, allowing teachers to have access to high-quality, openly licensed learning materials year after year. Participants also noted that when districts have supportive policies that emphasize collaboration (as mentioned above) that this will likely lead to better long-term sustainability of the overall movement.

Policy in Practice: Garnet Valley School District
Garnet Valley School District (GVSD) has both a "core leadership team" composed of district leaders, supervisors, instructional coaches, and teacher leaders, and an "extended leadership team" of teachers involved in its OER initiative. This ensures that the district has a deep bench of people working on OER to allow sustainability and buy-in.

Policy in Practice: Liberty Public Schools
LPS has several procedures in place to ensure that their OER work is sustainable. LPS developed a financial agreement with teachers to support those curating and creating content, in which teachers receive an hourly rate for developing courses for up to 160 hours (year one), up to 80 hours for course revision (year two), and up to 40 hours in subsequent years. The agreement states that resources developed through this process are the property of LPS and will have Creative Commons licenses, although teachers are named as authors. They also developed several processes to help ensure sustainability: a budgeting process for funds not spent on textbook purchases, a curriculum resource vetting process and a PD funding process from repurposed textbook dollars. To facilitate teacher buy-in, the use of OER is not mandatory, but LPS offers departments the option to use OER as a primary resource each year and has observed steady growth in the number of classes and grade levels utilizing OER.

Provide technical assistance.
Teachers need to be supported in resource selection, as the process of collaboratively selecting resources and creating learning experiences is time-consuming for teachers. Learning network participants pointed out that there are several ways that districts can support teachers. One of which is simply providing assistance about copyright law, fair use policies and other important policies related to OER. Another important consideration for districts using digital tools to facilitate OER use is student privacy. Districts should ensure that teachers and parents have a clear understanding of how student data will be recorded and used.

Policy in Practice: Garnet Valley School District
In partnership with Spider Learning, GVSD has created a course development hub, where it provides GVSD teachers with different types of technical assistance related to OER. The hub has numerous resources for creating OER, including a model course, checklists and templates, and flowcharts.

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[2] The recommendations here are focused on sustainability of district-led OER initiatives. For broader considerations of general sustainability of OER, please see concluding comments on sustainability.

State policy

Learning network participants also identified four recommendations for broader, state-level policies that facilitate a stronger implementation of OER: 1. Redesign textbook adoption processes; 2. Provide technical assistance and incentives and; 3. Consider unintended consequences of other policies.

Redesign textbook adoption processes

Some state textbook adoption policies serve as barriers to OER implementation. States such as Kentucky, California, and West Virginia use six-year or eight-year adoption cycles. This lengthy time period favors business models that profit from infrequent updates of instructional materials and provides little opportunity for OER adoption. States should thus consider shortening their adoption cycles or permit districts to submit waivers. For example, Tennessee school districts may submit a waiver to the state department of education if they wish to use learning materials outside of the state's approved list.

States should also clarify any ambiguous language around acquisition or use of digital learning materials that does not explicitly reference OER. Florida, Oklahoma and New Jersey departments of education provide school districts with a definition for digital-format materials. However, these definitions do not explicitly include OER, making it unclear whether their districts may choose to use openly licensed resources in place of proprietary ones.

Provide technical assistance and incentives for OER use.

Learning network participants noted the critical support that states can provide to districts by explicitly endorsing OER. Through regional professional development or web-based efforts, states can provide districts with information about how to find and use OER. States can additionally provide guidance on curriculum by providing a model for evaluation and adoption. For example, Louisiana's department of education provides vetted curricula, which includes openly licensed curricula created by Louisiana teachers, and recommends several professional learning providers on its website.

Content experts at the state level can also help create, curate and vet OER for a state OER repository. In 2012, Utah's department of education unveiled the Utah Open Textbook Project, a series of openly licensed textbooks funded through a partnership among the Utah State Board of Education, the Hewlett Foundation, the CK-12 Foundation and Brigham Young University's David O. McKay School of Education. These ELA, science and mathematics textbooks, developed by remixing learning materials found in the CK-12 Foundation's OER library, were explicitly encouraged by the state for use in schools.

Finally, participants noted that states can create contexts that may encourage the use of OER. For example, Washington state provides OER Project Grants, which are small, competitive grants "… [for] districts developing their own OER core instructional materials or creating OER users' groups to share ideas, define best practices, and champion effective distribution and implementation of resources." Oak Harbor Public Schools, a 2018-2019 grant awardee, will train its teachers to curate, vet, and adapt learning materials found in the CK-12 Foundation's OER library and develop openly licensed chemistry and physics courses. States could additionally choose to incentivize the use of OER through flexible professional development requirements. Teachers could be permitted to use hours spent creating, curating, and remixing content toward continuing education requirements and renewal of teacher licenses.

Consider possible, unintended consequences of other policies as they may relate to OER.

States should consider policies that may intersect with the extent to which districts take up OER. State curriculum adoption laws and guidelines can help or hinder OER efforts depending on their stringency. One Learning network participant pointed out that California's Williams Law intends to promote quality and equity by ensuring that all districts invest in state-approved textbooks. However, the same law can unintentionally hinder OER implementation if an openly licensed resource is not included in the state-approved materials list.

Furthermore, state accountability policies, which involve ranking districts or using report cards to "grade" districts, may discourage district-to-district sharing of resources. One Learning network participant noted that these accountability policies may unintentionally create district-to-district competition. In such an environment, teachers with high-quality OER may be reticent to share their resources with others, for fear that another district might outperform their own.

Future research

The Learning Network convening provided participants with an opportunity to outline several district- and state-level policy themes. However, the group also recognized that further research is necessary in the following areas to deepen our understanding of policies related to OER implementation.

1. What is the minimum level of digital readiness that a school needs even before exploring OER implementation? What key policy changes would facilitate this work? Is a 1:1 device initiative absolutely necessary?
2. After making the decision to move away from proprietary learning materials, how best should states and districts reallocate the funds saved? What professional learning topics should be among the top reinvestment priorities?
3. What other policies intersect with OER implementation? How can these be changed to sustain the benefits of OER (such as improved learning outcomes and teacher satisfaction)?
4. The concept of "local control" remains a historically critical concept in American education. What policies are necessary in order to ensure OER and local control can coexist?

"Focus Area 3: Extending the Research Base on Open Educational Resources" provides additional details about the types of policy-related questions that should be researched.

Conclusion

In the words of one Learning network participant, "the OER framework for K–12 should be one for sustainability." A key takeaway from this convening was the critical role that district- and state-level policies play in providing for a sustainable model in OER de-

velopment and implementation. The success of any initiative is dependent on its context, which is heavily impacted by relevant policies. OER initiatives have an opportunity to advance teacher collaboration and student learning. However, in order for OER to reach this full potential, supportive state and district policies must be in place to ensure sustainability.

Additional Exemplary District and State Policies

The policy themes discussed above are not intended to serve as one-size-fits-all solutions, but rather to provide a framework through which district and state leaders can begin to examine existing policies and adjust those that may serve as systemic barriers to OER implementation. The following stories from Carlsbad Unified School District and Washington demonstrate the unique ways in which our policy themes can be interpreted.

Carlsbad Unified School District (CUSD)

Carlsbad Unified School District in Carlsbad, California, north of San Diego, made the transition to OER in 2016 under Superintendent Benjamin Churchill. District leadership viewed OER as a way to engage and empower teachers in an organic and authentic process of developing, curating, and sharing resources. While its initial work began in middle school science, many of its recent efforts have focused on secondary English language arts (ELA). CUSD exemplifies the four themes identified by the PK-12 OER Learning Network.

Frame OER as investments in teacher learning. Churchill notes that investments in OER have positively impacted teachers' learning about how to design and enact curriculum based on learning goals, saying, "I've observed that teachers are spending much less time talking about texts and materials, and much more about what they want students to know and be able to do. OER has driven the conversation from 'What reading should I assign' to 'What do I want students to grapple with? What resources do they need? How can they make choices about their own learning?'" Another advantage of investing in teacher learning in this way is that OER helped increase teacher knowledge and background of standards and curriculum. Churchill notes that when teachers develop and create the units of study as

a team, they are much more familiar with materials and resources. Furthermore, CUSD invests in teacher learning by hosting professional learning opportunities around OER, bringing in OER content providers and sending representatives to #GoOpen regional summits.

Create supportive district structures to develop a culture of sharing and collaboration.
Churchill says that OER has provided an opportunity for teachers to collaborate and create together. He cites teacher buy-in from everyone involved as a major reason for the success of their district. In CUSD, the secondary English language arts (ELA) teachers voted on whether to move forward with OER and have held each other accountable to the work. It was not a district mandate; it was a collaborative decision. Teachers collaboratively went through a process of identifying Essential Learning Outcomes (ELOs), which drove the selections of OER. The district supports overall collaboration in a variety of ways, including seeking feedback from teachers throughout the process (via Google Forms), making sure a variety of teachers have voice in the process and sharing resources across grade levels. He also notes the importance of culture in creating a collaborative environment, saying "culture will make or break our OER implementation. We work on culture every day -- by actively engaging teachers, by listening to the voices of our teachers and librarians and instructional aides, by asking for student feedback, and by sharing our successes and setbacks at every turn."

Ensure sustainability.
Carlsbad is notable for how it worked with the teachers' bargaining group early in the OER process to create defined roles, responsibilities, compensation for supporting OER that allow it to be a sustainable initiative. For example, an OER curriculum coordinator serves a three-year term to facilitate a team of OER curriculum curators in developing units. Teachers and other staff serve as OER unit reviewers and are supported by administrators, technology coaches and a teacher on special assignment. Funding for these positions came from the funds that would have been allocated to purchasing a new, proprietary secondary ELA curriculum. Finally, CUSD has developed a five-year plan consisting of three years of curriculum development followed by two years of refining.

Provide technical assistance.
CUSD has designated one teacher on special assignment to provide specialized assistance for secondary teachers on OER development. Through a negotiated agreement on OER, CUSD has created a teacher-led team for vetting materials. This team also provides technical assistance to teachers through guidance in curating and implementing instructional materials.

In describing the overall experience with OER, Churchill says, "OER is not 'throwing away the textbook' and letting teachers untether from the district curriculum; rather, it is giving teachers voice in the curriculum development process and driving them to new ways of thinking about how they teach."

Washington state
Washington state has made strong investments in OER. In 2012, the Washington state Legislature passed House Bill 2337, directing the state educational agency to develop a library of openly licensed materials aligned with the state's learning standards, as well as provide professional development related to OER. Washington was the first state to pass such a bill in the U.S. and later passed House Bill 1561 in 2018 to maintain funding for OER. Washington state has been enacting many of the state-level recommendations identified by participants at the PK-12 OER Learning Network convening to facilitate stronger implementation of OER.

Provide technical assistance.
The Washington state Office of the Superintendent of Public Instruction (OSPI) has engaged in a number of outreach efforts, including OER summits, webinars, and presentations to school boards, district teams, and professional development conferences. OSPI has partnered with the Washington State School Directors' Association to develop model procedures for selecting instructional materials, explicitly encouraging districts to consider OER implementation and emphasizing that OER must be carefully vetted, just as traditional learning materials. Professional learning events have been attended by participants from over half of Washington's school districts. OSPI has also reviewed the quality of several openly licensed learning materials using rubrics developed by Achieve and Student Achievement Partners. Their goal in

reviewing curriculum is to model a curriculum review process so that districts can make informed decisions about curriculum adoption based on OSPI reviews or develop their own model for reviewing their learning materials.

Provide incentives for OER use.

As of 2018, Washington state has invested $1.25 million in supporting OER. Washington state has provided incentives via small, competitive OER grants for districts developing openly licensed instructional materials or creating OER user groups to share ideas, define best practices, and champion effective distribution and implementation of resources. Four of the districts receiving grants reported nearly $1 million in total cost savings, making OER an excellent return on investment.

Focus Area 2: Mentoring and Support Structures

By Kaitlin T. Torphy, Ph.D.

Mentoring and support structures can be critical resources that help states and school districts effectively implement and continuously improve their OER initiatives. However, as evident through discussions held at the PK-12 OER Learning Network convenings, many educators are still struggling to identify, build and navigate such structures. The following section draws notable examples of mentoring and support structures in action within the three spotlighted districts. Points regarding the future of mentoring and support structures, as remarked by the learning network participants, are also summarized to describe new approaches that could further facilitate the scaling and sustainability of OER initiatives.

Operational Definitions

In order to clearly communicate the value of mentoring and support structures, it is important to differentiate between the two ideas. In this section, mentoring refers to OER implementation assistance that a district may receive from an external entity. For example, a district more experienced with OER implementation may serve as an adviser to a novice district just beginning to explore OER. On the other hand, the theme of support is more internal to a district. Support considerations may include structural adjustments within a district to ensure scaling and sustainability of OER initiatives and the resources provided by district leaders to facilitate such changes.

Using District-to-District Mentoring to Strengthen OER Initiatives

Mentoring structures that propagate best practices for OER implementation, such as how to pilot newly curated or created learning materials and provide teachers with sufficient professional learning on navigating open licenses, can help introduce OER to new school districts in an efficient and sustainable manner. Rather than reinventing the wheel, educators new to OER can use and build upon the tools and strategies developed by their mentors.

The Office of Educational Technology (OET) initially led the national mentorship effort by pairing #GoOpen Launch Districts, which were just beginning to explore OER, with #GoOpen Ambassador Districts, their more experienced counterparts. Although currently recognized as national leaders in the OER movement, both Liberty Public Schools (LPS) and Garnet Valley School District (GVSD) did not begin the transition away from proprietary textbooks by themselves. Each partnered with leaders from an Ambassador District, which deliberately guided them through implementation.

Regional summits have also provided several opportunities for districts to engage with a network of professionals and share the existing body of knowledge. Leaders from LPS initiated this effort by launching the first #GoOpen regional summit in July 2016. Since then, 15 self-organized regional summits, supported by OET's #GoOpen Regional Summit in a Box toolkit, have taken place to provide districts new to OER with an outlet to explore OER and seek mentorship from leading districts. For example, the California #GoOpen Regional Summit in April 2018 brought together nearly 200 participants from over 30 districts all in varying stages of their OER journey. Several districts actively working on OER facilitated sessions that provided guidance to districts getting started. The sessions covered topics such as strategic planning, finding the best resources, showcasing district-created rubrics, and demonstrating how to use various tools for curating and organizing. A team of middle school math teachers from LPS chose the California summit as one of its professional learning opportunities that it agreed to as part of its three-year OER plan. The team not only facilitated a session on its process of selecting and developing OER, but also networked with many schools new to OER and shared lessons learned and best practices.

Thus far, regional summits have reached approximately 2,500 educators representing almost 500 school districts. To support their teachers' skill devel-

opment even further, some districts have personally invited the mentorship of individual expert educators outside of their immediate network.

Sharing resources and mentorship across districts empowers educators to revise, remix and reuse instructional materials according to their needs. Through this process educators can also learn how to personalize instruction for different learners or support other ongoing pedagogical reform initiatives, such as project-based learning or blended learning.

Mentoring Structures in Practice: Broken Arrow Public Schools

In Broken Arrow Public Schools (BAPS), the district's own instructional specialists largely led the curation and vetting process. However, BAPS also received frequent mentorship from instructional specialists from other districts who provided a second set of eyes to review the quality of curated materials. These relationships not only bolstered the quality of the newly developed digital textbooks, but also contributed to developing a network of Oklahoma educators involved in OER. Today, BAPS also provides mentorship by serving as a #GoOpen Ambassador District for 23 school districts in Oklahoma as each develops its own plans for OER implementation.

Learning Network participant Peter Nilsson, the director of research, innovation and outreach at Deerfield Academy and founder of Athena (a nascent OER platform), discussed the divide between "district-directed" and "teacher-initiated" curation of OER. Some states, he noted, have invested in providing teachers with openly licensed curricula. However, in those same states, RAND Corp. studies show that many teachers still supplement the openly licensed curricula with self-generated resources or resources found from online sources (Kaufman et al., 2017). He elaborated:

"State and district vetting and decision-making can set the rails on which a curriculum will run, but the demands of daily instruction and ongoing professional development, which drive teachers to look closely at the curriculum and consider it in the context of the needs of their students and their teaching preferences, lead teachers to supplement, adjust, adapt and reinvent."

Bridging this gap between top-down and bottom-up resources when creating coherent, aligned learning experiences for students, remains one of the biggest challenges to OER use. He asked about the role of platform design and information architecture in addressing this challenge and facilitating teacher engagement with the development of high-quality OER:

"As curriculum development is increasingly recognized as an extraordinarily complex task, what is the ideal relationship between teachers and curriculum development specialists? How can platforms play a role in the mentoring and support process, both making this process more efficient and bringing curriculum development relationships to scale?"

Using Support Structures to Empower Teacher Leaders

As district leaders learn about best practices from their mentorship experiences, they should also seek to develop internal structures to support their teacher leaders involved in the curation, creating and vetting processes. Teacher leaders should be supported by a formally designated district leadership team, comprised of appropriate personnel, such as the superintendent, assistant superintendent, curriculum directors, subject-area departmental chairs and technology directors, who provide an overall guidance, vision, and strategic plan for OER implementation.

Teacher leaders should also be supported with adequate opportunities for professional learning. Many district leaders represented at the learning network convenings achieved this goal by emphasizing OER topics in their professional learning communities' monthly meetings and scheduling professional development retreats. Funds saved through the transition away from proprietary learning materials were reinvested into additional professional learning activities as necessary.

Providing teachers with access to online OER repositories is another critical support structure. learning network participants expressed that, in transitioning away from proprietary learning materials, many teacher leaders begin by searching through online OER repositories to investigate what currently exists and can be modified to fit their local context or student need. Commonly used repositories include the CK-12 Foundation's library of OER, OER Commons and those provided by higher education institutions.

Support Structures in Practice: Garnet Valley School District

District leaders at GVSD supported teacher leaders in developing openly licensed materials through several methods. A formally designated core leadership team, composed of the superintendent, assistant superintendent, technology director, curriculum supervisors and instructional coaches developed a five-year OER rollout plan to provide them with yearly benchmarks for the teachers' work. GVSD leaders took advantage of the funds saved by transitioning away from proprietary textbooks to connect teacher leaders to various professional learning opportunities

across the nation. Finally, district leaders partnered with Spider Learning to develop an online platform where teachers could access additional professional learning materials and contribute to a district OER repository.

Future of Mentoring and Support Structures

State Leadership

States can also serve a critical role in providing OER mentorship and support to districts. First, state departments of education can support the curation process by building a state-approved repository of OER (see "Focus Area 1: District and State Policies that Support Open Educational Resources"). States can also support the OER vetting process by adopting or endorsing the use of quality rubrics. Many districts are already using the Educators Evaluating the Quality of Instructional Products (EQuiP) rubric to assess instructional resources. Aligned to the Common Core State Standards and Next Generation Science Standards, these rubrics are designed to support educators as they seek out high quality learning materials, including OER.

Learning network participants expressed that states should take the lead in data collection in OER-using districts. This research initiative could identify the characteristics of districts best suited for a transition from proprietary learning materials to OER (e.g. What is the baseline level of connectivity a district should have to successfully enable OER use both at school and at home?). States could use this data to develop a self-assessment toolkit for districts to measure their OER readiness.

Interoperability

Currently, information about the available OER, their quality and how to best incorporate it into classroom use is unevenly accessible to classroom educators. To address this issue, learning network participants suggested that increased interoperability between OER repositories and OER professional learning portals across state and district boundaries would facilitate greater uptake. One specific suggestion included a central portal for educators with links to various OER sites organized by standards or content area. In addition to serving as a digital repository of OER and a

one-stop shop for upcoming professional learning opportunities, this portal could inform users of copyright basics, fair use and open licensing.

Communication

Informal online communication channels, including social media websites, are often overlooked as potentially powerful mentoring platforms. Educators frequently cite websites such as Twitter, Pinterest, Facebook and YouTube as spaces to discover new learning materials. For example, learning network participants pointed out that many educators currently connect with each other and access OER through the #DTK12 hashtag (a design thinking community for PK-12 educators). Such informal online communication channels can be better leveraged by OER advocates to communicate best practices for OER implementation. Furthermore, learning network participants suggested situating OER within the context of other pertinent education research or policy topics to harness the expertise of broader communities of education professionals.

Conclusion

OER's capacity for adapting, remixing, and redistributing provide states and districts with the powerful flexibility to develop engaging curricula tailored to local context and student interests. However, building the trajectory of student learning is much too challenging for a single teacher to accomplish alone without access to external wisdom of practice. Mentorship allows teachers to participate in the ongoing peer-to-peer exchange of best practices among broad networks of involved professionals. Support structures, on the other hand, ensure that teachers are guided by a team of visionary leaders willing to invest in their professional development. As more states and districts seek to explore OER, both will be critical in improving the degree to which teachers confidently take advantage of the newfound opportunities offered by OER.

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Focus Area 3: Extending the Research Base on Open Educational Resources

By Susanna L. Benko, Ph.D., Emily M. Hodge, Ph.D., Marcia A. Mardis, Ed.D., Rebecca Morales, Serena J. Salloum, Ph.D., and Kaitlin T. Torphy, Ph.D.

Much of the existing research base focuses on the use of open educational resources (OER) in higher education (e.g., Wiley, Bliss, & McEwan, 2014). Although there are many similar challenges to OER implementation between PK-12 and higher education, including discoverability of learning materials and sustainability of OER initiatives, additional research must be specifically conducted at the PK-12 level to better understand issues unique to this realm. This research should not only explore what constitutes a high-quality OER implementation, but also the specific conditions under which OER implementation is associated with positive outcomes, such as a thriving school culture and climate, increased student achievement, and equitable access to high-quality learning resources. To the extent that OER advocates would like to promote OER implementation, both general research, which examines the nature of these issues, as well as applied research, which describes specific practices and policies to mitigate challenges, are critical.

Research Themes from the PK-12 OER Learning Network

During the PK-12 OER Learning Network convenings, participants brainstormed a number of research themes regarding OER implementation. While participants raised some existential questions about the future of the field that cannot be directly answered through empirical means, they also asked many researchable questions, including perceptions about OER, teachers' use of OER, and the relationship between OER and student learning.

Stakeholder Perceptions
One set of research questions presented by learning network participants dealt with educators' percep-

tions of OER. For example, what motivates district leaders to engage with OER? Is it the allure of potential cost-savings and teacher empowerment or are there other reasons? For school and district leaders who may know about OER but have not fully embraced it, why not? What specific barriers do they perceive, and what would they need to overcome such barriers?

Learning network participants also wondered about other stakeholders' perceptions of OER. For example, district leaders have Broken Arrow Public Schools have taken steps to inform students' parents and guardians about their use of OER. How have those efforts affected parents' perception of OER? With an understanding of how perceptions vary across groups, OER advocates would be able to frame their arguments appropriate ways and provide differentiated support for OER implementation.

Teachers' Use of OER
Other learning network participants looked to understand teachers' perspectives of OER and how their perceptions affect their decision-making. Teachers are the individuals who, in the end, deliver instruction and are the final arbiters of how policies and best practices are enacted in the classroom. Therefore, understanding teachers' decision-making processes is a critical aspect of understanding how OER are used (or not used) in the classroom.

Specifically, learning network participants asked about how teachers make decisions about selecting and adapting resources. How do their perceptions of quality, relevance, student interest, and other factors influence their choices? How does platform design affect resource selection and user experience? How do conversations and processes around resource selection vary when an individual teacher is selecting resources versus a team of a teachers? If teach-

ers adapt resources, what types of changes do they make and for what reasons? How do adaptations modify the rigor or cognitive demand of the task? Under what conditions is OER used to support other pedagogical approaches of interest, such as project-based learning or personalized learning?

Questions were also raised about differences among teacher groups. Do elementary school teachers perceive OER differently than secondary school teachers? Are there differences in how teachers from different content areas perceive OER? Lastly, does the environment (e.g. urban, suburban, rural) or varying student needs (e.g. students of color, students from low-income families, special education students) affect teachers' perceptions and use of OER?

Influence of OER on Teachers and Students
Participants asked a number of questions about how OER affects other dimensions of interest, including efforts to integrate college and career-ready standards or ISTE Educator Standards, teachers' technological, pedagogical and content knowledge (TPACK), and student engagement, as measured by attendance or discipline data, student achievement scores and surveys of non-cognitive skills. On an anecdotal level, many of the learning network participants previously had positive experiences with OER and suspect that OER likely has a favorable impact on these dimensions of interest. Yet, a much more systematic and empirical evidence of these relationships is needed to scale OER initiatives.

State and District Structures
Moving outward from the classroom, convening participants asked about state structures conducive to OER: "What are the most effective ways state governments can encourage OER adoption, creation, and use?" While determining the single most effective structure is difficult, research could certainly describe the ways in which states are promoting OER (see "Focus Area 1: District and State Policies that Support Open Educational Resources" for examples) and identify the types of sharing occurring between states. For example, are states linking to each other's OER repositories or to single resources, and if so, what type of resources? Examining and identifying effective, existing state-level structures would enable other states, who may be considering OER, to use

these structures as a model and better support initiatives from the start.

At the district level, the growing number of OER repositories and organizations providing openly licensed content may make instructional material selection more complex. Therefore, learning network participants wondered about identifying new models of procurement and instructional material adoption as OER use becomes more common. Lastly, because OER is often framed as a cost-savings method, a well-documented picture of how OER is integrated into district budgets would also be helpful.

Understanding how districts take up the challenge of sustainability is another key area of interest. If the development, curation, or vetting of openly licensed learning materials is part of teachers' contractual responsibilities, does this help to ensure sustainability and regular curriculum revision? Participants wondered about what types of professional learning opportunities would support this line of work and what school and district structures become potential barriers for teacher leaders. A better understanding of district-level supports and barriers would allow for OER initiatives to be customized to the needs of different districts.

Technical Challenges
A number of questions were raised about the digital infrastructure necessary to support OER. Regarding the sharing aspects of OER, participants asked about relationships with metadata, various repositories and learning management systems such as Canvas and Schoology. A related challenge is creating systems to vet quality, including the extent to which machine learning, artificial intelligence or automation may be able to curate and/or vet OER.

Many districts using OER supply students with computers, iPads or other devices. However other districts work with organizations who print openly licensed curricula into workbooks. Is a 1:1 student-to-device ratio necessary for high-quality OER implementation, or is there a minimum level of digital readiness that a district should be equipped with before fully embarking on an OER initiative?

Research examining such technical challenges that may be inherent to OER implementation would help to identify the ideal conditions. If schools do not have the infrastructure they need to properly use OER, and OER providers do not make their content easily discoverable and usable, OER efforts would likely stall because of technical challenges.

Equity

The U.S. Department of Education's Office of Educational Technology explicitly cites that OER can be a tool for educational equity "by providing all students access to high-quality learning materials, no matter their school's budget or procurement practices" (OET, 2017). Learning network participants displayed a strong interest in the relationship between OER and equity, which has been researched more extensively in higher education in terms of cost-savings for low-income students (Hilton & Wiley, 2011). Several participants asked about equity in terms of the accessibility of OER. Can OER be universally designed, or designed in a way that teachers can adapt resources to be accessible to students with varying needs? Another participant asked about what factors might lead to OER use in lower-resourced schools and wondered if there exists an implication for equity if students can personally own the materials used in school. Such feedback from the convening participants call for a deeper look into whether the benefits of OER can indeed be extended to all PK-12 student subgroups.

Varying Forms of OER

In studying any question regarding OER, researchers must recognize that OER does not take a single form and can support different approaches to learning. "What are the different definitions (or strands) of OER?" asked one group of learning network participants. Many questions were raised about the effects of using openly licensed curricula versus individual learning objects (e.g. assessments, simulations and games). They also asked if OER can serve as a strategy to reduce instructional homogeneity by supporting personalized learning or deeper learning (including project-based learning).

Finally, questions were asked about the relationship between these different forms and uses and teacher professionalism. For example, one group of partici-

pants asked if teacher conversations about resource selection in a more bottom-up approach to OER development leads to increased teacher self-efficacy and empowerment.

Research Frameworks

Many frameworks have been developed for organizing OER research. Wiley and his colleagues utilize one such schema – the COUP Framework – which includes studying OER cost, outcomes, usage and perceptions (Hilton, Wiley, Fischer, & Nyland, n.d.). However, this framework has generally only examined OER in higher education. As applied to PK-12, such a framework would include an analysis of cost-savings to districts, how teachers and students perceive and use OER, and the relationship between OER and various outcomes (e.g. student achievement and engagement, instructional quality, teacher professionalism).

A previous gathering of researchers and practitioners sponsored by the National Science Foundation also generated OER research questions within the categories of professional learning, impact on teaching, impact on learning, policy and procurement, curation and quality, and accessibility. This provides another schema for organizing OER research efforts (NSF, 2016).

A third potential framework for OER research questions is organized around the lifecycle of OER, from creation through adoption, revision and implementation (see image below). Such a framework includes the more well-researched areas – like perceptions and costs – but also the less explored areas of stakeholder perceptions, OER enactment and teacher decision-making around OER. An important contribution of this framework is that it explicitly acknowledges the difference between the adopted curriculum and the enacted curriculum and seeks to better understand the decision-making processes behind OER – whether at the state, district, school, or teacher level.

Regardless of what organizing principles are used, more research on PK-12 OER implementation will fulfill several important goals. It would allow OER initiatives to be systematically scaled and adjusted with deliberate attention to dimensions of OER implemen-

tation critical to sustainability. Additional research would also facilitate the spread of OER-enabling policies at the state and district level, allow OER providers to understand why teachers choose particular resources and how and why they adapt them, and lead to a better public understanding of the influence of OER on teaching and learning.

Conclusion: Recommendations for Future Studies

The questions above provide many research opportunities to understand the broad reach of OER in various educational settings. Below, we suggest some ways that these research questions could be developed into actionable research studies. Stakeholder perceptions of OER could likely be answered through qualitative means, such as in-depth interviews with educators, or quantitative methods, such as surveys. These approaches would help us discern how understanding of OER varies across those working at different levels of the PK-12 system (superintendents, principals, teachers), as well as other stakeholders, including parents.

Many learning network participants expressed explicit interest in understanding how different forms of OER are enacted. A comparative case study of districts (or schools) using a more top-down and bottom-up approach to OER, respectively, would provide insight into how these different approaches relate to teacher professionalism, educator autonomy and learning approaches. A comparative case study may also illuminate how certain district structures enable or constrain OER efforts.

An incomplete list of research questions to better understand production, adoption, revision, and implementation of OER

Production	Adoption	Revision	Implementation
OER are produced by a range of stakeholders for a range of reasons. These questions explore the creation of open materials.	Stakeholders discover and adopt OER for a range of reasons. These questions explore the decision to begin engaging with open materials.	No adopted curriculum is right for every classroom. A core principle of OER is that they are revisable. These questions explore the adaptation of OER.	The adoption of OER (by states, schools, etc) may not lead to implementation of OER. These questions explore the actual use of open materials.
Who produces OER? – What organizations/curriculum providers produce OER? – What schools, districts, or states produce OER? – What individuals produce OER?	**Who adopts OER?** – What roles do states, districts, schools, and teachers play in the decision to adopt OER for use? – What other parties play a role in OER adoption?	**Who revises OER?** – Do states, districts, and schools, and other parties customize their OER? – How much do teachers modify curriculum received from other stakeholders?	**Who implements OER?** – Who, other than teachers, uses OER? – Which teachers use OER? (Is it a type of teacher, or a teacher who is a part of a certain type of organization?)
Why do they produce it? – What is the mission of OER-producing organizations? – Why do schools/districts/states choose to produce rather than acquire OER? – Why do individuals create rather than acquire OER?	**Why do they adopt it?** – What leads stakeholders to seek out OER? – Why do stakeholders discover and adopt some OER and not others? – How do stakeholders form perceptions of OER?	**Why do they revise it?** – Why do states, districts, and schools modify OER? – Why do teachers modify OER, and curriculum broadly? – What values drive different stakeholders' decisions to modify OER?	**Why do they implement it?** – *This is a curious category that might better be phrased: "Why don't stakeholders implement OER?" Or: when do stakeholders choose not to implement OER that has been adopted and revised?*
How do they produce it? – When organizations/curriculum providers produce OER, what is their process? – When schools/districts/states produce OER, what is their process? – When teachers produce OER, what is their process? – What roles do stakeholders play in each other's OER creation process?	**How do they adopt it?** – How do adopters (at all levels) discover OER, both broadly (in terms of their existence) and specifically (in terms of individual use cases)? – What is the process of adopting OER? (Is it a state committee decision? Is it a teacher simply downloading something?)	**How do they revise it?** – When stakeholders revise OER, what guides their decision-making? – What tools and resources do stakeholders use when modifying OER?	**How do they implement it?** – What professional learning is built around OER? – What roles and processes exist in schools to support high quality implementation of OER? – What structures gather information about the effectiveness of the OER implementation?

Graphic provided by Peter Nilsson, director of research, innovation and outreach at Deerfield Academy and PK-12 OER Learning Network participant

Another set of studies could focus on how various models of OER play out in classroom practice; in particular, how teachers make decisions about OER selection and use in instruction. For this work, qualitative methods such as in-depth classroom observations, think-alouds, teacher interviews, and document analyses may help provide details about teacher decision-making and resource use in the classroom. OER repositories also have a rich set of paradata that could be analyzed to understand the characteristics of the most-downloaded content and the types of comments made.

Finally, while it would be resource-intensive, many participants expressed interest in understanding the effects of OER through a randomized control trial. For example, a district looking to begin using OER could randomly select some schools to receive OER implementation support. The district could then compare a variety of outcomes in those schools to others that continued to use proprietary learning materials. Student achievement by itself is a narrow measure of program effectiveness. We suggest collecting a broad range of data, including exemplary student work, direct observation of instruction, teacher surveys, faculty interviews and curricular tasks.

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Focus Area 4: Sustaining OER Initiatives

By Marcia A. Mardis, Ed.D. and Rebecca Morales

The themes and scenarios presented in prior sections of this research document depict many views of OER implementation in action — its themes, considerations and real-life occurrences. The common thread among all of these examinations is the need to sustain OER implementation in effective, ongoing and flexible approaches. In this section, we examine what constitutes fundamental aspects of OER sustainability and how these features fit together to provide entry points for developing state or district sustainability plans.

What is OER Sustainability?

OER implementation is a process, not an event (Mardis, 2017). Creating an OER-integrated learning environment is about much more than just aggregating new learning materials from an online repository. The PK-12 OER Learning Network convening participants echoed this view by emphasizing that OER transformation blends organizational and personal commitments to access, skill, policy, and motivation for seamless, continuous and sustained improvement. However, "[t]he main problem with most open educational resources … is that planning for sustainability is often an afterthought" (Kanwar, Kodhandaraman, & Umar, 2010, pp. 72-73).

So what does sustainability fundamentally entail? Policymakers contend that the core of OER sustainability is funding to support the shift to openly licensed learning materials (e.g., Boston Consulting Group, 2013). One learning network participant agreed, noting, "There needs to be revenue sources for providing the necessary professional learning for educators to either create OER or engage with existing OER." So while the dollar amount dedicated toward an OER initiative is undoubtedly important, what the funding is ultimately designated for is key to understanding what sustainability looks like in a particular state, district or school.

In this section, we cast sustainability as a continuous, staged process, rather than an implementation event. The discussions from the learning network convenings reinforce Wiley's (2007) definition of OER sustainability as the "ongoing ability to meet" the goals of OER, which include their continued (1) production, (2) sharing, (3) use, and (4) reuse." In Wiley's (2007) view, although achieving these goals requires financial resources, funding is not the only incentive sufficient to engage users in OER initiatives. At the March learning network convening, Anthony Gabriele, Garnet Valley School District's supervisor of learning, development, and professional growth, said, "There is a management load that's an unanticipated cost. Who else's world does it affect? It's really important to weigh out the benefits and the obvious costs, such as time and money, and adjust it for the unanticipated costs." In other words, funding is necessary, but not enough by itself, to implement OER at scale.

With these ideas in mind, participants at the learning network convenings shared their views on sustainability. Four themes cross cut the participant discussions: access, skill, policy and motivation. These themes not only provide a means of analysis, but also a list of effective ingredients for sustainable OER implementation. We will weave participants' ideas related to these four quadrants of sustainability together with recent research and examples substantiating their contentions. We will conclude with a proposed sustainability model and offer planning and implementation strategies.

Access

Reliable access to an adequate, robust supply of OER depends on many structural or social enablers and barriers. For example, learning network participants pointed to discoverability as a major, initial barrier for educators looking to use OER. The current lack of metadata and quality indicators about OER can lead educators to feel "lost" when searching for openly licensed learning materials to incorporate into curricula. Participants also raised issues regarding curation, OER supply maintenance, connectivity and personalization as they relate to access.

Curation

We tend to think of OER as digital versions of traditional learning resources, such as complete learning units. However, the advantage of OER is the openness – the endless possibilities to combine, edit, mix and apply. OER has the potential to allow each learning community to share in a common foundation of resources and simultaneously tailor their use to individual learners' needs. For this strategy to scale and sustain, these uses must be captured and recorded to inform all educators (Mardis, 2017). Sustainable curation practices reflect a balance between school community needs and state and local imperatives.

Curation is more than adding links to a page or bookmarking a website. Curation is an ongoing process of skillfully selecting, revising and updating resources to create a learning experience through the feedback loops created by content organization, description, promotion, reflection and engagement. In Liberty Public Schools, teachers are committed to working in teams to identify, organize, describe and reflect on OER in their content areas. Curation is essentially built into their workflow. In Broken Arrow Public Schools, curation is not just an endeavor shared among teachers; students are encouraged to participate in dialogue related to resource effectiveness and learning needs.

Maintaining the Supply of Quality Resources

A robust supply of OER refers not only to the quantity of text, videos, images, games, virtual experiences, online assessments and other learning materials, but also their quality (i.e. whether these learning materials can meet the unique needs of each learner). Faced with an urgent need to establish a repository of OER, many district leaders are turning to trusted sources. For example, Liberty Public Schools have made commitments to quality openly licensed resources provided by Eureka, Zearn and Open Up Resources.

However, when this supply of vetted content is exhausted and no state or regional repository is available, ongoing curation is crucial to ensuring that evolving definitions of quality reflect accessible supplies of resources, such as commercial suppliers or nonprofit databases (Fox & Jones, 2018). At a minimum, effective curation supports many learning environments and a variety of learning applications and will allow teachers to search and discover content from a variety of sources.

For many educators, these features are facets of quality. Dr. Jeanette Westfall, executive director of curriculum, instruction and staff development at Liberty Public Schools shared, "What am I worried about sustaining? Commitment to quality. How can we continue to show support for educators in the absence of a physical textbook?" To be sustainably implemented, educators need ongoing signals that OER meet or exceed the quality of traditional learning materials.

Connectivity

The issue of access also encompasses connectivity. For example, GVSD took deliberate actions to ensure seamless home and school internet connectivity, appropriate types and quantities of devices, technical specifications for interoperability and learning environment spaces that support the types of collaborative learning that OER encourages.

Broadband: Essential Infrastructure

High speed internet connectivity, both at school and at home, is an essential element of digital OER initiatives. Without reliable, robust internet access delivered over an up-to-date, functional network, OER's potential as a flexible, accessible digital learning materials cannot be fully realized. Several organizations offer tools and technical assistance to help district leaders assess their connectivity, create new policies, and undertake initiatives to ensure that learners and educators have access to OER at home and at school:

- Education Superhighway is currently working with governors in 24 states to provide technical and procurement support to hundreds of school districts.
- The Federal Communications Commission's E-Rate Program provides discounts for telecommunications, internet access, and internal connections to eligible schools and libraries.
- Section 3 of OET's #GoOpen Launch Packet provides guidance to help district leaders put in place an appropriate digital infrastructure for learning.
- A recent ISTE blog post about Rowan-Salisbury School System includes strategies for district leaders to work with community organizations to provide after-school internet access.

Enabling Personalization

Each of the three district spotlights detailed ways in which leaders viewed OER as means to directly meet learners' needs through personalization. Personalization entails matching the resource to both the learning task and the learner's unique needs and challenges. For example, an OER video clip does not have the same learning applications as a library of digital video clips. Digital resources can be combined in a number of different ways or tailored for different learner needs (Arslan, Gök, and Saltan 2010; Kay & Knaack 2009a, 2009b; Sing & Chew 2009).

Anthony Gabriele addressed personalization and described ways in which educators had embedded the appropriate size resources into curriculum guides that would not only provide implementation support, but also act as dynamic repositories of the best resources for specific learning tasks. Creating these guides constituted a clear best practice because, as Gabriele contributed at the March learning network convening, "[OER curriculum guides] allow experienced educators to be consistent and new educators to get up to speed quickly because they provide content and resources and guidance."

Westfall also noted that at LPS, sustaining the commitment to personalization is important to improving educators' practice because, "It's a matter of curating OER around what? If you curate around what is to be learned, you can blend OER and traditional resources to allow educators to communicate with everyone."

Policy

OER sustainability is about removing the mystery of a new, potentially intimidating initiative by assuring participants that there is a plan to support them beyond day one. Those plans often take the form of public policies. Public policies both shape and reflect a learning community's values, practices, and culture. Policies can be written or embodied, strict or flexible, enabling or constraining. Learning network participants cited two ways in which policies influenced their sustainability considerations: ground-up, or policies that grow out of organizational practices; and top-down, or policies laid out through statutes and regulations that affect decision-making processes.

Ground-Up Policies

Learning Network participants representing school districts observed that the organizational culture that grew while scaling OER initiatives became routine enough to function as de facto policy. Participants also described several instances where these local practices evolved into explicit policies to provide ongoing professional learning, release time and compensation for teachers involved in the OER curation and creation process. For example, both LPS and GVSD have adopted district policies to reinvest their budget flexibility toward professional learning and classroom support for teachers.

This interplay between culture and change can be eased by a thoughtful, attentive leadership. Anthony Gabriele outlined how his district built on educators' cultural momentum to develop a five-year process that has now become routine policy (see "District Spotlight: Garnet Valley School District"). This now-routine process allows educators to ease into changes to their practice by first understanding OER's benefits, gradually attaining the necessary skills, then culminating with opportunities for educators to shape their own curriculum; GVSD's incremental process increases commitment among educators because they do not experience a sudden switch from customary practices. Gabriele is also aware that implementation requires skill support and ensures that all members of the learning community are involved. He added that GVSD is evolving the process to include other personnel, such as librarians. This policy allows new educators who join the district to know that they will have the ability to engage in an established, effective professional learning experience supported by multiple educators. In this way, the culture of best practice has been translated into a policy that will sustain OER implementation.

Top-Down Policies

In addition to these local, "ground-up" policies, many policies that affect OER implementation are "top-down," coming from entities such as state educational agencies. The State Educational Technology Directors Association (SETDA) provides a range of resources examining policy issues for the implementation of digital learning resources, including connectivity, intellectual property and reuse rights, student data access, and other relevant national and state policies.

SETDA Resources for Developing Sustainable Practices and Policies

- Transformative Digital Learning: A Guide to Implementation
- Navigating the Digital Shift III: Broadening Student Learning Opportunities
- State Wi-Fi Leadership for Fostering Digital Learning Ready K-12 Schools
- Broadband Imperative II: Equitable Access for Learning

State laws, many of which have been rewritten to include digital content as an acceptable use of state funding intended for textbook purchases, can be catalysts to spur the transition to OER. As of 2018, 29 states have a definition for instructional materials that includes the option for digital instructional materials, six states require the implementation of digital instructional materials, and 30 states allow the implementation of digital instructional materials (Fox & Jones, 2018). However, digital learning content requirements are not necessarily spurring a move to OER; currently, only 17 states have a definition for instructional materials that includes OER (Fox & Jones, 2018). Textbook publishers are still controlling content and even populating supplementary materials lists with their fee-based content (Mickey & Meaney 2010).

A SETDA report (Fletcher, Schaffhauser & Levin 2012) outlined some recommendations for states and districts to make the switch from print to digital resources as soon as their next adoption cycle occurred. The development of a clear plan for making the switch and communication of that plan were deemed imperative. Such a plan would include a revision of policies, significant investment in the technology to support the move to use digital resources and an implementation of procedures that support key stakeholders during the move. SETDA additionally encouraged collaborative efforts "to create alternative, flexible models for the creation, acquisition, distribution and use of digital content" (Fletcher, Schaffhauser & Levin 2012, p.3).

Learning network participants pointed to several other issues that require attention, such as policies related to transparency, which allow the district to engage parents and sustain implementation. Regular community reports and acknowledgements of achievements were presented as two ways in which parents can be engaged. Parents are important stakeholders in student data policies that protect privacy, but allow for assessment and goal setting (Saljo, 2010).

Skill

PK-12 OER Learning Network convening participants frequently discussed that the educators' abilities were important to sustaining any OER initiative. Learning network participant Fred Brown, deputy executive director of Learning Forward shared, "I don't want to sustain OER only. I want to sustain educators' abilit[ies]." Specifically, learning network participants proposed that professional learning should go beyond the use of a device and focus on collecting, tracking and reviewing information. "K-12 educators must develop new information literacies to become effective" but currently the "knowledge and skills necessary for effectively utilizing and creating OER are not standard topics of educator education courses or … trainings" (Kimmons, 2014, p. 73)

Learning network participants additionally identified that professional learning must be local, collaborative and continuous and that educators should be provided positive feedback. This aligns with research that effective professional development is "supportive, job-embedded, have an instructional focus, [and] be collaborative [and] ongoing" (Hunzicker, 2010, p. 179). Developing new learning materials to support a curriculum is a central practice of teaching and OER is conducive to this practice. Using "curriculum materials [to support] professional practice" is called "curriculum enactment" and can "make educators' learning central to efforts to improve education" (Parke & Coble, 1997, p. 775).

Research on educators' ability to develop instructional materials is currently limited to case studies, but the ability to manage experience, control for environmental conditions, and develop curriculum has been referenced as an educator's "pedagogical design capacity" and is influenced by an educator's knowledge

of pedagogy and content (Littenberg-Tobias, Behesti, & Staudt, 2016, p. 352). PK-12 OER stakeholders all realize that there is a relationship between OER and educator skill. Understanding that relationship may be significant in that it may provide the opportunity to streamline a professional learning experience for educators that has a greater probability of improving their instructional practices. This would, in turn, generate improved production, sharing, use and reuse of OER -- a sustainable professional development cycle that sustains the objectives of OER (Wiley, 2007).

Motivation

A common theme discussed among PK-12 OER Learning Network convening participants was considering how the concept of OER is presented to educators and learners to motivate their participation with OER curation, revisions and use – specifically not highlighting cost. Wiley (2007) stated that sustaining OER is more likely "[w]hen people find more value in participating in an activity than the cost of participating in the activity. … By … increasing the value inherent in participating in OER projects for staff, educators and learners, we may be able to decrease the amount of extrinsic incentives (such as money) that are necessary to sustain OER projects" (p. 6). "A project's value depends on its impact on the target group (i.e. who benefits from it, how it adequately addresses their needs and what difference it has made) (Kanwar, Kodhandaraman, & Umar, 2010, p. 73).

This "framing" will influence how the concept is processed and received by an audience. Essentially, people naturally identify what is driving an event or occurrence (Goffman, 1974). Learning network participants reported that if cost is communicated as driver of OER adoptions, then its sustainability is threatened. Westfall presented two scenarios involving high school OER adoption at LPS: In the first scenario, LPS high school social studies teachers were told that the primary advantage to openly licensed instructional materials was cost savings. These educators opted to continue using copyright-restricted texts. In the second scenario, LPS high school science teachers were told that OER was a resource for project-based learning. They holistically opted for OER instead of copyright-restricted text. The contrasting outcomes of these two scenarios suggests that the messaging around OER is essential to instill educator motivation

to change long-standing practice.

"[I]n K-12, quality is a function of cost, because cost drives the ability of educators to gain access to up-dated materials that are aligned to current standards" (Kimmons, 2015, p. 42). It is important to understand, then, that PK-12 educators may interpret a strong cost-savings message as a lack of district willingness to invest in their expertise, because they are being asked to accept instructional materials of uncertain quality. To propagate a stronger message to inspire educators to sustain OER use, district leaders must:

1. Maintain a transparent culture.
2. Include educators in the planning, goal setting, resource creation, and evaluation process.
3. Invest any funds saved by OER use back into the educator (e.g., professional development, comple-mentary instructional resources, substitutes to cover planning time).
4. Feature OER as a mechanism that empowers educators, amplifies their instructional efficacy and preserves the educators' contributions.

Sustainability rests on "a culture of openness" (Iiyoshi & Kumar, 2008, p. 4); as one learning network partici-pant noted, "Highlighting successes is important to support sustainability. Public awareness supports you when you struggle." When "projects ... demonstrate a high degree of accountability and transparency ... during [their] implementation" (Kanwar, Kodhandara-man, & Umar, 2010, p. 73), educators work together and their community is enriched. In order to sus-tain educators' motivation to produce, share, use and reuse openly licensed materials, PK-12 districts must communicate that OER adoption is not only an educator-inclusive practice, but also an educator-driven process.

Conclusion: Sustainability Considerations

Discussions at the learning network convenings ad-dressed a wide range of large and granular issues related to sustaining OER implementation. Taken as a whole, participants' views linked to four main sustainability considerations: access, policy, skill and motivation. From their comments, it was clear that participants saw these areas as interdependent themes, with the considerations of one area having

consequences or implications for sustainability in other areas (Mardis, Hoffman & Marshall, 2008); the figure below provides a visual summary.

As the figure depicts, effective OER sustainability approaches take into account issues in four areas. Each area is a barrier or enabler to sustainability. For example, if one does not have access, the skill to use, policies that do not enable, and motivation to employ OER, then the implementation is not sustain-able. From the PK-12 OER Learning Network conven-ings, the consensus was that of these four quadrants, motivation is the most important. If motivation is not sustained, then the remaining quadrants cannot be adequately supported.
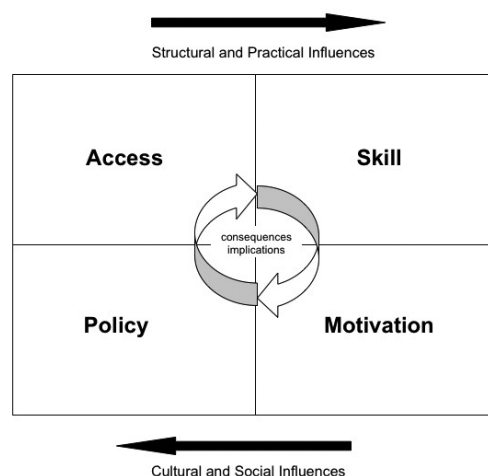
Graphic provided by Marcia Mardis, Ed.D., assistant dean for in-terdisciplinary research and education at Florida State University

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Acknowledgments