Leveraging Open Educational Resources to Increase Student Achievement and Teacher Professionalism

A Case Study of Leadership Public Schools For the William and Flora Hewlett Foundation

By
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What are Open Educational Resources (OER)?

OER are resources that have an intellectual property license allowing their free use or repurposing by others without license fees or royalties. These OER have the ability to radically reduce the costs of classroom materials. They allow for continuous improvement to enhance learning and for customized content tailored to teachers’ and learners’ needs. Those that are close-captioned allow for easy language translations.
At LPS we are using Open Educational Resources (OER) to innovate methods and materials that keep at-risk urban youth from falling further behind and, better still, prepare them for success in college and beyond. We do this by….

• Creating and modifying open-license resources to better support under-prepared high school students,
• Empowering teacher-innovators to constantly develop and improve innovative instructional approaches,
• Constantly measuring and increasing our impact,
• And distributing best practices within our network and beyond.

We believe our systemic approach to education innovation has the potential to transform educational opportunities in our most challenged urban communities.

Louise Bay Waters, Superintendent & CEO, Leadership Public Schools
Leadership Public Schools (LPS) is a network of four charter high schools in Richmond, Oakland, Hayward and San Jose that serves over 1,500 students. The four LPS high schools range from 62% to 93% low income and 94% of the students are African American or Latino. The average entering freshman ranges from 1 year behind grade level in Hayward to 4 years behind in Oakland with 10% to 50% of those students, respectively, starting 9th grade with skills at the 4th grade level or lower. All LPS students take college preparatory courses and 97% or more of the graduates have been accepted into college by graduation.

- LPS is achieving a high level of buy in and alignment across teachers and schools by using OER and involving teachers in an ongoing collaborative revision process.

- LPS has leveraged OER to produce several different types of technology-based educational resources including: online text books, online math programs, a data reporting system and a clicker mobile “app”. All of the products are developed to successfully integrate into the curriculum and align with each other to support student success.

- A network–wide emphasis on content literacy and OER has resulted in significant acceleration in math and literacy for urban secondary students.

- These gains have been seen in classes taught by new teachers using OER resources and OER supported collaboration, providing consistent results despite the higher teacher turnover rates typical of urban environments.

- Distributing the incubation of new practices and programs across the network is essential for sustained innovation and breakthrough results.
LPS has deliberately structured itself as an R & D network built around two design principles: collaborative innovation and distributed incubation, both of which are technology-based and rely on the creation or leveraging of Open Educational Resources (OER).

**Collaborative Innovation**
Collaborative innovation uses technology and OER to build, share and continually improve a common and comprehensive spine of curriculum, assessment, data and access / remediation resources for core high school courses. Many of these resources are LPS evolutions of open-source materials from CK-12 Foundation and others. Because they are open licensed, teacher-developed iterations that have shown strong results, they can be readily incorporated to upgrade the collective practice. OER common-spine resources are stored and shared on the web and implementation is supported by online collaboration and virtual professional development. By using the process of collaborative innovation LPS is achieving a high level of buy in and consistency across teachers and schools, providing a third path between top-down mandated curriculum and “do-your-own thing” entrepreneurialism. Many LPS common-spine resources are being made available free and open licensed through LPS and the CK-12 Foundation and the processes are being shared through organizations such as New Schools Venture Fund and PivotLearning.

**The LPS Common Spine**

<table>
<thead>
<tr>
<th>Scope &amp; Sequence</th>
<th>Core Content Resources</th>
<th>Applied Learning</th>
<th>State Test Aligned Interims</th>
<th>Critical Thinking</th>
<th>Formative Assessments</th>
<th>Literacy Support</th>
<th>Numeracy Support</th>
<th>Spanish &amp; Text-to-Speech</th>
<th>Multi Media</th>
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<tbody>
<tr>
<td>Curriculum Content</td>
<td>Assessments</td>
<td>Access Supports</td>
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**Distributed Incubation**
The second design principle, distributed incubation, recognizes that urban education is hard: the changes needed are multiple, difficult and immediate. Many of the solutions are not yet known. **No one school can take on all of the innovation required for sustained breakthrough results. For this reason LPS distributes the incubation of new practices and products across the four schools depending on need, interest, and talent. It then relies on the demand-pull of results to accelerate change and distribute practice throughout the network.**
“We’re a network of four schools. We’re very much about trying new ideas, succeeding at some and failing at others, with a goal of eventually making wide-scale change in our communities. We hope that other teachers will be able to build off what we have done to create materials to meet the needs of their students.”

Mike Fauteux, Math Teacher, LPS Hayward

At any one time, Leadership Public Schools has multiple innovations in varying stages of development across the network. Each idea is designed/adopted/ or adapted by a teacher team. It is then prototyped, distributed to a larger group of teachers, and iterated through a collaborative process of feedback webinars.

“The benefits of FlexMath are that it’s totally different from any type of math lesson I’ve had and actually works. I can gain mastery over math skills by having multiple chances to practice each mission.”

Isaiah Talauta, 9th Grade
THE LPS OER PRODUCTS IN THE CLASSROOM

ENHANCING THE CORE WITH OER AND TECHNOLOGY
In partnership with the CK-12 Foundation, LPS has modified CK-12’s open-licensed, online “flexbooks” to create College Access Readers in Algebra, Biology and Geometry. Each College Access Reader is available in its original form from CK-12 for advanced students, with embedded literacy supports for students up to four years below grade level, and with text-to-speech for struggling readers and Special Education students. Hardcopy and online Spanish translations are also available for students with very limited English skills. Depending on the classroom, students use the Readers directly online; in learning stations; or in hard-copy for note-taking and annotation paired with teacher display using an LCD projector. Additional College Access Readers are in an initial year pilot in Environmental Science and Algebra 2 and in the beginning stages of development in US History and Chemistry.

In addition to the Readers, LPS developed an initial prototype for an online Algebra program, FlexMath, which CK-12 enhanced and refined. FlexMath includes Algebra presentation supports for teachers and online practice for students as well as online remediation of basic math skills down to addition. It is available free in its original non-modifiable format from CK-12 at www.FlexMath.org. A new, more modular, interactive and editable version is due out as FlexAlgebra in 2012. CK-12 also funded an LPS-developed Geometry program and is using it as the foundation for an online FlexGeometry due out later in 2012.

IMPACT OF LPS’ FIRST OER PRODUCT

- LPS Hayward originally developed and piloted FlexMath Algebra, gaining 45% points on the California Standards Test (CST) over the 3 years of development.
- LPS Richmond led implementation of CK-12’s upgraded FlexMath Algebra program and had a gain of 43% points on the 9th grade Algebra CST with 30% of the students scoring at the advanced level.
- Envision’s Impact Academy* used the CK-12 FlexMath program and had a gain of 20% points in Algebra.
- Sierra Middle School* in Riverside Unified School District also used FlexMath and raised their 8th grade Algebra CST scores 37% points.

Of particular interest in the 2011 Algebra gains at LPS Richmond and Hayward is the fact that they survived the departure of the initial developer. In 2011 the Hayward gains continued and increased 14% points while 6 out of 7 periods were taught by new teachers. The Richmond teachers who achieved the outstanding gains were the same ones who had taught the course the year before.

*Envision’s Impact Academy and Sierra Middle School implemented the FlexMath tool by LPS and CK-12. They are not part of the Leadership Public Schools network.
SUPPORTING INTENSE DATA USE WITH OER AND TECHNOLOGY

The LPS Director of Data and Assessment has developed the “Personalized Pathways to College” data reporting system allowing students to track their own data and teachers to adjust instruction. It includes online or hard-copy personalized planning and data tracking for grades, graduation progress, California high school exit-exam (CAHSEE) preparation, and California Standards Test (CST) readiness. Each of these reports allows students to analyze their own strengths and weaknesses, plan a strategy for success, and enlist others to provide support. A similar suite of teacher tools aggregates a wide range of data in customized reports that allow teachers to continually adjust their instruction and chart the progress of their students. As with the College Access Readers, these have been refined through ongoing teacher and administrator input and varied implementation across the four schools. The basic suite of tools will be available open licensed in the spring of 2012.

The LPS Chief Innovation Officer has developed a mobile “clicker app,” www.ExitTicket.org, to produce just-in-time data at a concept level. It was designed with LPS math teachers based on LPS Richmond’s success with commercial “clickers” in Algebra. However the LPS ExitTicket app provides much greater functionality than anything currently available. Produced open-access and implemented with donated recycled Smart Phones or traditional computers, ExitTicket dramatically accelerates data use by students and teachers. Student engagement and concept attainment have skyrocketed. In the words of one of the teacher developers, “Kids are crazy invested around here and it’s awesome how well this works.” Design teams in English, history and science have submitted design specifications and are clamoring for their turn in the development queue.
Putting the Pieces Together: OER and LPS Richmond Algebra

Excerpts From: Accelerating Secondary Math Achievement: A Case Study of LPS Richmond’s Algebra and Academic Numeracy Courses by Patrick Lee, PhD. June 2011 (www.leadps.org)

At Leadership Public Schools Richmond, students are demonstrating significant achievement gains. In 2011 their California Academic Performance Index (API) gained 83 points, the 6th highest growth among all California high schools. LPS Richmond also surpassed the state’s rate of moving students out of the lowest performance bands and into the highest ones across all its tested subject areas.

The school’s continued success in math in particular is reflected in the gains 9th graders made in their courses during the 2010-11 school year. Taylor Garland and Sophia Thomas teach four periods of Algebra and Academic Numeracy, respectively. Their students made significant gains in content mastery as measured by several indicators. In addition to the CST gains detailed above, their students gained an average of 1.61 grades of growth in 9 months with 30% of the students gaining 2-3 grade levels on the NWEA Measures of Academic Progress.

A CULTURE OF DATA USE

Upon entering the classrooms of Taylor Garland and Sophia Thomas, it is clear that their ubiquitous use of data permeates the classroom in a myriad of ways. Formative and summative assessment results are publicly displayed on classroom walls for students to view and monitor. The teachers check students’ understanding using clicker devices that provide instant feedback on learning on both an individual and class level. Students examine their personal data tracker sheets listing their scores on different math standards, which they use to identify the projects they pursue in FlexMath, an online math instruction platform that integrates lessons, skill building, and assessments.

What are central to these everyday practices are timeliness, accountability and ownership. Many assessments are administered and scored on the spot in order to provide both the teachers and the students with immediate feedback. These include:

- Quizzes, checks for understanding, and other assessments administered with the clicker devices
- FlexMath and quiz results
- Daily launches, “do-now activities”, and exit tickets scored daily

Garland and Thomas adjust their instruction based on the results they get back and are able to implement whole class re-teaching strategies, small group workshops, or individualized assistance as needed. While in 2011, before ExitTicket.org, these strategies did not allow the teacher to see each student’s individual work, they facilitate error
analysis, whole-group re-teaching, and the student’s own self reflection and re-investigation surrounding a particular problem. Garland has found particular power from using a double daily exit ticket (one question with clickers, immediate discussion and re-testing) and then a similar clicker question during the launch the next day – thereby ensuring a high level of initial mastery. The use of clickers during the launch re-check also provides another point where the teacher can intervene with one-on-one assistance.

The teachers’ integration of data in their classroom also seems to promote a sense of ownership among their students. Students are eager to obtain their assessment results and are empowered to use that data to guide their own learning. For example, Thomas has students select their own “missions” in FlexMath based on the weaknesses they see from prior assessment results. Rarely does she have to redirect students to a more appropriate mission as most select ones that are aligned to their areas of academic difficulties.

Garland and Thomas describe the frequent assessment and results component of their instruction as a sort of “video game mentality.” Garland notes, “When students fail, they know they haven’t died. Like in a video game, they can fix what they did wrong immediately.” Given that students have multiple opportunities to learn, including revisiting problems they missed and retaking quizzes, Garland says they are more motivated to make the effort to learn. He calls these “at bats” and says that the more “at bats” a student has, the greater their engagement and learning.

With this developed ownership seems to come a sense of accountability. Since ongoing assessment results are posted on data walls, students are motivated to improve their scores and complete all the missions they need to backfill missing skills. The teachers aim to foster a healthy sense of competition so that students internalize a level of pressure to perform well and show growth without damaging their sense of self. Both say that the public data displays appear to motivate the majority of students in their classes. They also note that most struggling learners aren’t necessarily resistant to the data as they realize that the teacher and their peers are there to support them in their learning.

THE POWER OF MODIFICATION – OER IN PRACTICE

The Leadership Public Schools network has developed a culture of collaborative innovation where teachers across sites work together to develop curriculum resources and share promising instructional practices. FlexMath, including PRIME, was developed by Todd McPeak, the LPS Math Specialist, and piloted at LPS Hayward. Because of the strong results from that implementation, Richmond adopted the program and remained in ongoing communication with Hayward on refining its use.

A network-wide emphasis on content literacy resulted in a partnership with the CK-12 Foundation to modify their online, open-source, textbooks with embedded literacy supports. The resulting Algebra College Access Reader provided a resource for Garland’s packets. LPS also gave the FlexMath prototype to CK-12
and McPeak began working directly for that foundation, resulting in a more robust version of FlexMath for Richmond's implementation. Richmond's approaches to literacy, data and the use of FlexMath are now being adopted by the other LPS schools, including Hayward, and reintegrated into FlexMath and the College Access Readers in a continued cycle of collaborative innovation.

**THE PRODUCTS IN USE AT LPS RICHMOND**

Both Thomas and Garland draw upon multiple instructional resources to teach their classes. In Academic Numeracy, Thomas relies on FlexMath as her primary curriculum. Within FlexMath, she uses all components, including the launches, presentations, practice problems, and exit tickets from the Algebra portion and the individualized numeracy backfill from the online PRIME, or numeracy, segment. Often, she customizes some of the materials to align to the particular needs of her students (e.g., adding in more review to the launch, incorporating more work space to scaffold problems, etc.). In addition, Thomas utilizes hard-copy PRIME workbooks, assigning daily homework of 3-5 pages of problems for students to solve.

In Algebra, Garland customizes lesson packets to differentiate his instruction. These daily packets are typically 10 pages in length and include a launch, notes, and practice problems. The launch reviews material from the exit ticket the prior day. The notes section is aligned to Garland’s lesson for the day, which covers the key skills, concepts and standards embedded in LPS’ Algebra scope and sequence. Students then are able to self select the problems they will focus on in the packet as Garland provides individualized support during the remainder of the class. Every packet includes a writing assignment and many also include a reading segment. Content for the packet is drawn from Flexmath, the LPS/CK-12 Algebra College Access Readers and material Garland has created. The full packets, as well as the College Access Readers revised to reflect his work, are now in use across the network.
A CULTURE OF PERVERSIVE DATA USE

LPS is building a range of OER data tools and processes. Making data pervasive, continuous, public and mission driven empowers students. Linking data and OER curriculum resources gives teachers the tools to target and personalize student support.

“I like to see how much I’ve improved on the data sheets and data wall. It also helps me by showing the areas that I am weak on.”

Danielle Nicholson, 9th Grade
**OER AND THE CHANGE PROCESS**

Instructional change processes encounter predictable challenges. To begin with, districts or Charter Management Organizations (CMOs) often face twin conundrums – how to get the consistency of top-down change and the buy-in of bottom up as well as how to balance fidelity and flexibility. By using OER and involving teachers in an ongoing collaborative revision process, LPS has been able to define and maintain a consistent curriculum focus and framework while generating considerable ownership among individual teachers. Similarly, the ability of individual teachers to modify the materials at the classroom level has resulted in a significant level of cross-school consistency while allowing teachers and sites to adapt the resources and add in teacher-created materials.

As a small CMO, Leadership Public Schools had neither the time, expertise or money to develop complete curricula from scratch. By using expert-developed materials, such as those available through CK-12 Foundation, as a base, developing a customized common spine of resources for 19 core classes has become an achievable goal.

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**OER AND TEACHER PROFESSIONALISM**

LPS is using OER and the process of collaborative innovation as a way to transform the teaching profession. Teachers are seen in a role similar to doctors in a teaching hospital – tailoring treatments to their individual patients while contributing their knowledge to the advancement of the field as a whole. In an interview with Edutopia (http://www.edutopia.org/blog/how-to-team-teach-high-school ), Mike Fauteux and Rose Zapata, math teachers from LPS Hayward, talk about what this collaboration looks like in daily practice as they develop the Geometry lessons, available through CK-12, that will form the foundation for the forthcoming FlexGeometry.
CONCLUSION
Leadership Public Schools is at the beginning of its journey to build a common spine of resources to support teachers in meeting the needs of the full range of urban high school students. Including curriculum content, assessment and access materials, as often as possible these resources are open licensed. This allows for their continued refinement, building off of the innovations and best practices throughout the network. As importantly, this use of OER supports the professionalization of teaching by making possible a culture of collaborative innovation.

“While my students definitely benefitted from the College Access Reader pilot, I benefitted as well. Working with the Biology teachers from other LPS high schools to build something for our students was energizing. Being part of the development of the College Access Readers and the partnership with CK-12 allowed me to experience a new level of professionalism. It made me proud to be a teacher.”

Danielle Alvarado, a Biology teacher from LPS San Jose, speaks to the impact of being part of a cross-site team customizing OER to LPS students.
RESOURCES

Accelerating Secondary Math Achievement: A Case Study of LPS Richmond’s Algebra and Academic Numeracy Courses by Patrick Lee, PhD. June 2011
www.leadps.org

CK-12 Online Resources
A library of customizable, free, curriculum-aligned content for K-12 education.
www.ck12.org

- FlexMath
  www.flexmath.com
- LPS Case Study on CK-12
  www.ck12.org/about/leadership-public-schools-case-study

ExitTicket
ExitTicket is an interactive, real-time, “exit ticket” style classroom question and feedback system designed to accelerate student performance and support teacher data use.
www.exitticket.org

Edutopia
A video and blog post describing the successful team teaching partnership between LPS Hayward Math Teachers Mike Fauteux and Rose Zapata.
www.edutopia.org/blog/how-to-team-teach-high-school

Examples of where you can find OER:
www.Wikipedia.org
www.OERCommons.org
www.Hippocampus.org
www.KhanAcademy.org
Physics Education in Technology
http://phet.colorado.edu
Windows to the Universe [earth science]
http://www.windows2universe.org

For more on open licenses:
http://creativecommons.org/licenses/by/3.0/
Leadership Public Schools (LPS) is a not-for-profit organization founded in 2002 to serve a diverse student body throughout the Bay Area with a network of outstanding public charter high schools. LPS currently operates four public high schools in Richmond, Oakland, Hayward, and San Jose serving over 1,500 students. As public charter schools, LPS high schools are tuition-free and open to all. Our mission is to prepare all of our graduating students to succeed in college and beyond; develop our students into effective community leaders; and partner with school districts to strengthen both ourselves and other public schools.

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