

OER: lessons from the field

As open educational resources (OER) expand in the US and elsewhere, attention should be paid to the challenges of implementing OER and solutions to those challenges. OER currently hold great promise for instructing students in K-12 (secondary) and primary school classrooms, because – unlike traditional curriculum materials – OER content can legally and freely be copied, used, adapted and reshared by anyone. Notwithstanding the benefits, OER developers have not yet worked out certain structural issues that can make it difficult for teachers and students to use OER, impeding the adoption and broader acceptance of even the best designed OER curricula. Links which disappear over time, device management, data and privacy concerns, quality, scope, sequence and alignment challenges, copyright issues and sustainability of OER curricula are all challenges that advocates of OER and curriculum designers often miss, ignore or avoid. These challenges, however, can be overcome through thoughtful planning and partnerships, as has been done in the US with the successful Louisiana Guidebooks and other OER course materials.

Keywords

Open Educational Resources (OERs); K-12; Curriculum; link rot; English Language Arts; Louisiana Department of Education; #GoOpen Initiative; College and Career Readiness Standards

Open Educational Resources (OER) currently hold great promise for instructing students in K-12 (secondary) and primary school classrooms. Unlike traditional curriculum materials, OER come with a copyright license which provides that anyone can legally and freely copy, use, adapt and reshare OER content. In concept, this allows teachers to adapt to the local or personal needs of students. OER offer the promise of richer, more personalized, more flexible curricula to engage students and improve student performance. In the US, OER has attracted significant funding and other support from the US Department of Education (US Ed),¹ as well as from foundations, individual states² and school districts. However, although there are many significant benefits to OER, developers have not yet resolved certain serious issues that can make this resource difficult for teachers and students to use, impeding the adoption and broader acceptance of even the best designed OER curricula.

In this article we will identify some successes as well as common failures among the current crop of OER, and look at what developers and educators might consider in their quest for superior materials that are easy to adopt and use in the classroom. While the article is focused on our experience in the US and uses the example of school case studies, most, if not all, of the concepts and challenges exist within OER regardless of the country in which OER is sought to be adopted and the level of content involved.

For the last three years our company, Copyright Clearance Center (CCC), has been working with states, school districts, curriculum developers, funders and thought leaders to provide support to OER initiatives. In some cases, this support has been around our traditional field of copyright licensing (one of the perceived barriers to OER adoption; more on that below). We have also tried to help meet more basic needs of teachers and students by solving common logistical issues that create more barriers to adoption.

Specifically, we have identified several challenges that have prevented the wider adoption of OER, as well as solutions for each.³ These include:

- link rot (a term for the fact that links often degrade or change over time), device management issues (when students use technology to access content) and other technical difficulties
- data security and privacy
- who decides quality



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'OER offer the promise of richer, more personalized, more flexible curricula'

- scope, sequence and alignment challenges
- copyright issues and CC-BY revisions
- sustainability of OER curricula over time.

OER – definition and promise

According to a definition by UNESCO, 'OERs are any type of educational materials that are in the public domain or introduced with an open license.'⁴ OERs range from textbooks to curricula, syllabi, lecture notes, assignments, tests, projects, audio, video and animation. While the community may debate what truly meets the requirements of 'openness', at a minimum, most would define openness as allowing a teacher or educational institution, but not necessarily a commercial provider, to obtain the materials without the payment of any license fee and freely copy, share, post and distribute the materials without additional permission. To some in the community, 'open' only applies where there is a license which includes the ability to adapt, transform and distribute the adapted educational materials subject only to attribution to the original author(s) of the content.

OER have had some enormous successes in the last decade. A 2017 report by the RAND Corporation⁵ found that EngageNY (an OER K-12 curriculum for mathematics and English Language Arts (ELA) developed by multiple leading non-profit curriculum development organizations⁶ and funded by the New York State Education Department) is among the most widely used in New York State. A remarkable 80 to 90 per cent of teachers said that districts either required or recommended its use. This may be because OER can be adapted to local needs, and because they are collaborative, meaning that teachers do not all have to invent their own material. Rather, they can share resources and build on them.

In 2016 another RAND report⁷ found that Eureka Math, a curriculum written under grant by a Washington DC-located non-profit called Great Minds for EngageNY's maths program, was the most widely used maths curriculum in the US. These startling OER adoption statistics in K-12 schools were driven, in part, by the need for districts to quickly find teaching materials that aligned to the new Common Core State Standards. The EngageNY curriculum, for instance, was created to fill this need, and, as an OER, it can also be updated, customized and revised by a district to improve student performance, to better align with local standards and to improve student interest and engagement.

OER, unlike traditional textbooks, whether digital or in print, are often thought to be 'free', so the perception is that adopting them carries little of the financial risk that comes with investing in any new, potentially untested curriculum (as well as the costs that go along with purchasing physical books and/or license fees). Consequently, OER have a lower barrier to initial adoption, are easier to abandon should student performance lag, and are adopted with the hope that districts no longer need to purchase legacy books and licenses that educators feel are not relevant to the students. Of course, certain switching costs, such as the requirement to retrain teachers, remain.

One notable OER success has occurred in the state of Louisiana, which, historically, has struggled with the performance of its public schools. With its high poverty rates, the state consistently landed near the bottom of nationwide rankings in terms of student test scores.⁸ Thanks in part to the adoption of a new, more rigorous OER-based curriculum created by educators, known as ELA Guidebooks 2.0, the state is now attracting the right kind of attention for its school performance. In addition to having high-quality curriculum materials, reduced spending on this allowed additional funding for intensive professional development and implementation support. In 2015 the state's fourth-graders showed the highest gains in reading scores of any state in the US, gains that have held steady as more than 80 per cent of Louisiana school districts have gone on to adopt the new material.⁹

'OER have a lower barrier to initial adoption'

How Louisiana got there

The Louisiana Department of Education (La DoE) began its search for well-rounded standards-based curricula by turning to publishers in the traditional vendor marketplace. But when it could not find a program to fit the specific needs of the state's students, the Department began to explore alternatives.

That is when the Department realized that it could develop its own high-quality curricula, providing teachers with the flexibility to tailor their lessons to the needs of their students, while ensuring alignment with Louisiana state standards.

The ELA Guidebooks online course material typically consists of five self-contained units, each with lesson plans, whole works and supplementary sets of texts. '[They're] made for teachers, by teachers [and] are openly licensed, which means they can be adapted, used, [and] redistributed in any context teachers want,' explains Whitney Whealdon, then-Director of Academic Content at the La DoE. 'Often, teachers run into issues where they feel like they should stick with the exact language written in the textbook, but the Guidebooks provide that open opportunity to adapt [the material] and make it appropriate for the students in their classroom.'

To provide the necessary high-quality texts to support the new lesson plans, the La DoE selected supporting materials found on the internet, including short stories, newspaper articles, web content and blog articles. This initially provided schools attempting to adopt the Guidebooks with implementation challenges in accessing the required texts and delivering those texts to the students until, working with the CCC, it developed a new model. Indeed, Louisiana's Guidebooks have been so successful that they have been adopted by districts across the country, including in Nevada and Tennessee.

'large foundations are supporting the adoption of OER curricula'

Given the great promise demonstrated by EngageNY, Louisiana Guidebooks 2.0 and Eureka Math, large foundations are supporting the adoption of OER curricula by K-12 schools as well as in higher education. In 2016 the Bill and Melinda Gates Foundation, the William + Flora Hewlett Foundation, The Helmsley Charitable Trust and The Charles and Lynn Schusterman Family Foundation awarded a US\$10 million grant to Open Up Resources¹⁰ to support OER in primary and secondary schools.¹¹ In 2016 Mark Zuckerberg's Chan Zuckerberg Initiative (CZI) granted US\$8million to Education Super Highway to improve internet connectivity in schools across the country.¹² The US federal government is also involved. In October 2018 *Inside Higher Ed* reported that the US Ed awarded US\$4.9 million for open STEM textbooks to a 12-institution consortium led by the University of California, Davis.

Understandably, and laudably, these non-profits and government agencies are trying to move the needle in terms of OER, making high-quality digital materials available to more students at a lower cost.

Yet, as Louisiana discovered, just because the money is flowing does not necessarily mean that schools are ready.

'OER may be a sign of our current digital religion, but still exist in what is primarily a print world'

The practical challenges of OER

Even OER success stories like Louisiana's may come with significant costs – in time, money and frustration – on the part of both teachers and students. Schools and districts considering the adoption of OER as core curricular material should not ignore the practical costs of implementation.

The digital divide

OER may be a sign of our current digital religion, but still exist in what is primarily a print world, with all the technological glitches that inevitably entails. A 2017 report from the Consortium for School Networking (COSN) found that only 40 per cent of schools now report a 1–1 student-to-device ratio (meaning that each student has access to their own tablet or

other device in the classroom).¹³ Projections indicate that number will continue to grow, but even if all students have devices, the Wi-Fi infrastructure in many schools lags behind the demands that applications place on this infrastructure.¹⁴ As recently as November 2018, 42 per cent of teachers reported that internal connectivity at school remained a challenge.¹⁵ Additionally, efforts to digitally arm every student have not always gone well. A case in point is in 2013, when the Los Angeles Unified School District (LAUSD) purchased tens of thousands of iPads for its students and teachers, plus networking gear and educational software from Pearson, at a cost of US\$1.3 billion.¹⁶ The program, rolled out too quickly and with insufficient planning, was, by all accounts, a disaster. Problems ranged from patchy internet connectivity to an incomplete online curriculum to insufficient tech training for students and teachers. In October 2015 Pearson paid LAUSD a US\$6.4 million settlement.¹⁷

'digital access is not distributed evenly among socio-economic groups'

Another problem with the LAUSD experiment is that students were able to bypass the security features on their iPads and freely surf the web – a potential problem with any tablet in the classroom¹⁸ – not to mention after school, while children are doing homework. A 2015 survey by Common Sense Media of 8- to 18-year-old students in the US found that 50 per cent use social media while doing homework.¹⁹ Indeed, a recent article in *The New York Times* reports a backlash from parents against screens in the classroom, particularly in wealthier school districts.²⁰ Devices that students use for connecting with friends and playing video games need to magically become 'learning devices only', with educators required to enforce the rules.

Finally, digital access is not distributed evenly among socio-economic groups. Without question, wealthier school districts are more able to provide digital equipment and infrastructure. Meanwhile, even if schools have strong infrastructure in economically disadvantaged areas, students may not have adequate access at home to locate and complete assignments.²¹

Digital services, data security and student privacy

As with all new technologies, the power to use for good purposes has to be measured against the power of that technology to create problems. The adoption of digital tools and resources in the classroom is no exception. Among the benefits from the collection of data on students is that data can assist teachers in identifying areas of challenge for students and allows for the personalization of content and delivery, in turn leading to more efficient use of teacher time and a better, more engaging learning experience for students. Software with access to personal student data can create maps based on students' backgrounds to anticipate common challenges students with similar backgrounds face and thus allows teachers, districts and schools to intervene early before a student begins to struggle. On the flip side, who is holding this student data, and can we be assured that this data will be held securely and not used in ways detrimental to a student's achievement in school and in life? And as these tools become embedded in the curriculum, must parents and students accept the collection of data in order to participate in their public school curriculum?

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One potential problem is that many educational technology (EdTech) companies are small start-ups, not prone to investing large sums in secure environments. The threat of mass hacking of student data either as a criminal activity or even as a school prank can create embarrassing and potentially permanent issues for students. On the side of privacy, these small businesses also must resist the temptation to turn student data into a revenue-generating activity. Finally, when start-ups fail, who becomes the owner of the collected student data and how can parents and educators ensure that information collected about a student's performance will never become commercially available or even simply visible and permanent on the internet?

Beyond the simple question of data security, some applications used in schools explicitly require consent from parents to allow the sharing of their student's personal data. For example, The Summit is a personalized learning tool that was developed from the CZI and supported through the engineering work of Facebook.²² If a public school system adopts a

5 tool like The Summit, is it fair for parents to face a choice between allowing the sharing of their child's personal information and not permitting their child to participate fully in the school's curriculum?²³

As questions about the legal and practical ramifications of the mass collection of personal data become more relevant, schools may find that justifying the use of EdTech resources in the face of the risks of the misuse of a child's data become much harder.²⁴ And if this is true in the US, with its relatively lax data and privacy standards, it will be a larger impediment in the EU and in other stricter jurisdictions.

One person's trash ...

Now, let's go back to the UNESCO definition of OER: *'OERs are any type of educational materials that are in the public domain or introduced with an open license. The nature of these open materials means that anyone can legally and freely copy, use, adapt and re-share them'* and break that down. For material to be considered OER ready, it need only be designed for an educational purpose and freely available under an open license. But, while these requirements are clearly important to any entity funding the development of an OER curriculum, they do not take into account the needs of the teachers and students who will be using the material.

For one thing, it is often left to the user (i.e. the teacher) to determine the value of the OER material, as well as how to best put it to use in the classroom. While that autonomy can be a good thing, placing the onus of validating a particular OER lesson or unit on already overworked teachers can also create a significant burden. A 2017 report from K-12 Market Advisors found that teachers spend an average of 12 hours a week searching for or creating their own instructional resources.²⁵ Everyone knows that there is both valuable content and junk on the web, and that the challenge of monitoring the quality of educational resources available on the internet is not limited to OER materials; in fact, the quality problem also applies to resources that are not explicitly OER. Nevertheless, for advocates of OER – many of which are explicitly designed to 'live wild' on the internet – this question of quality control is most central. The proliferation of content makes validation by known entities critical, especially when a teacher seeking materials is trying to comply with educational standards.

'while OER is supposedly free for all, in the real world it comes with significant costs to implement'

To ameliorate this problem, states and districts have applied significant resources to help identify 'quality' OER materials. US Ed, for one, has launched what is known as the #GoOpen Initiative.²⁶ For a state to be known as a #GoOpen state and receive federal funding and support, it must maintain certain commitments to quality. This push for quality does not come cheap, however, and that brings us to an important point: while OER is supposedly free for all, in the real world it comes with significant costs to implement.

Links to nowhere

As already mentioned, OER often links to large amounts of material on the web, including videos, photos, podcasts, lesson plans and the like. Unfortunately, when a student or teacher tries to open these materials, they often discover that they are no longer available via that link. This could be because the material has been withdrawn, a website has been shut down, or the material has been removed for copyright infringement (sadly, often the case). Whatever the cause, the symptom is known as 'link rot'.

This past summer, a CCC researcher reviewed a social studies curriculum from a wealthy Missouri school district. The curriculum was new and had not yet been released. The district's goal was for its teachers to adopt the curriculum, and to make it freely available to poorer districts in the area, most likely in a printed format.

Our researcher found that 16 per cent of the links had a problem, some leading to dead links, others to links that had been taken down because the linked-to sites were infringing copyright. (The latter might actually lead to a great civics lesson if they did not leave school districts with legal liability).

Dead and illegal links aside, other practical problems abound when teachers and students attempt to use the typical OER offerings. Even when links do work, they may lead to articles choked with distracting pop-up ads and ads that might entice fourth-graders to click on inappropriate content or compromise their privacy.

When a broken link is supposed to lead to a core concept in a lesson, teachers may be forced to skip over that lesson, undermining its entire pedagogy. 'In a traditional setting, a teacher would have a textbook with all of the texts in one place', says Whitney Whealdon. Teachers who are working with openly licensed materials like Louisiana's ELA Guidebooks, however, 'don't necessarily have the texts in one place'.

'practical problems abound when teachers and students attempt to use the typical OER offerings'

Out of sequence

When OER lessons – or other resources, whether explicitly OER or not – are scattered throughout the internet, teachers are lacking two things that are crucial to effective teaching: firstly, *scope*, which describes the range of topics and standards of material taught at a specific grade level and, secondly, *sequence*, i.e. the order in which the material should be taught for the best results. A teacher may recognize a good lesson, may teach lessons well, but to organize those lessons into a coherent curriculum is far more difficult and a highly specialized skill. One useful analogy might be: just because someone is a great driver does not mean she would relish the task of putting a car together from a bunch of individual parts.

Like that driver with a box of random parts, common sense holds that a random series of out-of-sequence lessons, no matter how thoughtful, does not a quality curriculum make. (You cannot teach multiplication before addition, after all.) Selecting, sequencing and aligning OER lessons into a coherent curriculum, and then revising and adapting that curriculum over time based on real-world experience in the classroom (and making sure there are no broken links), is no trivial task. It takes time and money, as does making sure a curriculum is aligned with state standards. OER in successful implementations have a team of folks dedicated to preventing some of these problems from happening. This costs money, yes, but supports quality control and other needs.

There is, however, great potential for software solutions to assist teachers and curriculum developers to scope, sequence and align OER lessons to standards. The US Ed's #GoOpen Initiative requires the creation of a 'repository' for OER, but it does not require the repository to contain a 'curation' layer to assist teachers and districts in ensuring their selections are fully aligned with the scope and sequence of state standards.²⁷ As teachers utilize materials, machine learning and artificial intelligence can begin to help with evaluating the quality and appropriateness of the OER in the context of their use.

'OER in successful implementations have a team of folks dedicated to preventing ... problems'

Improper scope and sequence will leave gaps in a student's knowledge that cannot be easily recovered. This loss of fidelity to outcomes and standards can render the materials undesirable.

Copy that

Then there is the issue of getting OER content into students' hands. In some wealthier districts in the US, all students are required to have a digital device for their school work. These are known as 1-1 districts. In lower-income districts where students do not necessarily have access to their own personal tablets or computers, photocopying is required. More often than not, it is the teacher who has to click on each link (hoping that link functions) then print out, collate and staple the readings and editorials, magazine articles and blog posts for each student in the classroom. This is repeated for every classroom in the school and for every school in the district adopting the OER curriculum. Again in our informal research, CCC found that one OER social studies curriculum was an impressive 1,071 pages long, and would necessitate some 40,000 copies every year for each class. Beyond the costs of paper and toner, just think of the hours of time at the copy machine and

7 the frustration caused by paper jams and broken machines, particularly when many teachers may already feel overwhelmed with new OER curricula. As Lesley Vines, an ELA teacher in Louisiana, told *Education Week*: 'I was a little intimidated [by Guidebooks] at first ... It's such a variety of texts. Nonfiction and fiction ... are incorporated into every section'.²⁸

For many districts as well as for individual teachers, the physical support required to reproduce thousands of pages of text can make 'free' OER far more difficult to implement in a classroom than a curriculum that is purchased from a traditional textbook publisher. This challenge has led to a new kind of publisher in this space – a vendor that provides physical copies of open source materials in bound teacher- or student-facing books, contributing to the overall cost.

Copyright costs and infringement

In the last decade OER-based maths curricula like Eureka Math/EngageNY have been particularly successful and quick to be adopted. One reason is that, unlike English Language Arts (and, to a lesser extent, science and social studies), maths typically does not require the use of third-party materials still under copyright, such as articles, essays, poems and blogs. Therefore, the ability to issue a maths curriculum under an open license is straightforward and the delivery of the content is unhindered in either print or digital form. Apart from maths, in disciplines such as social studies, history and language arts, the use of authentic third party is required. This is driven in the US in part by the adoption of new college and career-readiness standards, such as Common Core.²⁹

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For OER, which require an open license, this need for authentic, high-quality content creates two significant challenges.

The first challenge is that, by definition, open licensing precludes the use of third-party materials that have not been initially published under an open license or that are not in the public domain. Yet the English Language Arts standards require that students engage with so-called 'authentic', complex content that provides context to whatever primary work is being studied. A student reading *The Great Gatsby*, for instance, might read accounts of class conflict in the Hamptons and historical articles about the 1920s and 1930s, and listen to downloads of jazz music. All of this additional material is protected by copyright. While a Schools' License from the Copyright Licensing Agency (CLA) would cover classroom use (although not open web posting) of these materials in the UK, there is not presently such a collective license in the US. Rather, content can be purchased or licensed from the copyright holder or an agent such as the CCC, or it can be used under the legal defense of 'fair use'. Anything else is considered infringement. (Technically, even fair use is an infringement, though excused, but that is outside the scope of this article.) While fair use is a tricky concept, it is safe to say that when a district adopts a curriculum for thousands of students at scale, that material is far less likely to be considered fair use than when a teacher copies something for her own classroom on the spur of the moment.

'egregious examples of OER linking to obviously infringing content'

To avoid the question of copyright, many OER providers believe the solution is to provide links to content on the internet. Beyond the issue of 'links to nowhere' discussed above, at CCC we have seen egregious examples of OER linking to obviously infringing content, including entire recently published books on peer-to-peer sites and bootleg audio recordings. For anyone offering OER, this gives rise to liability as a contributory infringer, and anyone using the materials would be a direct infringer.

The second significant challenge is that even copying that may be protected by fair use (in the US and the small handful of other countries that recognize this concept), if done by a school might not be protected by fair use if the copying is done by a third party. In the landmark 1991 copyright infringement case *Basic Books, Inc v. Kinko's Graphics*

Corporation, the copyshop paid US\$2 million in damages to publishers for copying and assembling course packs without seeking permission for the copyrighted material, even though the typical end user – the university student – might have a claim to fair use protection.³⁰

While fair use is a US concept, other nations allow educational reuse through exceptions such as ‘fair dealing’, statutory licenses and other regimes. These exceptions vary, though they generally do not extend to third-party copy providers, and do not extend to posting on the open internet.³¹ Accordingly, schools may have difficulty, even if they are protected by fair use, fair dealing, or another exception, locating a copying provider willing to overlook the copyright infringement risk. This remains true even for OER that link to lawful online content.

‘many OER providers simply push the question and risks of copyright and permission ... downstream’

Unfortunately, many OER providers simply push the question and risks of copyright and permission for third-party materials required in their lessons downstream to the districts and teachers rather than find a solution beforehand, leaving districts to decide for themselves their tolerance of infringement risk for linking to or copying materials.

Open licensing and the CC BY

While it may have its advantages, open licensing – especially the CC BY license, which allows redistribution and reuse of a licensed work as long as the creator is properly credited – has also created confusion and challenges that directly affect the quality and usability of OER. Specifically, under the Creative Commons (CC) CC BY license, anyone can take content covered by the license and print it and sell it, as long as the creator is attributed. The very nature of OER that use links and digital-only materials and that are issued under an open license creates difficult and unavoidable challenges for developers and the end users.

‘under the terms of the CC BY license the creator cannot charge money for the work, but anyone else can’

Ironically, under the terms of the CC BY license the creator cannot charge money for the work, but anyone else can, leading to frustration for some OER creators.³²

Moreover, under a CC BY license, all kinds of adaptations and modifications, and even incorrect changes, can be made to an author’s work, including distorting the pedagogy, while the attribution requirement (the ‘BY’ in CC BY) remains — thus linking the original author’s name to the corrupted materials. Without adequate license protection from bad actors, the creator (who may have received no money for their work) in turn may find their name attached to unapproved, corrupted versions of their work and face having those unapproved, corrupted versions sold to schools at a profit by third parties.

Lastly, it is difficult for an OER issued under a CC BY license to contain copyrighted third-party materials, especially when those materials are canonical literature published by a traditional publisher. Some commentators, when discussing the use of an open license, make the point that ‘in licensing out material under a CC license, for instance an academic article, electronic thesis or course material, people need to be careful not to include third-party-owned copyright[-protected] items they have no authority to license’³³ Effectively, OER developers can either choose to be ‘open’ and have an extremely limited set of third-party materials available, or choose to use contemporary text, images and other copyright-protected intellectual property. In subjects requiring outside reading (i.e. all subjects other than maths) and without the third-party materials on hand, all the issues raised in previous sections come into play.

‘the creator ... may find their name attached to unapproved, corrupted versions of their work’

The question of sustainability

The efficacy of CC BY licensing for OER also raises the question of the long-term sustainability of any OER curriculum.

Often, OER are seen as 'teacher-created materials' which the teacher then shares. It is fair to say that teachers have been sharing resources since the beginning of time. The internet, however, changed the scope of possible sharing among teachers – creating great possibilities for 'crowdsourcing' the best materials and having them circulate for free. This increase in the scale of distribution, however, creates two major changes. First, the teacher is no longer simply sharing; the teacher is publishing. As a publisher, a teacher now will have additional responsibilities under copyright law in so far as their lessons require third-party materials and a teacher may have incentive to no longer simply donate their intellectual property if there is opportunity to monetize their work.³⁴ Second, as OER change from supplemental learning resources to foundational learning resources, significant investment is required to ensure that students are receiving a fully scoped and sequenced curriculum. OER now face problems that textbook publishers face daily.

'the teacher is no longer simply sharing; the teacher is publishing'

Traditionally, textbook publishers have recouped their investment in content, scope, alignment and sequencing through the sale of books and software to schools and districts. Under CC BY licensing, however, the original distribution and reuse of OER curricula is free, making it unlikely that those publishers will recoup their investment through sales, especially as third parties may come along and sell copies in more convenient (or simply less expensive) forms and not pay the costs of creating the content. Instead, OER developers generally turn to philanthropic or government funding to build the initial curriculum and then rely on further funding to sustain the quality of that curriculum, adapting, improving or just maintaining it over time.

Remember Eureka Math and EngageNY, mentioned above as a great OER success story? It was issued under a CC-BY-NC license by its creator Great Minds. Great Minds subsequently went to court in two separate cases in order to prevent the large-scale copying of its curriculum by third-party service providers – and so far has lost.³⁵ This raises significant questions about the sustainability of a business model which sought to distinguish between commercial and non-commercial copying.

'OER now face problems that textbook publishers face daily'

Educational publishing is risky, even for established commercial publishers who need spend significant revenues in editorial development, sales, marketing and revisions in the hope that schools will buy their books. However, the sales models they use, while subject to criticism, are at least well established and understood. OER publishers, on the other hand, are often dependent on grant funding from governments and foundations, and, at least in the US, foundations are increasingly looking to limit investment to seed funding and start-up capital. Philanthropic organizations and governments also have their own objectives – objectives that may or may not conform to the best pedagogical practices. Government funding is unreliable when it comes to ensuring OER sustainability. Administrations come and go at the local, state and federal levels, with their interest in and support of OER waxing and waning over time.

Schools or districts adopting an OER curriculum must likewise take on that risk, knowing that continued updates and support for that curriculum are not guaranteed.

'OER developers have flipped the model (content for free/professional development for a fee)'

Granted, some OER publishers have created alternative models to generate revenue for ongoing content development. These models usually include some mix of professional development for teachers (for a fee) and mark-ups on the sale of anchor texts (an expense schools continue to bear with ELA OER curriculum). Ironically, traditional textbook publishers sell districts the textbook, then offer services like professional development for free, and OER developers have flipped the model (content for free/professional development for a fee). Incidentally, because of CC-BY, developers of OER cannot prohibit an organization from creating professional development around their content and selling that into the marketplace, meaning OER creators are in competition with any other organization that wants to offer professional development for content created by that OER creator.³⁶ This differentiates OER from traditional publishing, where copyright limits the amount that others can use the original publisher's content.

10 What this means for schools and teachers is that many OER will become use-at-your-own risk with – potentially – no original creator available to support the implementation of the curriculum if the actual creator lacks a business model to allow it to remain a going concern.³⁷ The schools and districts may need to have the time, money and staffing available to provide teacher support for the curriculum on an ongoing basis, to keep it up to date and, when adapting the curriculum, keeping it appropriately scoped and sequenced.

How schools can do OER right

Clearly, it is not enough to create excellent OER pedagogical materials. Despite the best of intentions, there are countless lesson plans and curricula available online that never get used in the classroom because of the aforementioned practical concerns and glitches. How can OER developers ensure not only the creation of high-quality curriculum materials, but also make the adoption and implementation of those materials in the classroom as seamless as possible?

OER developers must consider the often overlooked challenges of implementing OER in terms of basic problems such as copying and collation. They should cease using links which are not persistent, address copyright infringement issues and eliminate the need for teachers to search for missing material all over the internet. This means providing teachers with the materials in a format that any student, even ones without digital devices, is able to immediately consume. As the authors of a 2017 Aspen Institute report on education entitled *Practice Makes Perfect* put it, ensuring teachers have 'high-quality, rigorous materials is an effective and affordable tool for improving student learning outcomes at scale'. That is, as long as the tools are easy to use. As one La DoE official describes it: 'Make the best stuff the easiest stuff for teachers to use, and they will come ...'

At CCC, we have seen these concerns close up. In 2016 the La DoE came to us with its newly developed OER Guidebooks curriculum, which was more rigorous, more varied and more closely aligned to Common Core requirements than in previous years. Whitney Whealdon told us: 'It allow[ed] for a real diversity of formats in the classroom, [it] opened up the opportunity to bring in more newspapers, online articles and blog posts that students can respond and react to in the classroom.'

We agreed, and worked with the La DoE to ameliorate the challenges that were making adoption of the Louisiana Guidebooks difficult for local school districts. The La DoE needed its free curricula to be unintimidating and logistically easy for teachers to adopt and use in the classroom.

To make Louisiana's ELA Guidebooks the 'easiest stuff', the La DoE hired course materials producer XanEdu. The end result was professionally printed course packs with all the articles, course readings and blog posts located in one place, properly sequenced without unknown changes, and delivered in time. XanEdu also cleared all necessary copyrights and offered 100 per cent indemnification from any claims. This type of solution, which places students first by allowing educators to focus on teaching rather than the logistics of printing, sequencing and copying a curriculum and which removes copyright infringement risk, works well.

A printed course pack may seem like an 'old' technology, but it is also an adaptable one. Students and teachers are familiar with print and face few barriers to interacting with it. With digital technology, on the other hand, schools face ongoing pressure not only to maintain current equipment, but to keep that equipment up to date and compatible with newer software. While students and families can provide their own devices, that solution raises significant compatibility and training issues. (Students will have devices of different generations using different operating systems.) The inevitable technological problems and delays that occur will subtract from teaching time, never mind raise issues related to economic inequality.

'A printed course pack may seem like an "old" technology'

The bring-your-own device solution is another example – along with link rot and other issues mentioned above – where OER leads to downstream challenges for schools, teachers and/or students. As a result, districts often waste resources on new technologies that are

not adopted and digital technologies are almost never used. Recently, researchers from the University of Pennsylvania reported that teachers and students were using only 6 per cent of district-purchased digital tools, raising questions about the value and return on investment that districts are making in software.³⁸ In contrast, Whealdon tells CCC, 'A majority of our districts in Louisiana are using [ELA Guidebooks] in some form, [and] we've heard of implementations [of the ELA Guidebooks] in Tennessee, New York, Minnesota, Ohio, North Carolina and some other states.'

Other successful OER, such as Expeditionary Learning's (EL) K-5 curriculum, have chosen to use whole works rather than portions of works. The districts simply need to purchase the required set of books – even when only portions of the books were required – to access the curriculum's texts. EL also provided print-ready files and teacher training and support to enable easier adoption. This approach is more challenging in middle and high school, where a greater breadth of reading of work portions is the recommended approach. For middle school, then, the solution adopted in Louisiana has been a successful demonstration of how a new type of publisher/vendor such as XanEdu can support the large-scale implementation of OER in classrooms. In fact, even though, as mentioned earlier, OER in maths have seen great success with Eureka Math and Illustrative Math being adopted widely, these OER too face delivery challenges at scale in the classroom and may require outside service providers to ensure timely, organized and coherent delivery of the curriculum to the student.

The advantage of print and interactive PDFs

From an implementation standpoint, a print-ready OER curriculum offers the easiest way to deliver OER material into the classroom. For 1–1 districts, the use of digital course materials in the form of PDFs which capture the online materials is a solution to dead links (for text), poor connectivity, advertising overload and student (or teacher) difficulties engaging with the technology.

There are unforeseen advantages, especially to print. When CCC first piloted the Louisiana unit readers with seventh-grade teachers, we provided them with print copies that included some blank pages. This was done simply because it was easier to leave some pages blank when creating the prototypes, but it turned out that the teachers loved the blank pages, as they allowed space for students to take active reading notes on the text without being squeezed into narrow margins.

'a print-ready OER curriculum offers the easiest way to deliver OER material'

In a 1–1 district, an OER designed for print can always be offered digitally, and can be built as interactive PDFs with embedded links to allow access to media such as videos or interactive simulations (although the challenge of dead links remains). The course pack model also works well for non 1–1 school districts that want to adopt a successful OER curriculum, but that lack the budget to pay for iPads, tablets or PCs for every student. Success is seen in adoption, such as that experienced in Louisiana.

OER works – with the right support

The notion of OER often tends toward the utopian, the idea being that if you throw everything online and make it free, the result will be happier teachers and better-educated students. But in the real world, even the best products will not sell or be used if they do not have a support team to work out the kinks and make everything easily usable. In the case of OER, that usability can come in the form of a printed course pack or, for 1–1 schools, a digitally delivered PDF, fully sequenced for the teacher.

'The notion of OER often tends toward the utopian'

As more top-notch OER curricula take hold, education leaders will be confronting a new array of practical problems, including how these lessons will be maintained, updated and made sustainable in classrooms from year to year in the absence of a traditional publisher, a single guarantor of quality, or an understood business/funding model. For now, all signs are that the Louisiana model is working: A 2018 RAND study found that Louisiana ELA students were more apt to engage in practices aligned with the Common Core standards.³⁹

Julia Kaufman, a RAND policy researcher, told *Education Next*: 'We saw consistently higher results in Louisiana. We just thought there was a story there'.⁴⁰

As Louisiana teacher Lesley Vines told *Education Week*, she, for one, is all in, despite her initial feelings of intimidation. 'I think we're on the right track', she said. 'The growth in my students ... was just tremendous.'⁴¹

Abbreviations and Acronyms

A list of the abbreviations and acronyms used in this and other *Insights* articles can be accessed here – click on the URL below and then select the 'full list of industry A&As' link: <http://www.uksg.org/publications#aa>

Competing interests

The authors have based this article on learnings and observations acquired by supporting OER, including Louisiana Guidebooks, at the Copyright Clearance Center.

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