Harnessing OER to Drive Systemic Educational Change in Secondary Schooling

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Introduction

There is growing interest about the concept of Open Educational Resources (OER) and how it can transform education around the world, with governments exploring the potential of OER and considering policy positions supportive of open licensing. However, at the school level, they may not be leveraging the full transformative potential of OER as the majority of OER initiatives have focused on creating openly licensed materials that tend to support traditional educational models – most notably, through the development of open textbooks. While open textbooks may help to reduce costs, they are still largely based on an assumption that the underlying curriculum, classroom-based organizational models, and roles and responsibilities defined for teachers are what will best prepare young people for their subsequent entry into society and further education. The innovation of OER thus tends to reproduce content-heavy, top-down models of education that were developed hundreds of years ago to meet the needs of societies in the aftermath of the Industrial Revolution, and teacher-centric models in which the student is still primarily a passive 'consumer' of prescribed educational content whose main task is to complete standardized assessments in order to receive accreditation.

Simultaneously, though, the pace of technological change is generating advances in human resources, production processes, and the nature of products and services. Consequently, different skills are increasingly needed in the workplace, many of which are not central to the design of the traditional school system. The urgent imperative – and the real transformational potential of OER –-is thus to evolve new systems of education that can help our societies, and especially our youth, to navigate their way through a world in which the disruption wrought by information and communication technologies (ICT) requires a completely new approach to knowledge, skills, and competence. Ubiquitous access to open content offers an opportunity to re-think the basis on which we organize the educational experiences of school students and to liberate the time of teachers so they can focus on providing meaningful support to students rather than continuing to act predominantly as conduits of information from the textbook to the students. This provides an opportunity to overhaul resource use and the nature of teacher-student interaction so that students can develop key attributes required for success in the knowledge society.

This paper thus seeks to engage with the challenge of determining the conditions under which use of OER can drive a transformative educational agenda in schooling systems. It considers two key emerging questions:

1. What role can OER most effectively play in supporting school-level pedagogical transformation?

2. Given the inherent conservatism in public schooling systems, what policy approaches may most successfully initiate such transformation?

In exploring answers to these questions, we initiated two action research exercises: one at the school level at a private school in Johannesburg, South Africa; and the other at a national level in Antigua and Barbuda.

Developing a Model of Transformation at the School Level: The Case of St Peter's College

St Peter's College is a co-educational private secondary school located in Johannesburg, South Africa. The college is engaged in a long-term planning exercise to consider alternative educational models that will enable it to manage education challenges proactively to the benefit of students. In consultation with key stakeholders at the school, several principles were identified as important in developing a new educational model for the school. These included, for example: changes should lead to reductions in operational costs over time; changes made to the educational model of the college should improve the overall performance of students in their final Grade 12 examinations; the model should allow for individualized progress; and the focus should be on fostering the key attributes amongst students, such as a strong moral and ethical framework; independent thinking; self-motivation, ambition, and drive; internal responsibility for deadlines and punctuality; initiative; and a practical outlook.

Exploration of an approach to implementing this alternative model recognized it would not be feasible to expect schools to move away from current school organizational models unless parents (and teachers) were confident that students would perform at least as well in the final examinations under a new innovative model as they would under the old model of education. Thus, a phased approach is being adopted in implementing the new education model.

Pilot Study

A small pilot study was conducted to explore how best to adopt new teaching and learning methodologies to encourage greater student engagement and responsibility, and to gauge student and staff reactions to a change in teaching and learning methodologies. The pilot ran over four weeks during September and October, 2013. It placed heavy emphasis on harnessing OER to enable student-led content creation, with a long-term view of demonstrating that students can use OER to create self-paced learning environments that significantly accelerate their journey through the formal curriculum.

The pilot design was influenced by the vision of creating a student-centric learning environment, and the plan noted that students should help to develop and work through structured pathways of learning – with associated multimedia content for each subject - developed in an institutional Virtual Learning Environment (VLE). The pilot exposed students and staff to a VLE called Canvas and a repository of OER that supported the formal curriculum. An Internet search for appropriate OER was conducted to find quality resources for the pilot activities.

The pilot was conducted with 22 Grade 10 students from an Engineering Graphic Design class, and 11

students from the top-performing Grade 10 mathematics class. Students were required to work with one or two 'study buddies' to foster joint accountability for achieving learning objectives. These sets of 'buddies' were allocated a section of the curriculum to develop and provided a set of OER to use as building blocks for the relevant sections they were to compile. Students were tasked with adapting and reorganizing curriculum resources so that they taught formal concepts, content, and skills in ways that were relevant for their peer's age group and interests. They were provided basic training on how to organize their content and activities into Canvas. They were required to populate the empty VLE with OER, either from the repository or others they had found online and assessed as beneficial. They were also required to create learning activities that meaningfully covered the curriculum objectives. They then had a two-week period to craft and finalize their 'lessons' as an extra curricula activity.

Essentially, students had the task of developing an online learning environment authored by themselves for themselves. The logic of this is that, if such an approach – with quality reviewed by participating teachers rather than the environment being built by them – this would demonstrate effective use of OER to create a student-centric environment where students are responsible for their learning and for devising processes to achieve it. There is good educational evidence that this kind of hands-on approach can create more effective learning for students, but it also creates the potential to set up the kind of flexible learning environment anticipated by St Peter's College, as it breaks dependence on the teacher or textbook as the primary content source. Importantly, students would also be learning a number of key information literacy skills – working in online environments, searching for resources, reviewing and making content choices, and so on – while working their way through the formal curriculum. The educator's role was to facilitate the creation of this learning environment, offer guidance and mediate problems and conflicts, and to refrain from traditional teaching. In the final week of the pilot there was an opportunity to try out each other's 'lessons'.

Despite the small sample and competing priorities from the school's regular programme that limited student engagement, the pilot revealed some interesting findings. Students' responses reflected positively on the access to varied resources and media available both within the OER repository and on the Internet at large. Importantly, the pilot raised awareness among students to question the use of a single authoritative text that is traditionally associated with a particular course of school subject. Students' comments referenced their sense of engagement, control and accountability in designing and/or adapting resources to teach their peers. Students commented on the platform's ability to let them be creative, and demonstrated this through their selection of images and videos that supported the curriculum. However, they raised a concern about the lack of authority linked to their peers' lessons. They feared being taught 'wrong' information or acquiring incorrect skills. This raises the issue of empowering students to evaluate and assess the quality of online information, which is an increasingly important skill in an information society.

Students found it easy to work in the VLE. However, they used the school's computer laboratory for their work, which meant that they were constrained by specific times when they could work on the VLE. Nevertheless, all groups found enough time to create their lessons but they encountered restricted access – to the computer laboratories in general, and to sites blocked by the school filtering systems.

An evaluation of the student VLE 'lessons' revealed that all the courses were didactic in nature and characterized by large amounts of exposition, with little opportunity for a user to practise or test

themselves against the curriculum outcomes. It is possible that students emulated traditional methodologies because this is what they were familiar with. Thus, implementation of this kind of approach may require some 'un-learning' by students, but this is also likely to change naturally over time as they grow in confidence and experience with practice. Many of the courses were, however, pitched at peers with graphics and examples relevant for their age group.

Students raised reservations about whether this education model would prepare them adequately to write existing standardized examinations (which would require a longer-term investigation in order to be fully tested). The implication of this concern is that resistance to a change in the College's education model may come from successful students, who might feel that their chances of 'success' will be jeopardized. This is especially true in a school like St Peters College, which performs favourably in exit examinations.

Towards Change

While not revolutionary per se, the elements that made up the pilot were important stepping stones to achieving more significant future changes, as mapped out by the College. Important areas that were investigated under this pilot included new roles for students and staff. The educators involved also began to experience their new roles as facilitators: fostering coherence and discipline in thinking, especially when preparing curriculum materials for others, coping with the challenges of unlimited choice and encouraging learners to become creators in the educational environment. The pilot also ushered in the first use of OER and a VLE by the College and exposure to it will be useful in setting up new initiatives amongst the broader school body in the future.

This case study illustrates an example of how use of this OER VLE prototype allows students the opportunity to learn the curriculum, and facilitates the idea of increasing self-study over time, thereby increasing the scope for introducing greater flexibility into the timetable. In this context, OER was used in a different way, as students were responsible for assembling the content, thereby challenging the notion of the teacher and textbook as the authoritative sources of knowledge. Students were actively involved in deciding on the different content options and refining their work, thereby developing the key skills required in today's world, including information literacy skills.

If such a change in direction is possible at the individual school level, the next issue is to consider how to facilitate an entire system to change, which was also explored.

Developing a Model of Transformation Across a System

For change to be effective, it needs to be driven at the systemic level – ideally by government-level policy changes, as these ultimately direct the operations of most public schooling systems. However, such change is difficult as it requires consensus from a wide range of stakeholders, most of whom are inherently conservative in protecting traditional educational models. Likewise, the short-term nature of political appointments inhibits risk-taking in these public systems. Consequently, such change needs to be incremental in nature, so as to create as little disruption as possible and to create buy-in from all stakeholders. Furthermore, this allows for planning the use of technology as a regular occurrence, and not just a once-off, allowing currency with global trends, and to learn from and respond to previous changes.

In order to test this approach, an action research exercise was conducted. This action research focused on primarily on the secondary school system of Antigua and Barbuda, in order to research and understand the kinds of policy changes that are needed to effect meaningful systemic change in education, so that OER can fulfil its full potential.

Context

Antigua and Barbuda, located in the Eastern Caribbean, was chosen as the location for action research as the senior secondary system in that country is very small (just over 25 schools), thus allowing for a better possibility to demonstrate systemic change. Additionally, the government expressed strong commitment to implementing significant systemic transformation in schooling, in recognition of the reality that the current schooling system is not adequately preparing students for their future, and is especially not yet contributing to the development of new economic sectors. This created the material conditions to be able to re-think the organization and management of schools and the school day.

Ensuring the Necessary Infrastructure

As a first step in actualizing its commitment to integration of ICT in education, the government committed to provide the necessary infrastructure to support change, including Community Computer Access Centres, Mobile IT Classrooms, a one-laptop-per-teacher initiative, free Internet access, and the provision of Samsung Galaxy tablets with free access to mobile 4G LTE connections to every senior secondary student in the country. This clearly demonstrates the government's budgetary commitment to infrastructure, which is a first key requirement for systemic change to be possible. However, a new policy environment to leverage the effectiveness of the infrastructure investment was required.

Shaping the Policy Environment

A new policy on ICT in Education, approved in June 2013, contains a highly ambitious agenda for educational transformation, and encapsulates a strong commitment to OER and open licensing. The policy highlights the shifting role of educators, from teaching content to facilitating learning and allowing for self-paced learning. It also articulates how this approach can mitigate drop-out rates and facilitate self-employment.

A forward-looking policy of this kind is an important first step in leading systemic change but it is not a sufficient condition. Consequently, the next step in the process was to develop a comprehensive new ICT Master Plan to guide future procurement and deployment of ICT in schools. The activities identified within the Master Plan, developed in October 2013, also encouraged interpreting the policy in ways that promoted educational transformation. A few examples include a requirement that OER be exploited, that government release its education materials with an open licence to encourage sharing, and that senior secondary students had access to their own digital devices.

Engagement with Schools

The new ICT in Education policy highlights the importance of ensuring that school leaders play a

critical role in defining future plans for the use of ICT in classrooms. As part of ensuring that the schools' needs and requirements are central to all future planning, a School ICT Integration Plan was circulated to schools to assess what technology schools already have and whether it is working; plans schools have for using ICT; schools' priorities regarding buying new equipment; competency levels of staff and their professional development needs, and how schools maintain their ICT. In important ways, therefore, the ICT in Education Policy and Master Plan are modelling a school-centred approach to policy implementation, in ways that would hopefully mirror the underlying ethos of the learner-centred approach touted for schools themselves.

OER VLE Prototype for Antigua and Barbuda

Within this policy environment, the OER VLE Prototype discussed in the St Peter's College example was developed further for use across the secondary school system in Antigua and Barbuda. An OER repository was added to the Canvas VLE and populated with over 500 mathematics OER by a specialist mathematics educator, who organized and sequenced the resources within the VLE component of the prototype so they responded to particular specific objectives as stated in the Caribbean Secondary Education Curriculum (CSEC) Mathematics syllabus. An online mathematics 'textbook' was thereby compiled from available, quality, free OER. While the prototype could be used like a traditional static textbook, the OER VLE prototype's real power lies in providing students and educators the tools to manipulate and customize its resources. The prototype also offered automatically marked quizzes and tests, which could be adapted to suit local needs. Existing open source education tools were used to provide the OER textbook prototype's functionality. Two systems were interlinked, a VLE and a content repository.

Learner Management System (Canvas)

The Open Source Canvas VLE was deployed, primarily because its interface allowed for seamless transition and easy navigation between resources of different formats. Canvas also has good assessment functionality, allowing for the construction and easy adaptation of tests. Additionally, it allows public access so that users can bypass the login and password screens to allow ease of access to the 'textbook'. However, when a class or group wish to manipulate the 'textbook', then Canvas offers customizable permissions that can be set up for individual staff and or students. Another piece of functionality offered by Canvas that was essential to the model was the ability to deploy copies of a master course so that different groups had their own version of the textbook to manipulate and develop.

Electronic Content Repository (Drupal Database)

Alongside the VLE, but linked to it, is a content repository developed as a Drupal module. It provides functionality for the storage of electronic documents and 'tagging' of all OER. The repository stores metadata for all the OER used in the prototype, and every OER collected was described against the Caribbean Examination Council's (CXC) CSEC mathematics curriculum. This allowed student and staff developers looking to rework the 'textbook' an initial bank of existing and additional OER to peruse and consider—all linked to the curriculum. The repository's search facility allowed users to search according to curriculum statements, subject topics, OER service providers and resource

formats. As new resources became available, they were added to the repository. An additional function of the repository was the provision of a facility that allowed the scaling up of the 'textbook' so that it could be quickly adapted to support curricula from elsewhere. Additional curriculum taxonomies could be added and mapped against the existing taxonomy to enable linkages to appropriate OER already in the database. The repository also provided the 'textbook's' home page, containing directions on how to use the OER VLE Prototype and repository and provided a list and links to the mathematics topics (See http://www.caribbeanoer.org).

Deployment Strategies

While the OER VLE platform was designed to be adapted to differing contexts, various deployment scenarios were anticipated in the early stages:

- *Minimal Deployment Strategy (Public access / teacher reference),* which allows resources to be read and interacted with but not manipulated or changed – much like a regular textbook, but with interactive elements and self-assessment opportunities.
- *Standard Deployment Strategy (Contextual repurposing by educators),* which provides teachers with permissions to access and edit a school version of the master OER 'textbook' – thus the OER 'textbook' can be manipulated to suit local learning contexts.
- *Advanced Deployment Strategy (Students as content authors),* which allows students to have editing rights, using the same tools provided to educators in the standard setup.

Pilot Study

In March 2014, four schools in Antigua and Barbuda were identified to pilot each of the OER VLE Prototype's deployment strategies with their teachers and students. The pilot schools were provided a set of activities that guided them to use the prototype. In order to expedite the repurposing of the OER VLE prototype to better suit specific needs, a set of simple 'How-To' guides were developed for the students and staff.

On completion of the pilot, teacher experiences were collected using an online survey. The results suggested that educators considered a number of different ways to deploy the prototype within their current teaching styles. They enjoyed the access to new digital formats and resources (particularly video and interactive media) that the prototype provided, and found repurposing the course materials to better suit their teaching styles easy. Additionally, they reported that there were sufficient assessment opportunities for students to measure their mastery of curriculum objectives. They tended to use the prototype 'as is' but welcomed the functionality to repurpose the prototype and include contextually relevant/localised content.

However, there was also evidence to suggest that the current form of the prototype had not been incorporated into daily teaching strategies. Mitigating factors included lack of sustained pressure by the school management/education ministry to use the tool, difficulties associated with accessing computers and the Internet (i.e., access and cost), and complexities in the management of the prototype – in particular – generating school instances of the materials and the granting of permissions. Nevertheless, some educators reported that they were keen to upload and share their class materials within the prototype.

Changes at a Regional Level

Antigua and Barbuda is a member of the Organization of Eastern Caribbean States (OECS). During the 23rd Meeting of OECS Ministers of Education in October 2013, Ministers endorsed the proposal to continue developing a prototype Open Textbook initiative for the OECS. Thus, the Antigua and Barbuda initiative is effectively a regional pilot activity. Additionally, Ministers agreed to collaborate with Notesmaster to import all of the meta-data from the OER Repository into the Notesmaster system in order to take advantage of the powerful social networking tools that are built into that platform. This provides fertile ground for implementing new initiatives that have the potential to drive systemic change. If the initiative in Antigua and Barbuda proves successful, it can be rapidly scaled across the nine other states in the region.

Conclusion

OER initiatives that simply replace proprietary resources with openly licensed ones but with no significant intention to shift the basic productivity of teacher-student interactions, are unlikely to lead to any kind of significant systemic transformation. The experiments conducted at St Peter's College have demonstrated a significantly different application of OER, one that is both much cheaper even than OER textbook initiatives (given the vast eco-system of OER that exists already online, once the VLE infrastructure is established, basic capacities are developed, and models can be demonstrated to work successfully, there is no major additional investment required of any kind) and that brings the added value of developing a much wider range of student competencies than just subject knowledge. More importantly, though, if such approaches gain traction, they have very significant potential to create the opportunity to reconfigure fundamentally the weekly school timetable in order to create much greater space to introduce other changes planned by the College.

Making these shifts are much easier at a single, private school than across an entire system. While the work done in Antigua and Barbuda is too early to claim success, there are already many important tools emerging that might provide a roadmap for effective change. These include the following:

1. Proactive, visionary statements of policy intent;
2. Detailed strategic plans, with clear targets that work towards the achievement of the policy vision;
3. Budgetary and logistical commitments from government to ensuring that ICT infrastructure is universally applied across the whole system;
4. Strong engagement with principals and school management in planning the integration of ICT into schools on an ongoing, annual basis;
5. Creation through prototypes of models that demonstrate the potential for OER to serve a transformative educational agenda;
6. Strong engagement and professional development to enable core groups of teacher 'champions' to lead the process of change;
7. Careful evaluation to measure the impact of changes ushered in by innovations as they are introduced.

Thus, while success is far from assured, we believe that this research demonstrates that there is both sufficient evidence of the failure of traditional schooling models to meet changing social needs and

enough pointers to the kinds of systemic actions required for the proponents of OER to no longer chase after 'low hanging fruits' that simply reinforce the failed models of schooling, but, rather, seek to build sustained pressure for long-term, educationally effective systemic change.

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