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Theme – Open, Online and Flexible Learning: The Key to Sustainable Development

Sub Theme – Technology and Innovation - OERs and New Roles for Teachers and Learners

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Title – OERs taking Schools from Resource Poor to Resource Rich

A rapidly growing number of schools in developing countries are introducing packages of OERs through offline solutions such as APTUS, Rachel, Internet In A Box etc. Such solutions typically deliver thousands of teaching videos, free books and text books, digital dictionaries and encyclopaedias, interactive exercises, real time student progress details etc. The schools they are delivered to typically have few educational resources, undertrained teachers and poor teaching and learning support systems.

The paper will draw on several years of experience in Pacific Small Island States in implementing a range of ICT4E projects and provide insights into issues raised by this new approach of flooding schools with OERs. It will critically evaluate much of the developed world approaches to OERs for relevance, noting they come from reasonably well functioning education systems with well trained teachers, adequate resources and support systems and an ICT and information literate population.

The paper will attempt to answer the question – What do we need to do to ensure maximum learning benefits come from such use of such OERs.

To do this, it will examine the method and practices of deploying and accessing these OERs and identify gaps and inadequacies and make recommendations to address them.

Introduction

The William and Flora Hewlett Foundation define OERs as: teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge. (Hewlett Foundation n.d.)

In their recent review of their OER strategy the Hewlett Foundation reported (Hewlett Foundation n.d.) their focus now needs to move from creating OERs to greater adoption of OERs as primary teaching and learning resources

This report will investigate some of the issues around the growing use of "OERs" that are typically provided in packages like Rachel, Internet-in-a-box and APTUS (see Appendix 1 for details). Perhaps these are best described as Open Teaching and Learning Aids and such terminology will be used in the paper. Often such resources are not officially licensed as Open Education Resources (e.g. through the Creative Commons licenses), but general approval for free use and distribution is given. Examples would include the Khan Academy videos, Wikipedia for schools, Gutenberg books, TED talks etc.

This segment of OERs is not often referenced in OER papers and research, but they are playing an increasing role in developing country education systems, particularly in "offline" solutions where the internet is not available or is too expensive for schools. The appeal of "cheaply" providing such a rich source of Teaching and Learning resources is very strong.

COL itself doesn't seem to include this type of OERs in their reviews of OERs, except when mentioning APTUS and reviewing the comments on the various web pages, blogs and social media associated with each package, the deployments are rising into the thousands of schools in many countries and in many different languages.

Literature review

There seems to be few reviewed publications on this section of OERs, despite the huge success of the Khan Academy and the less well known, but still very popular Rachel Offline package (World Possible Rachel Offline n.d). What little can be found, seems to focus on developed countries. Perhaps this is because relative newness of these packages in developing countries and also that often they are deployed in weak or informal education systems (and very often by technical people, not educators)

Recent studies by Mannus Consulting, the Education Development Centre and SRI International on the Khan Academy give some insight into the use and effectiveness of the Khan videos, especially in the Math subject area

The US based independent SRI International research institution conducted a study in 2014 on the use of the Khan Academy system in US schools. As reported on their web page (SRI International n.d.)

The primary goal of this research was to generate information for school systems, school leaders, and teachers on how Khan Academy, and by implication other similar digital learning tools and resources, could be used to support personalized math learning (i.e., learning that tailors what is taught, when it is taught, and how it is taught to the needs of students working individually and with others)

It is important to recognise that this study was not to look at the effectiveness of the Khan system, only how it has been implemented in US schools

While the report highlighted many different uses of the videos and associated teaching and learning systems, it went on to suggest that the "support structures for learning" that exist in the USA most likely influenced how they were used and that conclusions could not be drawn that the same uses would be best in developing countries that have relatively weak or even non-existent learning support structures for teachers.

According to the World Bank's EduTech blog (World Bank EduTech Blog 2014)

In environments where the Khan Academy is meant to be used in large part because of the absence of such support structures for learning, what steps might educational policymakers and educators consider in order to make the 'successful' use of the Khan Academy more likely? More broadly: *What are the important things that need to be in place (human resources, technology, incentive structures, pedagogical practices, physical space, etc.) for tools like the Khan Academy to be introduced most productively, with the greatest impact?*

Literature is yet silent on these important issues.

In the report on use of Khan in Guatemala, the US based Mannus Consulting reported on the effectiveness of the use of the Khan maths videos in the Sergio Paiz Andrade Foundation pilot program of use of ICTs and Khan videos in selected schools (Manus 2016). In a well-structured research project, Mannus reported up to a 10% increase in maths scores in schools where students accessed the videos on tablets.

Little is said in the report about the "learning support systems" or the implementation practices, except to report that each student spent on average 1-2 days per week viewing the videos for an average of one hour and a total of between 7 and 13 hours over the study period

Again, while the findings are interesting, the study is somewhat incomplete and leaves many of the same questions about the supporting systems, policies and practices unanswered.

A similar research project, funded by Intel in Chile and conducted by EDC (EDC 2014) where carefully selected schools who were "thoughtfully introducing" the Khan Videos were evaluated over a two week period. The preferred use of the Khan system was the math exercises and greater student participation and interest was recorded. Again, little information was given on the implementation other than to say the use of the Khan exercises replaced the existing time spent on exercises, minimising changes to the teaching and learning system, making the introduction much easier.

A review of the World Possible Rachel Off-line package (World Possible Offline n.d.), Solar Spell (Solar Spell n.d.) and APTUS (APTUS n.d.) web sites listing of deployments shows a very strong focus on suppling the devices and content with minimal mention of its relevance to education outcomes or application in the classroom. There is little or no data on usage, learning outcomes or impact studies.

Indeed, none of the web pages promoting the various packages give hints or suggestions on how best to deploy them. It seems that most often, one time teacher's training is provided, but there are no mentions of continuing professional development, best use models, teacher support structure or evaluation of impacts.

This seems very reminiscent of the many (now discredited) approaches to ICT in education that were criticised for "dumping devices" on schools. It seems we have not fully learnt that lesson yet, but at least we are now "dumping devices and content".

As Mike Trucano from the World Bank says in his EduTech blog on Complexities of Using Free and Digital Learning Resources (World Bank EduTech blog 2015)

How are you actually going to use all of this stuff?

As part of the process of answering this question, education systems may want to consider:

1. ***Mapping** this body of digital learning resources, both in their entirety and one-by-one, against their existing curricula and curricular objectives*
2. ***Sequencing** individual materials in ways that are appropriate and relevant for use by teachers and students*
3. *Helping teachers **orchestrate** the use of these materials for learning.*

He cites the most frequent response to these questions as "Can't the teachers take care of that"

The most appropriate answer would seem to be "With some difficulty, after training and at the expense of other duties"

Deployments of APTUS, Solar Spell and Kio Kits

In Pacific Islands, several trials of the above "solutions" are under consideration or just commencing.

Perhaps the most prolific of these is APTUS (See Appendix 1). To date 40 have been delivered to Vanuatu (as part of the Cyclone Pam relief), Kiribati is planning 40 for every senior secondary school and Fiji has pre-ordered 400 for rural and remote primary schools to be used in conjunction with the 5,000 tablets donated by the Indian Prime Minister. In each case, education officials are now working to determine what content should be included, especially locally relevant content and how best to introduce them.

Solar Spell (see Appendix 1), an initiative from Dr Laura Hosman as part of a USA University research project, has been delivered to Federated States of Micronesia, Vanuatu and Samoa. The model of deployment is interesting as it works through the US Peace Corp volunteers based in rural villages and schools. Currently more than 100 units have been deployed.

Kio Kit (See Appendix 1) is perhaps the most recent entry to the Pacific. It is developed in Kenya for rural African schools and seems well suited for the remote Pacific Islands. It is being trailed in five schools in the Solomon Islands through the Ministry of Education.

Separate initiatives using the Rachel content as a base with added local content for issues like Pacific Climate Change and Pacific Healthy lives are being trailed in Vanuatu in a program of school based Community Learning Centres and in Tuvalu in primary schools. A local IT businessman is also promoting a Rachel based package for delivery to interested schools in PNG. Many "Rachel on a Stick" USBs have been given to a wide range of education officials and teachers

In all cases, teacher training ranging from 1-2 days to one week is given, but this is not followed up and no evaluation has yet been made of the impacts. The Kio Kit trial in the Solomons has plans to follow up with regular site visits for further training and evaluation, but at the time of writing, this has not commenced. USP School of Education has started a research project to study these projects (and other similar initiatives), but results are not expected until 2017.

Findings

Typically, most developing country deployments of APTUS/Rachel/Solar Spell fall into the category of pilots or trials with no attempt to integrate the approach into the existing teaching and learning systems. It is unclear just how the resources will be (or are being) used.

While important, pilots and trails should lead to scaled up and sustainable deployments, but little research is being conducted to learn how best to do this. Unfortunately, this seems typical of ICT for better education deployments in many developing countries.

Often the deployments are introduced to address policies that call for a change from Teacher centric teaching to Learner centric learning. They carry the hope that providing appropriate packages of Open Teaching and Learning Aids will provide the tools and resources to facilitate this change, assuming it will lead to better quality of teaching and learning and the use of new pedagogies. It is recognised that education officials and teachers will need training for this, but teacher Professional Development systems are weak or do not exist and early efforts are not sustained.

Other education Teaching and learning support systems will need to be strengthened to enable such changes, especially in addressing scalability and sustainability. E.g. the linking of learning outcomes and curriculum requirements to the Open Teaching and Learning Aids will be critical, as will adapting and packaging them to suit local needs and issues and including local resources.

Perhaps the final learning as hinted at previously is that there doesn't seem to be good models of using these OERs in Pacific Schools. As mentioned in the SRI research on Khan Math videos (Murphy et al 2014), teachers seem to choose many different ways to use these resources. The unanswered question is what works well in developing education systems. It seems that at least, guidelines for the use of the Open Teaching and Learning Aids need to be developed to assist teachers.

Clearly focusing on devices and content will not be sufficient to deliver maximum learning outcomes at scale and sustainably.

Professional Development and OERs in Pacific Education Systems

It is reasonable to expect that to make effective and sustained changes in education, a strong Continuous Professional Development (CPD) system must be in place, not just for teachers, but for most education officials. This is particularly true when moving from teaching in a resource poor environment to having an abundant range of high quality resources. Ongoing training for teachers to help them move from the "Sage on the Stage" to the "Guide on the Side" is clearly essential for such a core change in teaching.

Many Pacific MOEs have recognised that education is changing much more rapidly than ever before and that they need new, more efficient and effective School Leader and Teacher Professional Development approaches. Traditional methods of teacher PD involves the "face to face trickle down" approach through training of trainers who then go out and train more trainers and eventually the training gets to the school. Such approaches have never been very successful as the quality of training degrades with each step in the process and the higher rate of change makes this approach less attractive. Very often, such capacity building results in few changes, especially in schools with untrained school leaders.

Linking CPD's with ICTs seems a logical step and there have been many attempts in the past to use a range of ICTs for training of educators. More recently, the Open Praxis publication, Vol 6 Issue 4 2104 on Online Training of teachers using OERs : Promises and potential strategies (Misra 2014), Pradeep Kumar Misra states that

Agencies promoting Open Educational Resources (OER) are of the view that online teacher training using OER can do well on all these fronts, as underlined in a call from the International Council for Open and Distance Education- ICDE (2013), Open, distance and online learning is rapidly expanding in universities and colleges in Africa and Asia, but faculty training has not caught up with the speed of development

Drawing from initiatives such as TESSA in Africa and TESS in India, and applying COL's MOOCs for Development model (Commonwealth of Learning 2016) may provide a new cost effective way of Continuous Professional Development for educators

Making such CPD packages available in the same Offline mode as Rachel or Khan etc. and including them with the OER package seems to be an obvious step. This will enable the delivery high quality professional development for teachers directly to the school. The training can be facilitated by the Head Teacher or Principal and exercises to develop school implementation plans can be included in the course. Having all the school stakeholders present should improve the prospect of implementation of the required changes.

Conclusion

While there is growing evidence of the benefits of using OERs in teaching and learning especially in developed countries, little is known about the impacts of introducing open teaching and learning aids such as APTUS or Rachel in weaker education systems typical of developing countries.

Most deployments to date have been conducted in "pilot mode" and mostly focused on the devices and the content, leaving it up to teachers to work out how to best use them in the classroom.

Sustainable and scaled up approaches must provide more support for educators, including strengthening professional development and developing links between the OERs and learning outcomes and the curriculum.

The technology and approaches which allowed the development of content packages like Khan and Rachel seem well suited to including open courseware for education professional development in the format of MOOCs for Development (MOOCs4D). Open courseware on using the OERs should be included in the offline package content. Such an approach will greatly increase the value and effectiveness of deploying Offline OERs to developing schools.

Appendix 1

The following is a brief introduction to some of the approaches to packaging the Open Teaching and Learning Aids available today.

a) APTUS

COL's idea of a "classroom without walls" is called APTUS. We can imagine a situation where a learner in a typically unconnected environment can access a lesson in a Learning Management System (LMS), and complete an assignment, with her/his credentials intact and available to the teacher. Learners can also participate in a socializing process through visiting and commenting on a blog related to the learning materials and courses.

The current version of APTUS can provide access to about 3000 videos of Khan Academy, about 100 000 articles from Simplified Wikipedia in English besides Wikitionary with about three million entries. It can hold thousands of books in PDF or EPub format. It also provides a WordPress installation to allow teachers to add own content. File sharing through OwnCloud, an open source solution, is available.

b) Rachel

RACHEL Offline is a collaborative effort of non-profit organizations to bring the best technology to those groups that need it most. RACHEL content will always and forever be free. Content updates will also always and forever be free. To the best of our ability, instructions and support

will always be free, allowing anyone to replicate and build the products we sell here for their own use.

When a RACHEL server is turned on, a RACHEL server emits a wireless signal, just like the one you are likely using to read this website. This signal however, only provides access to the copies of websites stored directly on the RACHEL device. Any device with a web browser (a laptop, desktop, tablet, or smartphone) can connect to RACHEL's wireless signal.

There is an ever growing list of free educational content available at

http://dev.worldpossible.org/cgi/rachelmods.pl

c) Internet in a Box

We are building the Internet-in-a-Box - A small, inexpensive device which provides essential Internet resources without any Internet connection. It provides a local copy of a terabyte of the world's free information

This Open Source project is being developed by volunteers in southern California. We are seeking schools and communities worldwide who would benefit from our work.

d) Solar Spell

SolarSPELL is a Solar Powered Educational Learning Library: a digital library over an off-line WiFi hotspot, designed to simulate an online experience. Making use of open education resources and ever-smaller and more efficient technology, SPELL provides and all-in-one, self-powered play-and-play kit, ready to be deployed with absolute minimal training or maintenance required for start-up and continued operation

This project's goal is to support education in all subject areas and enable the development of Internet-relevant skills, by providing access to books, videos, and other valuable educational content through an offline digital library, including content specifically curated for the Pacific Islands. This project is an initiative led by Prof. Laura Hosman.

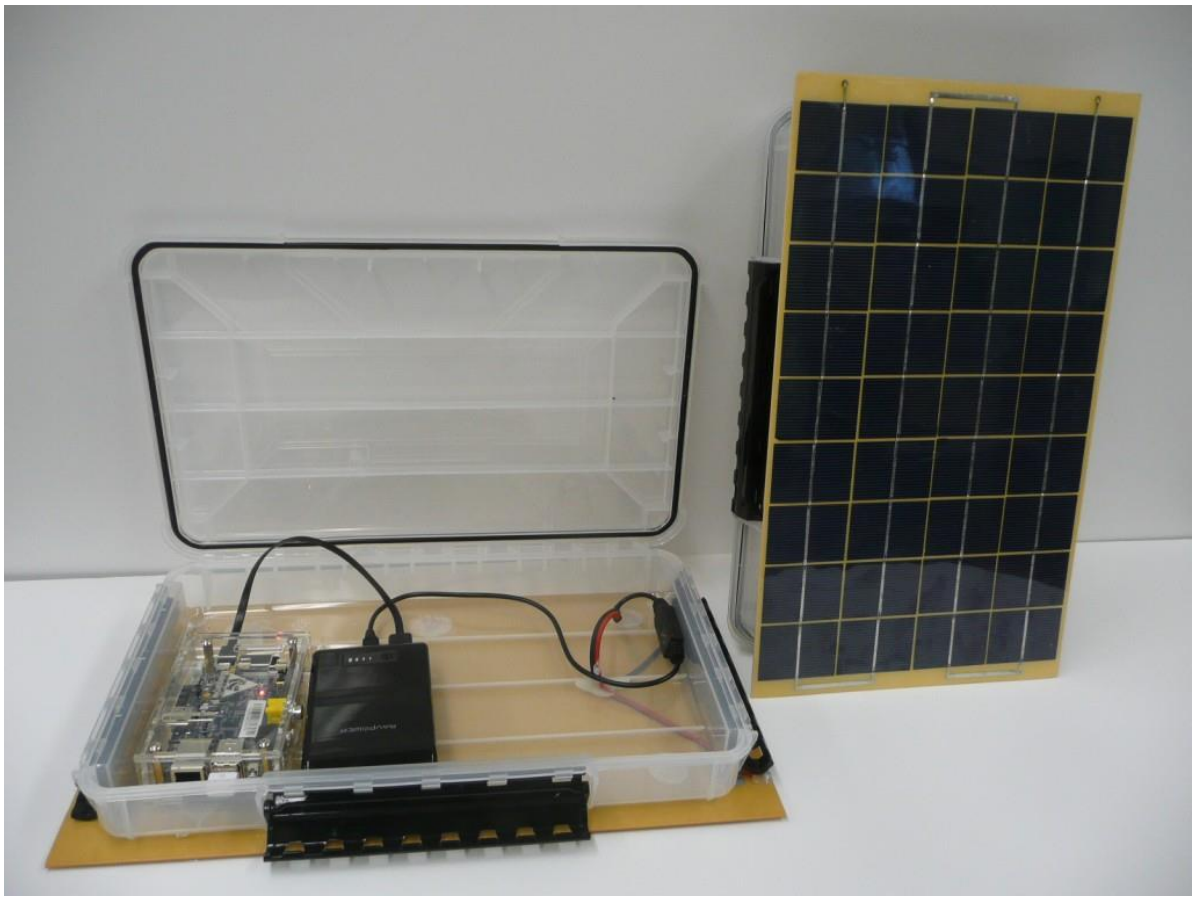
The SolarSPELL library (2016 version) consists of:

- Raspberry Pi 3 Microcomputer
- 32 GB SD Card pre-loaded with open-access educational content
- 10W Eco-Worthy Solar Panel
- Voltage Regulator
- 10,000 mAh Rechargeable Rav-Power Battery

- Micro USB Connector Cords

An Online version of the content is provided here

http://pacificschoolserver.org/



e) Kio Kit

The Kio Kit is a simple and elegant solution that can turn any classroom into a Digital Classroom in minutes. It is designed for schools with poor infrastructure.

With a hardened, water resistant, lockable case, the Kio Kit consists of 40 ruggedized Kio tablets, headphones and BRCK micro server containing both world-class and international content. There is a single plug to charge the Kit and one button to power the whole system. The Kio Tablets and BRCK within it have enough battery to manage intermittent power in rural areas.

The Kio Kit comes with a wealth of pre-loaded content from some of the world's leading digital publishers. It includes academic content aligned to local curriculum, games that stimulate critical thinking; and content outside the curriculum focused on responsible citizenship

Our Wirelessly charged simple and easy to use Kio Tablets are designed to be intuitive for children. They are tough enough to allow for occasional drops and spills with a scratch resistant screen coating and a rugged outer shell to reduce breakage

The first four approaches preload a range of OERs on to a micro server, powered by a battery that runs the system for 6-8 hours. Each includes a wifi hot spot to gain access to the content. Content can be accessed by any wifi device with an internet browser. Typically the system costs between US $100 and $200

Only the Kio Kit provides a full package, including the access devices. This costs approximately US $5,000 for a self-contained kit with 40 tablets.

All packages sort the content in different ways and have different packages of content and different Open resource tools

References

APTUS (n.d.) Commonwealth of learning Web page accessed 25th October 2016 https://www.col.org/services/knowledge-management/aptus

Butcher, N (2014) Harnessing OERs to drive systemic education change in Secondary Schooling. Hewlett Foundation. Retrieved from http://bit.ly/1mDdwmN

Cobo, C. (2013). Exploration of open educational resources in non-English speaking communities. The International Review of Research in Open and Distance Learning, 14(2). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1493/2482

Commonwealth of Learning (2016): MOOCs for development, retrieved from https://www.col.org/services/knowledge-management/mooc-development-mooc4d

Creative Commons (2013) What is OER? http://wiki.creativecommons.org/What_is_OER%3F de los Arcos, B., Farrow, R., Perryman, L.-A., Pitt, R. & Weller, M. (2014). OER Evidence Report 2013–2014. OER Research Hub. Retrieved from http://oerresearchhub.org/about-2/reports/

EDC (2014) Increasing Student Engagement in Math – The study of an Intel Funded Pilot program in Chile. Light D, Pearson E. Retrieved from http://www.intel.com/content/dam/www/program/education/us/en/documents/Evaluations/Khan-Academy-Chile-Report.pdf

Hewlett Foundation (n.d.). Open Educational Resources. Retrieved from http://www.hewlett.org/programs/education/open-educational-resources

Manus (2016): Assessing the use of technology and Khan Academy to improve educational outcomes in Sacatepéquez, Guatemala. Retrieved from https://learningequality.org/media/FUNSEPA_Final_Evaluation_Report_27May2016.pdf

Misra, P (2014): Online training of teachers using OER: Promises and potential strategies. Retrieved from http://openpraxis.org/index.php/OpenPraxis/article/view/155

Murphy, R., Gallagher, L., Krumm, A ., Mislevy, J., & Hafter, A. (2014). Research on the Use of Khan Academy in Schools. Menlo Park, CA: SRI Education. Retrieved from https://www.sri.com/sites/default/files/publications/khan-academy-implementation-report-2014-04-15.pd

New Zealand Ministry of Education (n.d.): Enabling e-Learning portal. Retrieved from http://elearning.tki.org.nz/

OEER Africa (2014) OER in teacher education: reflections from the OER Africa teacher education network. Retrieved from http://www.oerafrica.org/system/files/9810/201403-oer-teacher-education-final.pdf

Rossini, C. (2010). The state and challenges of OER in Brazil: from readers to writers? Berkman Center Research Publication No. 2010–01. Retrieved from http://ssrn.com/abstract=1549922

Solar Spell (n.d.). Web page accessed 25th October 2016 https://solarspell.org

SRI International (n.d) Research on use of Khan Academy in Schools: Retrieved from https://www.sri.com/work/projects/research-use-khan-academy-schools

Vaa R (2015) A Baseline Study on Technology Enabled Learning in the Commonwealth Pacific Island Countries: Report. Retrieved from http://oasis.col.org/bitstream/handle/11599/1738/2015_Vaa_Baseline-TEL-Pacific.pdf?sequence=1&isAllowed=y

Weller, M et al Institute of Educational Technology, Open University (United Kingdom) (2015): The impact on OER on Teaching and Learning Practice. Retrieved from http://oro.open.ac.uk/44963/1/227-1106-2-PB-3.pdf

Wolfenden, F The Open University, UK et al (2104): Using OERs to improve teacher quality: emerging findings from TESSA. Retrieved from http://oro.open.ac.uk/27174/

World Bank EduTech Blog, Trucano, M (2015): Complexities utilizing free digital learning resources. Retrieved from http://blogs.worldbank.org/edutech/complexities-utilizing-free-digital-learning-resources

World Bank EduTech Blog, Trucano, M (2014): Contextualizing Khan Academy. Retrieved from https://blogs.worldbank.org/edutech/contextualizing-khan-academy

World Bank EduTech Blog, Trucano, M (2014): Evaluating the Khan Academy. Retrieved from https://blogs.worldbank.org/edutech/evaluating-khan-academy

World Possible Rachel Offline (n.d.). Accessed 25th October 2016 https://racheloffline.org/