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# Mainstreaming Open Textbooks: Educator Perspectives on the Impact of OpenStax College Open Textbooks

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## Abstract

This paper presents the results of collaborative research between open textbook provider OpenStax College (OSC) and the OER Research Hub (OERRH), a Hewlett funded mixed methods open research project examining the impact of open educational resources (OER) on learning and teaching.<sup>i</sup>

The paper focuses primarily on the results of two surveys that were conducted with educators using a range of OSC open textbooks during 2013 and 2014/2015. The results of this research shows that OER such as OSC enables a majority of educators to better respond to student needs whilst often making teaching easier and in some instances changing teaching practices. Although this paper does not focus on the impact of OER on students, a majority of educators surveyed perceive an increase in student satisfaction when using OER such as OSC and believe that OSC are saving students money.

**Keywords:** Open Educational Resources (OER), Open Textbooks, Impact, OpenStax College, OER Research Hub, open access

## Introduction

The high price of textbooks, which have increased in cost by more than fifteen times since the 1970s, and the impact on students in both the USA and elsewhere, is well documented (e.g. Senack, 2014 & 2015). In some USA states, such as California, the cost of textbooks is reportedly higher than the cost of tuition.<sup>ii</sup> As a result of the high cost of textbooks, 7 in 10 students surveyed by the USA's Public Research Interest Group (PIRG) in early 2011 reported at least one occasion where they had not bought a textbook for a course; and those that did choose to buy proprietary

course materials faced increased debt (see: <http://www.studentpirgs.org/news/ap/high-prices-prevent-college-students-buying-assigned-textbooks>). A 2014 survey by Nebraska Book Company/Neebo reported that students are more concerned about the cost of textbooks than course costs (Bonner, 2014). Moreover, students who do not purchase a book have heightened concern about the effect on their grades (e.g. Senack, 2014).

The cost of textbooks also impacts on the type of study that students undertake. As the 2012 Florida Student Textbook Survey reported 31% of students have chosen not to take a course because of the high cost of the course materials (Donaldson, Nelson, & Thomas, 2012).

Whilst proprietary textbook providers continue to profit from education (e.g. Wischenbart, 2014), they are also required to accommodate and shape the narrative around open education (Weller, 2013) and simultaneously limit the impact on potential profit margins. Indeed *open washing* (e.g. where the language of “openness” is used to present something that is not open as being so) has increased as OER has mainstreamed (Weller, 2014, p.20), particularly in the instance of open textbooks, one of the most prominent and well-known types of OER in the USA. However, the “battle” for the meaning of *open* is ongoing and challenges still remain: Allen & Seaman’s Babson latest report revealed that around three quarters of educators have not heard of OER (Allen & Seaman, 2014) whilst the Boston Consultancy Group report that, although more than 50% of the K-12 educators and administrators they surveyed had some knowledge of OER, there was less understanding of how best to utilize it in an educational setting (Boston Consultancy Group, 2013).

An increasingly strategic drive to “mainstream” OER through facilitating the use and visibility of OER has been driven by a range of organisations, initiatives, and policies around the world that are focused on change and embedding openness into everyday practice across different sectors. In the UK, Leicester City Council began to provide support for the use of OER and introduced a policy to encourage OER uptake (see: <http://www.digilitleic.com/?p=605>). At a national level in the United States, SPARC (see <http://www.sparc.arl.org>) and others campaigned for the *Affordable College Textbooks Act* that went before Congress in October 2015 and if successful will increase the amount of OER used in educational institutions across the USA (see: <http://www.sparc.arl.org/advocacy/national/act>). Meanwhile colleges such as Tidewater Community College have pioneered a textbook free degree (“the Z-Degree”), cutting the cost of study by up to 25% whilst simultaneously increasing retention and test scores (see: <http://www.tcc.edu/academics/zdegree/index.html>).

## Background: Open Textbooks and the OER Research Hub

This paper describes research carried out by the OER Research Hub (OERRH), a research project funded by the Hewlett Foundation which examines the impact of OER through collaborative, comparative, international research (see: <http://oerresearchhub.org>). The OERRH was conceived as a coordinated response to the lack of evidence relating to key areas or questions about the impact of OER identified by stakeholders in the community and previous projects such as the Hewlett funded Open Learning Network (OLnet) project (see: <http://www.olnet.org>). The OERRH collaborated on a range of impact studies with projects, initiatives, and organisations around the world.

Using a mixed methods approach the project structured its research through the use of 11 hypotheses; a number of these were aligned to each collaboration. The OERRH conducted surveys with over 7000 respondents from over 180 countries.

As the OERRH progressed, and because of the same hypotheses being used across different collaborations, the OERRH's comparative methodology enabled findings from one survey to be compared with another. Findings against the eleven hypotheses can be found in the 2013-2014 report (de los Arcos, B., Farrow, R., Perryman, L.-A., Pitt, R. & Weller, M. 2014). Several of the OERRH's collaborations were with open textbook projects who provide low-to-no cost open textbooks: OpenStax CNX (formerly Connexions) and OpenStax College (<https://www.openstaxcollege.org/>) (OSC) based at Rice University, Houston, USA; Siyavula in Cape Town, South Africa (<http://www.siyavula.com>); and the BCcampus Open Textbook project in British Columbia, Canada (<http://bccampus.ca/open-textbook-project/>).

This paper focuses on our work with OSC. Since 2012 OSC have provided a growing range of no-to-low cost, peer-reviewed, CC-BY licensed open textbooks and report saving students over \$30 million in a little over two years (see: <http://openstaxcollege.org/news/our-textbooks-have-saved-students-30-million>). In August 2014 OSC announced that they were diversifying into the K-12 textbook market (see: <https://openstaxcollege.org/news/openstax-is-creating-digital-textbooks-that-deliver-personalized-lessons-for-high-school-students>). Since the release of their first textbook, the rate of known OSC adoptions has rapidly increased: from 40 institutions in 2012 to 350 in 2013 to 1061 by mid-October 2014 (see: <http://openstaxcollege.org/news/our-textbooks-have-saved-students-30-million>).<sup>iii</sup> By mid-June 2015 OSC reported 1653 known adoptions of their textbooks at 1213 different institutions across the United States.<sup>iv</sup>

## Current Research

The Open Education Group's review project, which compiles peer reviewed research on OER, highlights (as of 13 August 2015) 17 studies that examine the impact of OER and open textbooks,

including a range of studies that look at perceptions of quality, attitudes towards OER, and perceived impact (See: <http://openedgroup.org/review>). Research on the impact of open textbooks has largely focused both on the efficacy of open textbooks and the student benefits to using open textbooks, in particular cost savings.

A smaller number of studies focus on the impact of OER and open materials on educators. Quality remains a key concern for research to date due to perceived poor quality of resources remaining a concern and potentially limiting uptake: Bliss, T.J. Robinson, T.J. Hilton III, J. & Wiley, D. A. (2013), Clements, K.I. & Pawlowski, J.M. (2012), Bliss, T.J. Hilton III, J. Wiley, D. & Thanos, K. (2013), Hilton III, J. Gaudet, D. Clark, P. & Wiley D. (2013) and Allen and Seaman's (2014) Babson report, for example, all report on educators' perceptions of OER quality in comparison to proprietary resources.<sup>v</sup> The Babson report also describes a number of barriers to educator use of OER and highlights the role of educators in the adoption process whilst the Boston Consultancy Group reports that "trusted quality" was the crucial factor for OER uptake for 19% of potential users in the K12 sector (p8. Boston Consultancy Group, 2013).

Petrides, L. Jimes, C. Middleton-Detzner, C. Walling. J. & Weiss, S. (2011) report on a range of reasons educators are motivated to use OER, including student cost savings, a feeling of "personal responsibility" towards their students and because of immediate access to the resources "ease of use." (p43). Similarly the Boston Consultancy Group report that amongst K12 educator adopters of OER surveyed in 2012 "flexibility/modularity" and "low cost" were key motivators to continued OER use (p20. Boston Consultancy Group, 2013). Masterman and Wild (2011), who focused on educators in Higher Education's perceptions and use of OER, report a range of impacts including time saving, responsiveness to learner need, and integration of resources. The collaborative research below, and the overall findings of the OERRH, broadly support a number of conclusions drawn from this previous research. The results below also develop existing research further by presenting evidence that a positive experience with OER makes future use and advocacy of OER more likely, in addition to, increasing educator freedom to innovate.

This paper focuses primarily on the underreported, perceived, and actual impact of open textbooks on educators; both developing and building on existing research. It presents the findings of collaborative research with OSC and reviews related data from two sets of educator surveys (2013 and 2014/2015). This paper also includes qualitative data from the surveys. The paper presents data thematically and examines how educators first found out about OSC materials, reasons for adopting OSC, impact on students, and the impact of OSC on educators' future and current behaviour.

## Methodology

The OERRH conducted two sets of educator (and student) surveys in collaboration with OSC. The first set of surveys were conducted in the Fall of 2013 and the second set of surveys were open to respondents over the Fall/Winter 2014/2015 period. The former was disseminated via the OSC adopter list, OSC newsletter and a handful of direct educator invitations whilst the latter was distributed via the OSC newsletter only.<sup>vi</sup> In both instances, Twitter and Facebook were also used to promote the survey, and in the instance of the 2013 survey, an incentive was offered for participation.<sup>vii</sup> Follow up interviews with participants who indicated that they were interested in taking part in further research were conducted: three educators were interviewed post-2013 survey<sup>viii</sup> and five educators post-2014/2015 survey.

The questionnaires aimed to provide insight into educators and students using OSC materials and other OER, any impact of the open textbooks, and their use of other online resources. The survey was designed by aligning research questions to the work so that comparison was possible with other collaborative activity elsewhere on the project. The survey focused on the following hypotheses/research questions:

- Use of OER leads to improvement in student performance and satisfaction.
- The open aspect of OER creates different usage and adoption patterns than other online resources.
- OER adoption at an institutional level leads to financial benefits for students and/or institutions.

The breakdown of educator respondents for both sets of survey is as follows:<sup>ix</sup>

Table 1

*Responses to Educator Questionnaire*

Types of educator survey	Total No of responses recorded	Total number of respondents using OSC	Invalid responses	Total No of respondents used for analysis
Email adopters list 2013	52	47	0	47
OSC November newsletter 2013 (incentivized)	42	32	6	26

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Individual Survey responses from educators introduced to OSC 2013	4	4	0	4
TOTAL 2013	98	83	6	77
OSC newsletter 2014/2015	133	52	2	50
TOTAL 2014	133	52	2	50

As can be seen above respondents were filtered according to whether they confirmed that they had previously used or currently use OSC open textbooks. Invalid responses occurred, for example, in instances where respondents had participated in both the adopter and newsletter questionnaire. The following analysis reports on the educators who have experience of using OSC materials, N=77 in 2013 and N=50 in 2014/2015.

## Sample Overview

The majority of survey participants for both the 2013 and 2014/2015 educator surveys resided in the United States (88.2%, n=67 and 79.6%, n=39 respectively) and had over 10 years teaching experience (67.1%, n=51 and 68.8%, n=33 respectively). Around 95% of both sets of survey respondents reported working at least part-time as a classroom teacher (94.8%, n=73 in 2013 and 96%, n=48 in 2014/2015). When asked what educational contexts they worked in, 50% (n=25) in 2014/2015 and 57.1% (n=44) of respondents told us they worked at least part-time in a Higher Education/University context.

Unsurprisingly, given the educational attainment requirements to be an educator in the US and elsewhere, all respondents reported having a Bachelor's degree or higher (n=76 in 2013 and n=50 in 2014/2015). In addition, 92.1% of respondents reported their highest qualification as a Master's degree and/or PhD/Professional Doctorate in 2013 (n=70) and 88% of respondents in 2014/2015 (n=44). Nearly 70% of both sets of survey respondents had been teaching for more than 10 years (67.1%, n=51 in 2013 and 68.8%, n=33 in 2014/2015).

The following table illustrates users (either current or previous) by textbook title (note that some textbooks were not available at the time of the 2013 survey and are indicated by N/A):<sup>x</sup>

Table 2

*Respondent Textbook Use*

Textbook title	Date of publication	2013 survey (No of educators who have used or are using a particular textbook) n=77	2014/2015 survey (No of educators using particular textbook either in digital or paper format n=49)	Total of educators surveyed who have used textbook
Anatomy & Physiology	June 2013	6	12	18
Biology	March 2013	3	14	17
College Physics	June 2012	54	15	69
Concepts of Biology	April 2013	4	15	20
Introduction to Sociology	June 2012	12	5	17
Introductory Statistics	Nov 2013	N/A	10	10
Precalculus	Oct 2014	N/A	2	2
Principles of Economics	March 2014	N/A	2	2
Principles of Macroeconomics	March 2014	N/A	2	2
Principles of Microeconomics	March 2014	N/A	3	3

TOTAL		79	80	
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A frequencies analysis of the 2013 survey responses and self-reported use of OSC materials reveals that just under half of the instructors surveyed were currently and had previously used at least one OSC open textbook (49.4%, n=38). Just under 10% of educators surveyed were not currently using OSC materials (9.1%, n=7) whilst the remainder of survey participants were currently using OSC materials but had not previously used them with their students (41.6%, n=32).<sup>xi</sup>

The length of time educators have used OSC materials ranged from less than one semester to up to approximately 15 months for 2013 survey respondents who were using either *College Physics* or *Introduction to Sociology*.<sup>xii</sup> “Current use” as one semester or less is further supported by a small number of educators commenting that the timing of the survey was too early to make real assessment of the impact of the materials. However, although these respondents could not perhaps yet comment on any impact on their students, they were familiar with the resource and had reviewed it.

## First Encounters with OpenStax College

All respondents were asked, in both sets of surveys prior to filtering, an open textbox question regarding how they first became aware of OSC textbooks. Personal recommendation was an important route for the first exposure to OSC: in 2013 over a quarter of respondents who had used or are using OSC told us that they first heard of OSC materials via a colleague, peer, etc. (27.6%, n=21). Similarly just under 20% of respondents in our 2014/2015 survey told us that they had first found out about OSC via this route (18.4%, n=9). As our survey findings were filtered so that only those who had, or currently used, OSC materials were included, it can be surmised that positive, personal recommendation (e.g. anything from explicit recommendation or at the very least having the resource highlighted to them as something worth examining) is an important first exposure to this brand of open textbook, encouraging people at the very least to review (and in this instance adopt) the textbook.

These findings support that of Clements & Pawlowski (2012) who surveyed educators on OER adaptation and adoption: “Even though browsing by topics is still the most common way to find resources, most users look into trust mechanisms as recommendations from colleagues, personal friends, or organizations that have a good reputation.” (p9. Clements & Pawlowski, 2012) The importance of recommendation from a reliable source was confirmed elsewhere in the survey.

When educators were asked to tell us what would make them more likely to choose one particular OER over another<sup>xiii</sup>, almost three quarters of respondents in 2013 told us that they would be more likely to choose a particular OER if it originated from “a reputable/trusted institution or person” (73.7%, n=56) with 95.7% of educators in 2014/2015 responding in the affirmative to this question.<sup>xiv</sup>

Moreover, in both sets of surveys, over 95% of educators told us they were more likely to recommend OSC textbooks to fellow educators/teachers as a result of using the resource (96.1%, n=73 in 2013 and 95.7%, n=44 in 2014/2015). Within this context, the role of educators in promoting and giving credibility to OER, such as open textbooks, cannot be underestimated.

Furthermore, it appears in our group of survey respondents that their first exposure to OSC arose through them deliberately looking for online (and in some instances low or no cost, see below) materials for their students. More than one third of educators reported first finding out about OSC textbooks by conducting their own online search for materials (38.2%, n=29 in 2013 and 36.7%, n=18 in 2014/2015).<sup>xv</sup>

It is clear that, with these survey respondents, people were motivated enough to start looking for alternatives to previous textbooks. A number of respondents told us they were explicitly looking for online, free or open materials. Or, as the following example shows, the high cost of proprietary resources was an important motivation to look for OER:

“I went looking for an open source textbook for teaching physics when I thought about the racket that the textbook publishing companies are running.”

(Educator, Fall/Winter 2013)

Internet or other searches remain key to finding OER such as OSC. Indeed knowing where to look for OER was reported as a frequently faced challenge by 60% of OSC educator 2013 survey respondents (n=45) and 73.9% of OSC educator 2014/2015 respondents in addition to almost 50% of all respondents to OERRH surveys to date (48.0%, n=1876).

## **Increasing Access to Resources**

“Access. Access. Access. We are at a college that predominantly serves low-income students. OpenStax provides students a great text at the best price (free) or for a nominal fee if one wants a printed edition. It has solved the problem of students not having or delaying getting the text due to financial concerns.”

(Educator, Fall/Winter 2013)

Wiley (2014a, 2014b and 2013) has written extensively about the problem of “disappearing ink” and the impact of restricted usage or high cost online or hardcopy resources on students being

able to “own” resources and other associated materials (such as their own online notes) beyond their course duration. Ironically the problem appears to be compounded by educational institutions themselves: “Specifically, campuses have initiated a number of programs like textbook buyback, textbook rental, digital subscription programs, and DRM-laden ebook programs, each of which results in students completely losing access to their required textbooks at the end of term.” (Wiley, 2014b)

In asking educators about the impact of using OSC on their students, the consequence of a free or low-cost resource being used in class and available both online and/or in low-cost print format had a range of reported impacts.<sup>xvi</sup> In addition to cost savings, some educators highlighted how immediate access to the resource enabled pre- and post-course use of the textbooks, which as one educator described it, was “a great excuse-defying tool.” Access to materials in a range of formats enables *every* student to participate in their preferred way, without the need to request or be dependent on financial aid to help pay for proprietary textbooks. As one educator noted in our 2014/2015 survey:

“It gives them breathing room. Many are cash strapped. When they must choose between food for their children, gas to get [...] to work/school OR purchasing a book, books lose. Having a free book permits them the luxury of having information at their fingertips, without an associated cost. They LOVE to read the book on their phones. I've seen them in the hall, cruising through the text on phones and tablets. Sometimes, it just isn't "cool" to be seen studying a book... But no one gives you a second glance if you are looking at your phone! So, you can be "nerdy" and no one will know! They love the search feature on the digital book.”

(Educator, Winter 2014/2015)

It is less about digitalization making a difference here but about cost and openness. The fact that *whatever format* a student prefers to use, access to OSC is either no or low cost (as in the instance of a printed version of a textbook). Compared with proprietary e-materials (which require a student to pay for them and are often accessible for a restricted time period) the OSC textbook has no barriers to use: *anyone* with an interest in a subject can utilize and share open materials such as OSC.

“They are able to access the textbook and start doing homework immediately rather than being delayed until weeks after the start of the course due to lack of finances.”

(Educator, Fall/Winter 2013)

“They have the book as a resource after leaving class. With another text they would most likely sell it back. Also sharing content with others outside of class.”

(Educator, Fall/Winter 2013)

“Students appreciate not having to pay for an expensive textbook, but also like the option of buying a hardcopy for a modest price. Also, when the textbook is available free online, there is never a lag time at the beginning of the year for students to get their books - they can use the book starting on day 1.”

(Educator, Fall/Winter 2013)

These findings echo those of Bliss, T.J. Robinson, T.J. Hilton III, J. & Wiley, D. A. (2013) whose study of more than 80 community college educators who had utilized Project Kaleidoscope OER reported that “over 20 percent of teachers described the advantages of OER in terms of student access to materials at the very beginning of the course” (p9).

### **Cost savings**

Although it is not clear how many educators we surveyed were motivated by financial concerns to adopt OSC, it is of note that impressions of cost saving are positive and support reported actual cost savings made through the use of OER.<sup>xvii</sup> Over 85% of educators in both sets of surveys told us they believed students had saved money by using OER (88.3%, n=68 in 2013 and 86%, n=43 in 2014/2015).

A smaller number of educators in both sets of surveys believed their institution benefited financially from using OER: 59.2% in 2013 and 62% in 2014/2015 believed that their institution saved money in some way by using OER (n=45 and n=31, respectively). In comparison to the overall OERRH educator sample that showed that 73.1% (n=264) and 47.4% (n=172) of educators thought that students and institutions respectively had saved money by using OER,<sup>xviii</sup> OSC using educators seem more confident in their belief that this type of OER saves money. However, as Wiley and Hilton III (2012) state calculating institutional cost savings is very dependent on how OER are remixed and a range of factors need to be taken into account. This reason might also explain why a small but significant number of respondents told us they weren’t sure whether their institution had saved money by using OER (18.4% in 2013 and 26% in 2014/2015 n=14 and n=13, respectively). This lack of certainty is reflected by the comments that 2013 educators provided for both the “yes” and “don’t know” response options. As one “Don’t Know” respondent told us:

“I sure think that if the institution more fully made use of open educational resources that we could benefit financially: by retaining more students who otherwise have to drop out because of the high cost of textbooks; by providing

higher quality and more diverse and accessible learning and teaching resources which would be a great financial benefit.”

(Educator, Fall/Winter 2013)

Whilst similarly reflecting on the complexity of calculating institutional financial savings, one “yes” respondent more generally remarked:

“The school district can allocate the resources to other areas rather than textbooks.”

(Educator, Fall/Winter 2013)

Whilst one “no” respondent to the 2014/2015 survey noted:

“It takes faculty much longer to create tests and other materials when comparing with big commercial publishers' products...”

(Educator, Winter 2014/2015)

The number of educators who were unsure about institutional cost savings arguably highlights an apparent lack of certainty amongst some respondents as to if and how institutional cost savings could be calculated and/or what constitutes cost savings. This could arguably indicate a possible lack of transparency and/or lack of available data on the financial impact of textbooks beyond student cost saving, the latter which remains largely the focus for impact data to date.<sup>xix</sup> There are a small and growing range of tools available to assist with cost saving calculations available, however these appear to not yet be in widespread use.<sup>xx</sup>

## **The Impact of Exposure to Open Textbooks**

Positive experiences with an open textbook (e.g. OSC) or other OER has potentially far reaching consequences both in terms of facilitating the “mainstreaming of OER” but also in terms of changing educator practice (see below). In both sets of OSC questionnaires<sup>xxi</sup>, educators were asked about the likelihood of carrying out a range of actions as a consequence of using OSC materials.

Over 95% of educators in both surveys reported that they were more likely to recommend OSC materials to fellow educators as a result of using them. Additionally, around 81% of educators in both surveys reported being more likely to discuss using OSC with their institution’s administrators as a result of utilizing this particular type of open textbooks.

Moreover, between 70-80% of educators surveyed would use other OER for teaching as a result of using OSC materials (79.5%, n=58 in 2013 and 73.9%, n=34 in 2014/2015). In addition, 43.1% of educators in 2013 and 43.5% in 2014/2015 reported being more likely to remix the textbooks

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using the Connexions platform (now OpenStax CNX) (n=31 and n=20, respectively)<sup>xxii</sup> with 38.9% of educators in 2013 and 48.9% in 2014/2015 reporting that they were more likely to contribute to Connexions as a result of using OSC (n=28 and n=22, respectively).

These findings reveal that successful use of high quality resources such as OSC enhance the credibility of OER in a variety of ways: there is a perceived increased likelihood of use (or least exploration) of other OER, advocacy of open resources such as OSC with fellow educators and administrators; increased likelihood of contributing to a repository (such as OpenStax CNX), or exploration of the remixable potential of materials via OpenStax CNX or another platform. Indeed 59.2% of respondents in the 2013 survey and 89.1% of educators in the 2014/2015 survey told us they were more likely to select a particular resource when looking for OER if it had an open license allowing adaptation (n=45 and n=41, respectively).<sup>xxiii</sup>

This type of impact is not confined to use of OSC materials. When the same questions were recontextualised and put to educators using Siyavula open textbooks, largely in South Africa, 90.2% of respondents reported that they were more likely to use other “free educational resources”<sup>xxiv</sup> for teaching (n=55). Almost 80% respondents reported being more likely to report errors in the textbooks (78.9%, n=45) and around 70% of respondents also said they would contribute content to the textbooks and/or volunteer for Siyavula (70.9%, n=39 and 70.5%, n=43 respectively) as a result of using the textbooks (see, e.g. Pitt & Beckett, 2014). Although the context, distribution, and use of Siyavula open textbooks is different to that of OSC (textbooks were distributed in hardcopy format across South Africa by the government, for example) it is important to note in both the instance of OSC and Siyavula at least the *intention* of educators who make use of OER to act differently as a result of using open textbooks.

## Impact of OER on Educators

“I simply swapped one textbook for OpenStax. Aside from assigning homework in an online system (not through OpenStax), I have not majorly changed my teaching practices.”

(Educator, Fall/Winter 2013)

“Not at all, except that I had to adapt to slightly different notation.”

(Educator, Fall/Winter 2013)

The self-reported impact of using an OER like OSC on educators varied from no reported or uncertain impact to triggering widespread transformation of practice. In some instances, as above, reported impact on educator practice was purely practical at the time of the survey: a matter of exchanging one textbook for another with changes to notation and/or online homework systems. In other instances, educators, as below, reported more radical impacts on their own

practice. Each response was thematically categorized and revealed a range of impacts on educator practice:

Table 3

*Thematic responses to the question “In what ways, if any, has using OpenStax College textbooks impacted on your own teaching practice?”*

Survey	Enables knowledge to be more up-to-date/boosts confidence	OSC materials make teaching easier	Enables innovation/changes pedagogical approach	Student welfare/cost key issue	Don't Know	None	Other	Total
2013	3	19	18	4	10	6	7	67
2014/ 2015	3	10	7	4	5	2	0	31
	6	29	25	8	15	8	7	98

There are two main impacts reported by educators on their own teaching practice: around 30% of educators in both surveys reported that using OSC materials makes their teaching easier<sup>xxv</sup> while around 25% of respondents in both surveys reported that using OSC had enabled innovation or changed their pedagogical approach. In the remaining reported cases impact was currently unknown (as they were just starting to use the text), OSC materials were directly benefitting the educator themselves in terms of confidence or up-to-date resources, or there were no reported impacts. A small number of educators made other comments in response to this question; e.g. gave feedback on the materials more generally.

Although these sets of surveys did not explicitly ask respondents how they reused or remixed material, a small number of educators indicated in response to other open textbox questions that they were combining OSC with proprietary, open or their other material, or indicated that they were planning to modify or remix the material at a future date, elsewhere in the survey. For example:

“I take relevant parts from the book and combine them with my own information. It helps me formulate questions and cuts my prep time because the information is useful and I can integrate it rather than rewriting it.”

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(Educator, Winter 2014/2015)

“My AP Biology students downloaded the PDF version of the OpenStax textbook and used it as their primary textbook. Our plan is to modify the textbook to better fit our curriculum next year.”

(Educator, Fall/Winter 2013)

Robinson, T. J. Fischer, L. Wiley, D. Hilton III, J. (2014) argue that copyrighted materials, including textbooks: “...contributes directly to the deskilling of teachers and their sense that the curriculum is beyond their control.” (p. 348). Open textbooks, on the other hand, are openly licensed and this means educators can use as much or as little of the book as they like and modify or integrate the material with other resources, if required.<sup>xxvi</sup> In contrast to copyrighted resources, our survey findings both support Robinson et al.’s contentions whilst revealing that openly licensed materials enable educators to take back some of that “control” which was perceived as lacking when seemingly tied into using a costly resource with students. A number of educators reflected on what this meant for their practice:

“I am able to think a little more creatively of what new experiences I can design for my students using resources in the text or other online resources. I think the text is a great foundation, but I don't feel constrained to shy away from employing other teaching tools for fear they might ask: "Well, if you were going to have us watch this video or do this online tutorial- why did we have to pay \$250 for the textbook?"

(Educator, Fall/Winter 2013)

Students can be exposed to a wider range of teaching styles than those contained in one set of resources through the use of OER, particularly if educators choose to remix content and draw together a range of sources to teach with. This is possible because any obligation to use a costly resource extensively is removed. Similarly, the following educator notes the “internal guilt” they felt from being contractually bound to use particular resources and the way in which they could show their empathy with students’ situation by taking action to alleviate the cost of textbooks:

“It allow[s] me to choose the best affordable materials in a class. I am not bounded to use big commercial publishers' products. I do not take bribe from them and it gives me freedom from internal guilt. It allows me to show how I care about the students in a practical and beneficial way.”

(Educator, Winter 2014/2015)

Similarly, another educator described how taking back “control” through using OSC involved breaking the “hold” that previous textbooks had and in some sense “liberated” them:

“I am teaching the way I want to teach, in the order and flow that I want. I am free of any text book. The book is a resource...The book no longer drives the course. I produce the curriculum. The book is my servant. I am not its servant.”

(Educator, Winter 2014/2015)

Although this paper does not focus on educator perceptions of the impact of OSC on students, some respondents noted the impact of changing practice on students in response to this question. Echoing the “excuse defying” comments of the fellow respondent noted earlier, the following educator notes that by using OSC materials, the relationship to, and between, students has changed.

“The availability of OpenStax textbooks online has allowed me to give more responsibility to my students. They cannot use the excuse that they left their book at home. Their textbook is always available and with our class web page, their assignments and handouts are also always available. Easy home access has given us more time to spend working on problems collaboratively in class. In the past when assigning problems as homework, if the student were to get stuck, he/she was stuck. Now, working collaboratively, students answer each other's questions and I am there to help as well.”

(Educator, Fall/Winter 2013)

This could be seen as a representative example of an impact of OSC on students that over 55% of educators in both surveys *strongly agreed* or *agreed* with: the idea that either OER/OSC in the classroom “develops learners’ increased independence and self-reliance” (58.1%, n=43 in 2013 and 56.8%, n=25 in 2014/2015).<sup>xxvii</sup> Providing resources that students can access 24/7, in perpetuity, and in multiple formats means students have no “excuse” not to participate whenever they choose to. Another response saw one educator reflect on their own practice, copyright issues, and a growing “interest” in creating OER:

“I appreciate the resources that OpenStax provides (e.g. PPT, quiz questions, videos) as well as the ease with which I can quickly find a full chapter written on a topic I am teaching or a very specific topic, along with media. I also really like to expose my students to other images and tables in addition to their textbooks' images, and OpenStax allows me to do this without worrying about copyrights. I find myself comparing my lecture notes that I am about to present to my students with OpenStax books, and am gaining an interest in developing more and more OERs myself.”

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(Educator, Fall/Winter 2013)

Finally, other educators told us how swapping to an OSC textbook triggered a transformation of their pedagogical approach or changed their teaching style:

“Changing to this new book gave me the impetus to flip my classrooms. After all, I was going to have to re-align material..... so why not take the plunge?”

(Educator, Fall/Winter 2013)

“I have become less instructive and I direct students to study the text if they want to know a bit more content.”

(Educator, Fall/Winter 2013)

More generally, but reflective of our findings above, are educator responses to a range of statements regarding the use of OER/OSC in the classroom. 67.1% of 2013 and 61.4% of 2014/2015 respondents agreed or strongly agreed with the claim that OER/OSC allowed them to better accommodate diverse learners’ needs (n=49 and n=27). Using OER enabled a significant number of educators to respond better to their students’ needs, presumably in some of the ways highlighted above with regard to use of OSC and possible impact on their own practice.<sup>xxviii</sup>

Arguably a consequence of this and, for example, student costs savings, it is of note that around 65% of 2013 and 69.8% of 2014/2015 respondents strongly agreed or agreed that use of OER such as OSC in the classroom increased learners’ satisfaction with the learning experience (66.2%, n=49 and 69.8%, n=30 respectively). The relationship between increased “control” over resources and teaching practices noted by a range of educators was also expressed by one educator in terms of “...greatly increased ... enjoyment...”<sup>xxix</sup> and it would be interesting to see if increased teacher satisfaction impacts positively on students and if so, how?

## Limitations to this Study

There are limitations to the approach that was adopted for our survey work. In the instance of the 2013 surveys incentivisation (two \$250 Amazon giftcards could be won in a prize draw), whilst increasing participation in the survey may have attracted respondents only interested in the prize draw or more inclined to give positive responses. Although there is no evidence for this bias, it is the case that educators who participated in all sets of surveys were self-selecting. To mitigate bias it was made clear that any information relating to the prize draw (e.g. name and email) was separated from survey responses before being passed to OSC for the prize draw.

An arguable limitation to this study is that it is both self-reported impacts of OER on educators and, particularly in the instance of future intended actions (e.g. it is more likely that someone will do X due to Y), there is no follow-up to see what occurred next or if instructors did, for example, use more OER in the future. Moreover, the research findings reported above only represent the experiences and thoughts of a small number of OSC users: as noted earlier there are 1,653 known adoptions as at mid-June 2015 (and likely hundreds more adoptions or use that is not reported to OSC) whereas our research makes use of data drawn from a total sample of 127 respondents.

The surveys also highlight further avenues for research, which were either omitted (e.g. the hypotheses on educator reflection) or not included (e.g. the length of time using OSC materials). Whilst some of these were explored in interview there is scope for improvement in the questionnaire structure. In addition, our research highlights the need for more in-depth, focused and systematic study of how educators use OER, their motivation for doing so and whether any pedagogical change occurs.

## Conclusion

Open textbooks such as OSC have a positive impact on both educators and students. The findings above show that educators report increased student participation as a result of using OSC, in addition to cost savings. Whilst some educators are deliberately searching for open material themselves, for others personal recommendation and a “trusted source” of open material appears to act as a shortcut to finding resources that are of high quality. In the instance of the OSC users we surveyed, there appears to be a potential “domino” effect in terms of successful use; almost all of our survey respondents were more likely to recommend using OSC materials to others as a result of using the books themselves. This finding and the wider range of “advocate” style behaviour that our survey results revealed show the potential of even a brief introduction to a resource such as OSC. However, further focused longitudinal research with a broader range of participants would be needed to develop these initial findings.

Calculating the cost of OER adoption at an institutional level remains complex and there was uncertainty amongst educators we surveyed regarding the calculation of institutional cost savings. Providing tools such as those highlighted earlier, and promoting the use of these, would help gauge potential costs savings and provide useful, localised evidence to help initiate further discussion with regard to policy change.

In summary, the above results show that OER such as OSC enables a majority of educators to better respond to student needs, which can make teaching easier, and in some cases, engender a change of pedagogical approach. The educators surveyed believe that OER such as OSC are saving students money and perceive an increase in student satisfaction. The role of personal introduction to OER also appears an important one, particularly when recontextualised within the findings related to “advocate” style behaviour reported above.

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<sup>i</sup> Findings from the OSC 2013 survey and selected findings from the 2014/2015 survey were reported previously in Pitt, 2015 and Pitt, 2014a

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- <sup>ii</sup> See, for example: <http://tinyurl.com/p5qowgm> and <http://chronicle.com/article/7-in-10-Students-Have-Skipped/128785/> (accessed: 26 March 2015)
- <sup>iii</sup> Note that this number reflects those institutions that have advised OSC that they are utilizing the textbooks and does not reflect the total number of institutions that utilize in whole or part OSC material
- <sup>iv</sup> Personal correspondence with David Harris of OSC, email dated 18 June 2015
- <sup>v</sup> Although not included in this paper, for the results of the OSC Winter 2014/2015 survey in relation to quality see Pitt, 2015
- <sup>vi</sup> See <https://openstaxcollege.org/news/using-our-books-fill-out-a-survey-to-win-250> and <https://openstaxcollege.org/news/we-need-your-help-complete-the-oer-research-hub-survey-from-the-open-university>
- <sup>vii</sup> Two \$250 Amazon vouchers were offered in a prize draw administered by OSC
- <sup>viii</sup> See for example Pitt, R. (2014b). These interviews were released publically as part of the *Open Textbook Research Week*, which was devised to promote and disseminate the open textbook research findings to date in June 2014.
- <sup>ix</sup> Table taken from OERRH blog post and developed to include 2014/2015 breakdown, see Pitt, R. (2014a)
- <sup>x</sup> For detail on when textbooks were released and their edition version see (click on title of book to be taken to detail and publication date): <https://openstaxcollege.org/staxdash>
- <sup>xi</sup> 41.6% of 2013 survey respondents had used the *College Physics* textbook with their students (n=32) whilst 62.3% currently used the textbook with their class (n=48). Similarly, 10.4% of educators from the 2013 survey reported previously using the OSC *Introduction to Sociology* textbook (n=8) whilst 15.6% currently use the textbook with their students (n=12).
- <sup>xii</sup> This calculation is based on use of the *College Physics* and *Introduction to Sociology* textbook, which were released in June 2012 by OSC and the launch of the email adopter list survey in mid-September 2013.
- <sup>xiii</sup> As noted above this question was aligned to our informal learner hypotheses but provided some useful insights in this context.
- <sup>xiv</sup> Similarly personal recommendation was an important factor for our survey respondents with 59.2% of respondents in 2013 and 82.6% in 2014/2015 reporting that this was a factor that would make them more likely to choose one OER over another (n=45 and n=38, respectively).
- <sup>xv</sup> Even if not searching for open resources, a Google search carried out when writing this paper for “Physics textbooks” turned up OpenStax College as the number one result.
- <sup>xvi</sup> A peer-reviewed analysis of these findings is pending.
- <sup>xvii</sup> See for example curated data on financial savings on the OERRH Impact Map: <http://oermap.org/hypothesis/583/hypothesis-f-finance/>
- <sup>xviii</sup> This group of educators represents all those surveyed who were asked this question and includes OSC educators.
- <sup>xix</sup> See for example curated data on financial savings on the OERRH Impact Map: <http://oermap.org/hypothesis/583/hypothesis-f-finance/>
- <sup>xx</sup> See, for example, the Open Education Group’s Calculator: <http://openedgroup.org/calculator/index.html> and the *OER Adoption Impact Explorer* (released: February 2015) <http://impact.lumenlearning.com> and for background: <http://openedgroup.org/archives/248>. OSC also have their own cost savings calculator available for use: <https://openstaxcollege.org/administrators>
- <sup>xxi</sup> A similar set of questions also featured in the 2013 survey with Siyavula educators
- <sup>xxii</sup> Now known as OpenStax CNX (see: <https://cnx.org>). As noted earlier the Connexions platform was undergoing a revamp in the run up to and during the survey: in both instances of questions relating to Connexions a higher number of respondents told us they “Didn’t Know” when compared to other questions. This could be for a number of reasons, including less active promotion of CNX whilst the platform overhaul was taking place.

<sup>xxiii</sup> The survey also asked specifically about Creative Commons licenses within this context: 39.5% of respondents in 2013 and 82.2% in 2014/2015 reported this factor making it more likely that they would select a particular resource when looking for OER (n=30 and n=37, respectively)

<sup>xxiv</sup> The term OER was not used in this context as it is not well-known in South Africa. For more see Pitt, R. & Beckett, 2014.

<sup>xxv</sup> Responses ranged from concrete examples to positive statements about the content that could be described as indicative of this (rather than generic statements which were classed as “Other”).

<sup>xxvi</sup> OSC textbooks are CC-BY licensed (see: <https://openstaxcollege.org/administrators>)

<sup>xxvii</sup> Note that the respondent cited above “strongly agreed” with this statement.

<sup>xxviii</sup> Further research would be needed to understand exactly what the experiences of educators were and how they were more able to “better accommodate” a wider range of students via OER.

<sup>xxix</sup> “Greatly increased my enjoyment in teaching physics as I can personalize lessons to match my own interests and our lab facilities...” (Educator, Fall/Winter 2013)