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Article abstract

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Cost-Savings Achieved in Two Semesters Through the Adoption of Open Educational Resources



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Abstract

Textbooks represent a significant portion of the overall cost of higher education in the United States. The burden of these costs is typically shouldered by students, those who support them, and the taxpayers who fund the grants and student loans which pay for textbooks. Open educational resources (OER) provide students a way to receive high-quality learning materials at little or no cost to students. We report on the cost savings achieved by students at eight colleges when these colleges began utilizing OER in place of traditional commercial textbooks.

Keywords: Open educational resources; open textbooks; electronic textbooks; open access

Introduction

For many post-secondary students and professors in the United States, it would be difficult to imagine the school experience without commercial textbooks. Textbooks are a staple of American college life even though some studies indicate that students read the textbooks less frequently than their instructors might desire (Berry et al., 2010). It is unfortunate that textbooks are underutilized, particularly when they are so costly. The continuing increases in textbook costs are symptomatic of 40-year trends of rising educational costs (Baumol, 1996; Privateer, 1999). The United States Government Accountability Office estimated that textbooks cost the average student \$900 (U.S.D.) annually (2005). A study conducted by the Student Public Interest Research Group calculated that over the past twenty years textbook costs have increased at a rate four times higher than inflation (Allen, 2010).

The rising cost of textbooks may disproportionately harm students in community colleges, where tuition is generally lower and students may face greater financial difficulties. In their longitudinal study of graduating high school seniors, Provasnik and Plenty (2008) found that individuals from lower socioeconomic statuses were more likely to postpone college enrollment, and that those who did enroll in college were more prone to choose a community college than their wealthier peers. Another study found that over half of community college students (55%) are from the two lowest income quartiles compared with 38% of public 4-year students (Bailey, Jenkins, & Leinbach, 2005).

In some cases, textbooks can account for a large proportion of student educational expenditures and debt. For example, in the state of California during 2007-2008, textbooks accounted for 59% of the total cost of attending community college (Goodwin, 2011). Students with financial difficulties may choose to forgo the purchase of textbooks due to the high financial burden, particularly since textbooks are optional but tuition fees are not (Buczynski, 2007). Economists have argued that textbook costs in higher education have become nearly unavoidable in the commercial publishing model (Carbaugh & Ghosh, 2005). But Buczynski notes,

Faculty cannot teach successfully in classroom environments, whether face to face or online, with increasing numbers of students who do not have access to required readings and other learning materials. There is a gap between the business models employed by textbook publishers and student expectations for access. (2007, p. 174)

One way that this gap can be bridged is through the utilization of open educational resources (OER). In 2002, UNESCO convened the Forum on the Impact of Open Courseware for Higher Education in Developing Countries. On this occasion, Saul Fisher from the Andrew W. Mellon Foundation recommended the group adopt the

phrase “Open Educational Resources” to describe their proposed model of sharing educational materials. In adopting this terminology, the following definition was proffered: “The open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes” (UNESCO, 2002, p. 24).

In the intervening years much has been done to bring to pass the vision stated at that 2002 UNESCO meeting. For example much OER has been created, including courses, textbooks, videos, journal articles, and other materials that are typically available online and are licensed in such a way so as to allow for reuse and revision to meet the needs of teachers and students (Johnstone, 2006; Bissell, 2009; Hewlett, 2013; D’Antoni, 2009; Downes, 2007).

For example, Ravid et al. (2008) identified how Wiki textbooks might assist student learning both by employing digital technologies and lowering costs. Platforms such as Connexions have shown remarkable potential to harness technology and OER to reduce textbook costs for students (Baker, et al., 2009). Initiatives like Carnegie Mellon University’s Open Learning Initiative (OLI) and growing numbers of departments and instructors using OER to replace traditional publisher-produced textbooks make the continued study of OER critical (Johnstone, 2006). In some instances, governments have sponsored the development of OER. Caswell (2012) describes how Washington State community and technical colleges have created an open course library intended to help lower educational costs for students throughout the state. OER may provide substantial cost savings to students without negatively impacting student learning (Hilton & Wiley, 2011; Allen, 2010).

Researchers and practitioners have invested significant financial, temporal, and intellectual resources into developing and distributing OER (see, for example, Fleming & Massey, 2007; Baker, et al., 2009). While OER production and consumption still involves significant costs, the potential cost-savings benefits to students are important to continue to explore. Utilized in the classroom, OER can provide powerful tools for teaching and learning. Studies indicate that a growing number of OER are becoming available for use in the classroom (McKerlich, et al., 2013). Limited research has been done regarding the efficacy of using OER instead of traditional resources. Shepperd et al. (2008) found that students who utilized electronic textbooks performed just as well as their peers who used traditional textbooks, a finding replicated by Rockinson-Szapkiw et al. (2012). Currently available studies indicate that student learning is not negatively impacted when OER are substituted for traditional learning materials (Hilton & Laman, 2012; Wiley et Al., 2012; Hilton et al., 2013).

Context of the Study

The context for this study is an open education initiative named Kaleidoscope Open Course Initiative (KOCI). The Kaleidoscope Open Course Initiative (KOCI) is a Next Generation Learning Challenges-funded project with three goals. KOCI was designed to (1) eliminate textbook costs as a barrier to student success, (2) improve the quality of course designs in order to increase student success, and (3) create a collaborative community to share learning and investment in the project. Eight community colleges and state colleges agreed to work together to develop new course designs and textbook replacements that exclusively use OER. Teachers from two or three schools collaborated to identify, adapt, and when necessary create OER materials for common courses that were taught at each of their schools. As part of the initiative each course was taught both by the colleges that participated in their development and also by some other KOCI colleges who had not participated in the creation of that specific course. The colleges also offered other sections using traditional textbooks. The decision of whether a particular section utilized the KOCI OER materials or traditional textbooks was determined by teacher or department preference at each college.

At the time of this study, KOCI included eight colleges or community colleges (the initiative has since grown to over 20 schools). This study focuses on seven of the original KOCI schools, as no data were available for the eighth. Our study was based on the work done at the following colleges: Cerritos College (Norwalk, CA, 22,000 students); Chadron State College (Chadron, Nebraska, 3,000 students); Mercy College (Dobbs Ferry, New York, 10,000 students across four campuses); College of the Redwoods (Eureka, California, 10,000 students); Santa Ana College (Santa Ana, California, 18,000 students); Santiago Canyon College (Orange, California, 10,000 students); and Tompkins Cortland Community College (Dryden, New York, 3,500 students).

These colleges worked together in 2010 and 2011 to replace traditional textbooks with OER across their multiple campuses. In a pilot study during the 2011-2012 academic year, KOCI schools taught the following courses that utilized OER in place of commercial textbooks: Intermediate Algebra, Developmental Reading, Developmental Writing, English Composition I, Introduction to Psychology, Business Fundamentals, Physical Geography, Chemistry Fundamentals, and Biology Fundamentals. Each school chose between one and four of these courses to implement in the fall 2011 and spring 2012 semesters. Across the seven colleges, in the fall 2011 and spring 2012 semesters there were 14,606 total enrollments in these classes. Of those, 3,867 enrollments were in sections that utilized OER, and 10,739 were for parallel sections that used commercial textbooks. Of the 256 teachers we tracked, 194 of them exclusively taught classes that did not use OER. Forty-eight of them exclusively taught classes that did. Fourteen of them taught both OER and non-OER classes.

Research Question

As stated previously, high costs of textbooks present a barrier to learning for many students in the United States. One of the most significant benefits of using OER is that students and those who support them (including taxpayers) are able to save money that would otherwise be spent purchasing textbooks. In the present study we seek to discover precisely how much students in KOCI courses potentially saved as a result of the course materials being freely available. In addition, we examined how much money students in non-KOCI versions of the course potentially spent on their textbooks. This represents an important attempt to quantify savings that result when OER are employed. In other words, OER proponents have claimed that OER will save students money; our purpose is to examine this claim by calculating savings that occurred at seven different colleges across the United States when courses utilizing OER were implemented.

Method

In order to calculate the savings achieved by students in KOCI, and the amount spent by students in non-KOCI classes, we needed to determine how much the traditional textbooks cost in these courses, as well as calculate the number of students enrolled in each type of course. While there are a variety of approaches that could be utilized to analyze costs, we chose to use a straightforward method of calculating average costs based on actual book costs as reported by bookstores located on the campuses of the KOCI colleges. Although textbook cost data were not gathered during the 2011-2012 school year, we estimated these costs by visiting each school's bookstore website, identifying each teacher's book list for the spring 2013 semester, finding the prices of each textbook (usually directly from the bookstore website, but occasionally from Amazon or other sources), and creating a list that enumerated each teacher and the prices of their required textbooks.

For example, to identify the textbook cost for students attending Professor R's English class, we would go to the bookstore website for her school, find her booklist (see Figure 1), and sum the total costs of her books based on the prices on the bookstore website. In order to standardize costs across colleges, we always selected the price of a new book (in part because used books were not always available, see Figure 1, below), and only included required (not optional) texts. When digital books were available, we selected the digital book price. When price comparisons were available from the bookstore websites we used the cheapest price of a new text. In instances when textbooks were out of stock we obtained the cost information from www.amazon.com (again, the cheapest price of the new text).

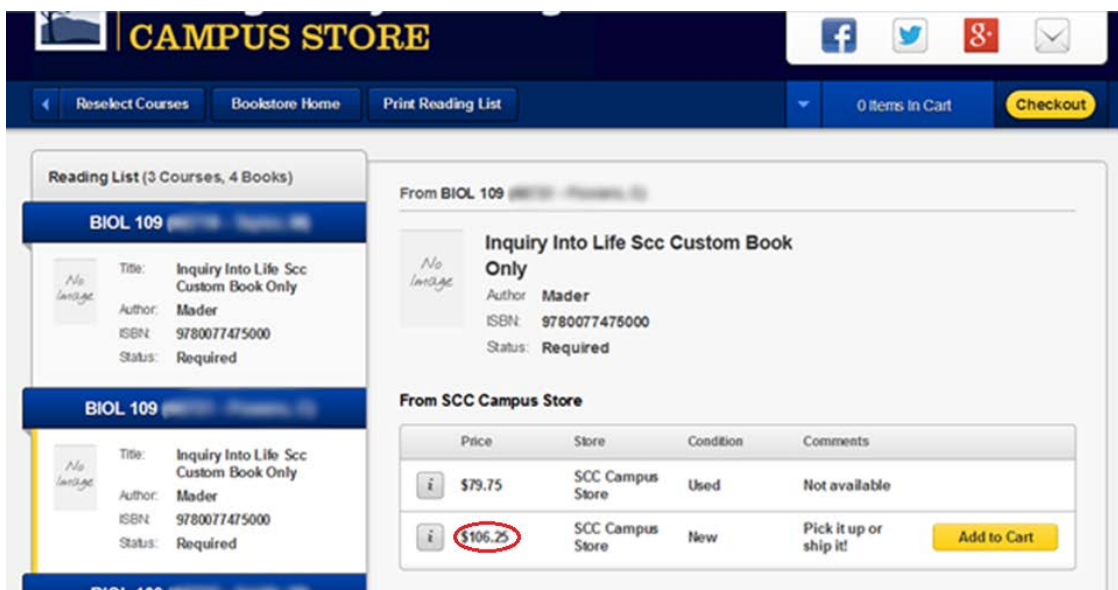


Figure 1. Example of finding textbook cost by teacher.

Results

There are many ways in which one can approach the data we obtained. We begin by examining the costs of textbooks by college. We present the costs of each course in which OER materials were available. As mentioned previously, the OER versions of the course had zero textbook costs; below, we enumerate the costs in those sections using traditional textbooks.

Table 1 shows the costs of texts at Cerritos, which had five KOCI classes: Business Fundamentals, English Composition I, Physical Geography, Developmental Reading, and Developmental Writing. The average textbook costs we calculated by summing together the costs of all required books per section and then divided by the total number of sections. These averages were weighted according to the number of students in each section (e.g., classes with high enrollment would affect cost data more than classes with low enrollments).

Table 1

Cerritos College Costs per Course

Class	Average textbook cost for non-KOCI sections	Students enrolled in KOCI sections	Students enrolled in non-KOCI sections	Potential amount saved by KOCI students	Potential amount spent by non-KOCI students
Business Fundamentals	\$42.97	944	44	\$40,563.68	\$1,890.68
English Composition I	63.11	317	2,943	20,005.87	185,732.73
Physical Geography	102.00	363	731	37,026.00	74,562.00
Developmental Reading	36.54	49	589	1,790.46	21,522.06
Developmental Writing	90.14	54	408	4,867.56	36,777.12
Total	\$65.93 (average)	1,727	4,715	\$104,253.57	\$320,484.59

As illustrated in Table 1, textbook costs per class ranged from \$36.54 (Reading) to \$102.00 (Geography). Across the five classes, textbooks cost on average \$65.93 per course. There were 1,727 students enrolled in KOCI classes at Cerritos. Those students potentially saved a total of \$104,253.57 over the two semesters. There were 4,683 students enrolled in classes similar to those using KOCI texts; however, these classes used traditional textbooks. Those students potentially spent a total of \$320,484.59 on textbooks during this same time period. Table 2 shows the text costs for Chadron State College, which had two KOCI classes: Introduction to Psychology and Developmental Writing.

Table 2

Chadron State College Costs per Course

Class	Average textbook cost	Students enrolled in KOCI sections	Students enrolled in non-KOCI sections	Potential amount saved by KOCI students	Potential amount spent by non-KOCI students
Intro. to Psychology	\$163.19	27	55	\$4,406.13	\$8,975.45
Developmental Writing	\$24.00	48	7	1,152.00	168.00
Total	\$107.31 (average)	75	62	\$5,558.13	\$9,143.45

As shown in Table 2, there were two averages for textbook costs: \$163.19 for Psychology and \$24.00 for Writing. The average text cost at Chadron is \$107.30, largely because of the high number of students enrolled in the non-KOCI sections of Introduction to Psychology. The 75 students enrolled in KOCI sections at Chadron potentially saved \$5,558.13. The 62 students enrolled in similar non-KOCI sections of these classes potentially spent \$9,143.45.

Mercy College offered one KOCI course: College Algebra. The average textbook cost for taking a non-KOCI College Algebra class at Mercy College was \$170.00. During the 2011-2012 school year, 50 students enrolled in KOCI sections of this class and they potentially saved \$8,500.00. Additionally, there were 136 students enrolled in non-KOCI sections of this class, who potentially spent \$23,120.00 buying their books for the class.

Table 3 illustrates the textbook costs for College of the Redwoods, which had three KOCI classes: Biology Fundamentals, Introduction to Psychology, and Developmental Reading.

Table 3

College of the Redwoods Costs per Course

Class	Average textbook cost	Students enrolled in KOCI sections	Students enrolled in non-KOCI sections	Potential amount saved by KOCI students	Potential amount spent by non-KOCI students
Biology Fundamentals	\$148.43	154	306	\$22,858.22	\$45,419.58
Intro. to Psychology	174.19	61	806	10,625.59	140,397.14
Developmental Reading	53.75	27	119	1,451.25	6,396.25
Total	\$154.21 (average)	242	1,231	\$34,935.06	\$192,212.97

As shown in Table 3, the textbook averages at Redwoods ranged from \$53.75 (Reading) to \$174.19 (Psychology). On average, across these three classes, textbooks cost \$156.14. There were 242 students enrolled in KOCI classes at the school, who potentially saved \$34,935.06. There were 1,231 students enrolled in similar non-KOCI classes at the school. Those students potentially spent \$192,212.97 on textbooks.

Table 4 shows the textbook costs for Santa Ana College, which had three KOCI classes: Business Fundamentals, Intermediate Algebra, and English Composition I.

Table 4

Santa Ana College Costs per Course

Class	Average textbook cost	Students enrolled in KOCI sections	Students enrolled in non-KOCI sections	Potential amount saved by KOCI students	Potential amount spent by non-KOCI students
Business Fundamentals	\$37.00	124	126	\$4,588.00	\$4,662.00
Intermediate Algebra	103.50	42	34	4,347.00	3,519.00
English Composition I	64.38	26	538	1,673.88	34,636.44
Total	\$60.03 (average)	192	698	\$10,608.88	\$42,817.44

The textbook averages at Santa Ana College ranged from \$37.00 (Business) to \$103.50 (Algebra). The average price of textbooks in these three classes was \$60.03. The 192 students enrolled in KOCI classes at the school potentially saved \$10,608.88. There were 698 students enrolled in similar classes that used traditional textbooks. Those students potentially spent \$42,817.44.

Santiago Canyon College offered two KOCI courses: Biology Fundamentals and Intermediate Algebra. However, no data for accompanying non-KOCI classes were obtained for the Intermediate Algebra course, thus only the data for Biology Fundamentals could be used. The average textbook cost for this class was \$135.17. There were 145 students enrolled in this KOCI class. Those students potentially saved \$19,464.48 because they did not have to pay for a textbook; in contrast the 434 students who were enrolled in a similar Biology Fundamentals class potentially spent \$58,663.78 on textbooks for this class.

Table 5 shows the textbook cost data for Tompkins Cortland Community College, which has four KOCI classes: Principles of Biology II, Intermediate Algebra, Introduction to Psychology, and Academic Writing I.

Table 5

Tompkins Cortland Community College Costs per Course

Class	Average textbook cost	Students enrolled in KOCI sections	Students enrolled in non-KOCI sections	Potential amount saved by KOCI students	Potential amount spent by non-KOCI students
Biology Fundamentals	\$207.00	24	104	\$4,968.00	\$21,528.00
Intermediate Algebra	142.35	32	797	4,555.20	113,452.95
Intro. to Psychology	67.36	135	988	9,093.60	66,551.68
English Composition I	119.51	20	602	2,390.20	71,945.02
Total	\$108.99 (average)	211	2,491	\$21,007.00	\$273,477.65

As illustrated in Table 5, textbook costs ranged from \$67.36 (Psychology) to \$207.00 (Biology) at Tompkins Cortland. The average cost of a textbook across these four classes was \$108.99. The 211 students enrolled in KOCI classes potentially saved \$21,007.00. The 2,491 students enrolled in classes using traditional textbooks potentially spent \$273,477.65.

Another way to approach these data is to examine how much each course cost across the several schools. Table 6 shows the average cost of textbooks by subject.

Table 6

Text Costs by Subject

Course examined	Colleges where taught	Average textbook cost across courses	Students enrolled in KOCI sections	Students enrolled in non-KOCI sections	Potential amount saved by KOCI students	Potential amount spent by non-KOCI students
Biology Fundamentals	Redwoods, Santiago, Tompkins Cortland	\$148.28	323	844	\$47,894.44	\$125,148.32
Business Fundamentals	Cerritos, Santa Ana	41.76	1,068	170	44,599.68	7,099.20
Developmental Reading	Cerritos, Redwoods	39.74	76	708	3,020.24	28,135.92
Developmental Writing	Cerritos, Chadron	83.10	102	415	8,476.20	34,486.50
English Composition I	Cerritos, Santa Ana, Tompkins Cortland	71.16	363	4,083	25,831.08	290,546.28
Intermediate Algebra	Mercy, Santa Ana, Tompkins Cortland	144.36	124	967	17,900.64	139,596.12
Introduction to Psychology	Chadron, Redwoods, Tompkins Cortland	115.85	223	1,849	25,834.55	214,206.65
Physical Geography	Cerritos	102.00	363	731	37,026.00	74,562.00
Total		\$90.61 (average)	2,642	9,767	\$210,582.83	\$913,780.99

As illustrated in Table 6, there were nine subjects taught using KOCI materials across the seven different schools. Per course cost averages ranged from \$41.76 (Business) to \$148.28 (Biology).

How much money did students collectively potentially save or spend across these KOCI sections? We used the data from the above tables to create a comparison of the average textbook costs in each of the seven KOCI schools that are the focus of this study, as well as the amounts potentially saved or spent by students in these colleges. The total average textbook costs averaged across all non-KOCI classes at each of these schools was \$90.61. There were 3,734 enrollments in KOCI classes. Those students potentially

saved a total of \$338,337.74 because they did not have to buy texts for their KOCI classes. There were 10,004 enrollments in non-KOCI sections of these classes; these students potentially spent \$906,462.44 on textbooks for these classes. Note that these numbers for KOCI and non-KOCI enrollments are higher than those displayed in Table 6, for reasons discussed below.

Discussion

The results of this study were fairly straightforward. Our purpose in the present study was to quantify the amount of money students in KOCI courses potentially saved as a result of their course materials being freely available. In addition, we wanted to understand how much money students in non-KOCI versions of the course potentially spent on their textbooks. The amount saved per textbook varied per school, in part because of the different costs of textbooks utilized by each department or individual. For example, a textbook for an introductory course in psychology at College of the Redwoods cost \$174.19, while the average cost of a textbook for the same course at Tompkins Cortland Community College was \$67.36. This difference is an indicator of the variance in commercial textbook costs.

While there are limitations (discussed below) to our ability to precisely identify the amount of money potentially saved by students, we were able to calculate the average cost per textbook across these courses. The average cost per textbook that we calculated (\$90.61) is in harmony with other studies on textbook costs (such as U.S. Government Accountability Office, 2005, cited previously). Because we were able to identify students enrolled in sections utilizing open materials, we could calculate the amount of money potentially saved by these students. When the amount potentially spent by non-KOCI students is combined with the amount potentially saved by KOCI students, the resulting cost savings are greater than one million dollars for one academic school year. This significant cost savings suggests that the claim that OER can reduce costs for students is valid.

We acknowledge there are additional costs not accounted for, in that the original creation of many of the OER which were later used in KOCI was funded by grants from foundations or governments. Thus some of the costs described in this article have been shifted from students to grant-issuing organizations. However, it is also important to note that these development costs are one-time costs, as opposed to the ongoing costs faced by students semester after semester. Also, these one-time development costs must be amortized across all uses by all students over all terms, both within and without KOCI. We did not include these costs in our analyses. Additional costs that are not accounted for in our cost estimate include the training and coaching in OER implementation that was provided to KOCI faculty through the grant, and costs potentially incurred if students choose to print out the OER which are freely available online.

One limitation in this study is that it is difficult to predict the ways in which students choose to obtain their books. We calculated prices based on the cheapest new or digital copy. However, some students would have borrowed or rented textbooks, not purchased them, or obtained a used copy. Throughout the paper we described “potential” savings in order to acknowledge that some students choose not to purchase textbooks. This non-purchasing behavior would affect the amount of savings that occurred.

There were also some limitations to obtaining textbook cost data using the method described above. Since this aspect of the research was done *ex post facto*, we could not be certain that the books we found for spring 2013 always matched the books that were employed in the fall 2011/spring 2012 semesters. In some instances, textbook costs could not be determined because of a school’s current use of OER. Most notably, the Math 116 class at Mercy College currently only uses OER texts; therefore we used historical reports from faculty members to arrive at the price of the Mercy Math textbooks. The Math classes at Redwoods and the Writing and Reading classes at Chadron currently only use OER texts; we were unable to find historical cost information on these texts, and excluded them from the cost average. While the costs of these textbooks was excluded from creating an average textbook price, the number of students participating in these courses was added into our overall cost-savings figure, thus explaining the difference between the numbers in Table 6 and the overall numbers reported in the paragraph below it.


When looking for textbook costs, we did so at the teacher level. For example, if we knew that Teacher X at Santa Ana taught a non-KOCI section of Algebra, we specifically looked for her by name on the school website to determine how much textbooks in her class cost (as different teachers often require different textbooks). However, in some instances, we could not identify specific textbook costs for a specific teacher. For example, four of the schools’ bookstore websites (Redwoods, Tompkins Cortland, Mercy, and Cerritos) did not identify books by teacher; rather they are identified by course section number. Because only 2013 books were available (and we had 2012 section numbers) we were not able to specifically identify which teacher used which books. In these cases, we determined the cost of each section of a specific class listed on the bookstore website for the spring 2013 semesters and averaged the costs of books required by those sections. For example, since you cannot search for textbooks by teacher at Cerritos College’s bookstore website, to find the textbook cost for Professor Y’s English 52 class at Cerritos, we went to Cerritos’s bookstore website, found the textbook cost for each section of English 52 in the spring 2013 semester, and took an average of those textbook costs. As illustrated in Figures 2 and 3 there was sometimes a wide variety in costs per section. For example, section 20128 only required one book (*The Great Gatsby*) while section 20235 required two textbooks, which were much more expensive. The costs of the textbooks of these and other sections of English 52 were averaged together and non-Kaleidoscope classes were assigned the average per-section cost of the non-KOCI classes. Similarly, in instances in which a teacher was not teaching during spring 2013, we used the average textbook cost among the other sections at his

or her school for that particular class to assign textbook costs. While these limitations exist, and we acknowledge that these data are not necessarily generalizable, these data provide a glimpse into actual textbooks faced by college students in the United States.

ENGL: 52: 20128
1 Required Material(s)

Choose - Please select from the following...
 Select 1 of 2 Choices

CHOICE 1

Great Gatsby
 Author: Fitzgerald
 Edition:

 Buy New [In-Stock] \$15.00
 Buy Used [In-Stock] \$11.25
 Rent New [In-Stock] \$11.85
 Due Date 08/20/2013
 Rent Used \$6.23
 [In-Stock]
 Due Date 08/20/2013

CHOICE 2


F. Scott Fitzgerald: The Great Gatsby (Digital Edition)
 Author: Fitzgerald
 Edition:
 Print ISBN: 9780684163253
 Access: Downloadable
 Format: Adobe Digital Editions
[Click for Details](#)

 Buy Digital **\$12.99**
 [In-Stock]


Figure 2. Example 1 for finding an average section textbook cost.

Books
 Textbooks & Course Materials
 Digital Textbooks
 General Books

Course Material(s)

ENGL: 52: 20235
2 Required Material(s)

Required Material(s)
 Select All - Automatically selects lowest price(s).

EasyWriter: Pocket Reference (2009 MLA & 2010 APA Upd)
 Author: Lunsford
 Edition: 4th

 Buy New [In-Stock] \$30.50
 Buy Used **\$23.00**
 [In-Stock]


MERCURY READER CERRITOS COLLEGE
 Author: Kayser
 Edition:

 Buy New [Available to Order Will Arrive Soon] **\$22.50**

Figure 3. Example 2 for finding an average section textbook cost.

Conclusion

Open educational resources have a large potential to save students, as well as the parents and taxpayers who support them through grants and loans, significant amounts of money. We found that the average textbook cost across all non-KOCI classes at the seven KOCI schools we studied was \$90.61, meaning that a full-time student would spend over \$900 on textbooks each year.. Broad adoption of OER makes that cost zero for every student impacted. If these savings were realized by only 5% of the 20,994,113 students in the United States who enrolled in college during the 2011 fall semester (National Center for Education Statistics, 2013), the total savings would be approximately one billion dollars per year.

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