**Affordable Learning Georgia
Open Mathematics in Action**

**Final Report**

**Date: May 15, 2017**

**Grant Number: 116**

**Institution Name: Coastal College of Georgia (Georgia Highlands College)**

**Participants: Libby Gore, Camille Pace, and Laura Ralston**

**Course Name(s) and Course Number(s): MATH 1111, College Algebra**

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|  | **Summer 2016 (Pilot)**  | **Fall 2016** | **Spring 2017** |
| **Average Number of Students per course section** | **21 students** | **27 students** | **24 students** |
| **Number of course sections affected by implementation** | **2 (Web-Based)** | **39 sections (34 face-to-face on 5 different campuses/instructional sites, 2 hybrid, 3 web-based)** | **29 sections (26 face-to-face on 5 different campuses/instructional sites, 3 web-based)** |
| **Total Number of Students Affected by Implementation** | **42 students** | **1062 students** | **686 students** |

**1. Narrative**

During Spring 2016, a subcommittee of Mathematics faculty reviewed the available options for Open Educational Resource textbook and online homework management system. Based on the subcommittee’s review, OpenStax *Algebra and Trigonometry* for the 2016-2017 academic year paired with WebAssign, an online homework management system was adopted by the entire Mathematics division. During Summer semester 2016, Libby Gore piloted two sections of MATH 1111, College Algebra, in a web-based format using the OpenStax textbook and WebAssign. During the pilot, Mrs. Gore created hour-long video lectures, fill-in lecture notes, Webassign homework assignments and practice exams. Based on feedback from Mrs. Gore, the initial implementation was seemingly a positive experience for students. Anecdotally, Mrs. Gore reported that overall performance in the web-based MATH 1111, College Algebra was improved. In Fall 2016, the piloted course and corresponding materials were implemented in all face-to-face, hybrid, and web-based sections of MATH 1111, College Algebra. All full-time and adjunct faculty Instructors were provided all the material in a master course shell in D2L and a master set of WebAssign homework assignments, along with a training session. As Mrs. Gore fielded numerous questions and concerns from instructors during the semester, she created “how-to” videos for such topics as how to copy the master course in D2L, a tour of the master course in D2L, how to create a section in Webassign, how to copy assignments within Webassign, and how to schedule an assignment in Webassign.

As part of qualitative analysis, faculty were asked to respond anonymously to a survey with the following questions:

* In which course(s) have you used Open Educational Resource (OER) textbook(s)?
* What positive experiences have you had while transitioning to OER textbook(s)?
* What challenges have you faced while transitioning to OER textbook(s)?
* Has there been an impact on your instruction while transitioning to OER textbook(s)?
* Please comment on the impact OER textbook(s) has had on your instruction.
* Has there been an impact on your students while using OER textbook(s)?
* Please comment on the impact of OER textbook(s) on your students.
* What, if anything, would you do differently the next time using OER textbook(s)?
* What positive experiences have you had while transitioning to Webassign?
* What challenges have you faced while transitioning to Webassign?
* How many semesters have you used OER textbook(s) with Webassign?

Link to the survey: <https://docs.google.com/forms/d/1Un8Ys3hiGnYHKgcVr9RyJlTtAPUkJylcLDJ39TkzMRA/edit#responses>

For faculty, the transition has had mixed results. Based on the survey of faculty using the OER materials and Webassign, 44% reported a mixed impact on their instruction and 33% reported a negative impact. Some of their comments, positive and negative, are below:

* “All student had the book. Almost all students purchased Webassign early in the semester. The difficulty level of the book’s explanations forced students to engage from the beginning of the course. Webassign’s questions were more challenging than MyMathLab’s questions, which I thought was good”
* “The price and instant availability are huge selling points. The actual interface is easy to use and appealing to the eyes.”
* “The College Algebra textbook is not very helpful for students looking for extra examples.”
* “Difficult to use for many reasons. Mistakes. No review problems at the ends of the chapters. The problems do not have numbers. The pages do not have numbers unless you download and then the solutions don’t pop up. Very difficult to reference anything in the book. Probably too few problems.”

Furthermore, faculty felt the impact on students was mixed as well. Approximately 38% indicated a mixed impact and 25% reported a negative impact. Faculty stated:

* “Students are excited to learn on the first day of class that the text is free, and the Web Assign didn't cost as much as other programs. Students don't tend to use the book much outside of class.”
* “They do not like the text or Webassign”
* “Cheap is good for the students but the lack of quality is not.”

Even with the training and instructor-created supplemental materials provided, there was a steep learning curve for some faculty. The lack of publisher-created supplemental materials, like a test generator, and the limited question bank within Webassign, are two of the most common complaints. Furthermore, in Fall 2016, the initial content and sequencing was awkward. An adjustment to the sequencing and content was made for Spring 2017; however, the overall results were still mixed. Grade comparison results are below in Section 3b.

The course was designed by one instructor, specifically for a web-based format. In the future, it could be better to have several instructors work on it for a broader view. Another idea is to add videos to guide instructors through best practices in using the material and how to improve student retention in the course.

Although, the MATH 1111, College Algebra, course redesign using OER materials had mixed results, the course will continue to run for the 2017-2018 academic year. Continued monitoring of DFW rates will occur. Continued use will be reevaluated in Spring semester 2018

**2. Quotes**

On the first day of class, when the instructor announces that the textbook is an open educational resource or free, the students’ initial response is overwhelming positive, almost excitement. However, when seeking comments related to the OER textbook, the response is, unfortunately, not so positive, as these quotes indicate:

* When asked what is missing from this course (MATH 1111), a student responded

 “A good textbook. The open source is not easily understood.”

* Another student commented “It did not explain enough of how the material was done.”
* “Just more examples that show every step of how to work the problem” was suggested by a student.
* When asked what would you like to see added to the course (MATH 1111), a student said “To have an electronic textbook that is actually reliable in information and does not have a much of errors!”

**3. Quantitative and Qualitative Measures**

**3a. Overall Measurements**

**Student Opinion of Materials**

**Was the overall student opinion about the materials used in the course positive, neutral, or negative?**

Overall, the student opinion of the textbook and the instructor-provided supplemental materials, such as power points, video lectures, and Webassign homework, was positive, based on survey results from Spring semester 2017. Data collection was not completed during Summer semester 2016 or Fall semester 2016.

Total number of students affected in this project: 1790 students over three semester

Student survey responses collected in Spring semester 2017

* Positive: 79% of 65 number of respondents
* Neutral: 7% of 65 number of respondents
* Negative: 14 % of 65 number of respondents

**Student Learning Outcomes and Grades**

**Was the overall comparative impact on student performance in terms of learning outcomes and grades in the semester(s) of implementation over previous semesters positive, neutral, or negative?**

 Choose One:

* \_\_\_ Positive: Higher performance outcomes measured over previous semester(s)
* \_\_\_ Neutral: Same performance outcomes over previous semester(s)
* \_x\_ Negative: Lower performance outcomes over previous semester(s)

**Student Drop/Fail/Withdraw (DFW) Rates**

**Was the overall comparative impact on Drop/Fail/Withdraw (DFW) rates in the semester(s) of implementation over previous semesters positive, neutral, or negative?**

**Drop/Fail/Withdraw Rate:**

43% of students, out of a total 686 students affected, dropped/failed/withdrew from the course in the **final** (Spring 2017) semester of implementation.

Choose One:

* \_\_\_ Positive: This is a lower percentage of students with D/F/W than previous semester(s)
* \_\_\_ Neutral: This is the same percentage of students with D/F/W than previous semester(s)
* \_\_X\_ Negative: This is a higher percentage of students with D/F/W than previous semester(s)

**3b. Narrative**

For qualitative analysis, students were asked to respond to a survey with the following questions

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| --- |
| * Were you able to get the book and the software in the first two weeks?
 |
| * What version of the book do you have?
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| * What materials do you use for this course?
 |
| * What is missing from the course?
 |
|  |
| * How many hours a week do you study for the course?
 |
| * Are you happy with your grade?
 |
| * What do you think of the pace for the class?
 |
| * What would you want added to the course?
 |
| * Are you in my face to face class or online?
 |

Results of the student survey show that 95% of the students had the required materials within the first two weeks of the course. Ninety-seven percent of students chose the electronic version of the textbook and 3% elected to purchase the hardback version. Of the materials available to the students, 97% relied on the Webassign homework, 43% used the OER textbook, 35% viewed power points (however, not every instructor made these available), 29% watched videos, and 12% sought out other resources. Seventy-one percent of the students indicated the nothing needs to be added to the course; however, the remaining 29% wanted more examples and better explanation of material. The average number of hours spent studying, as self-reported by the students, was 3.12 hours per week. The majority of students were happy with their grade in the course, thought the pace of the course was acceptable, and were enrolled in a face-to-face section of the course. Here is a link to the survey: <https://docs.google.com/forms/d/1CEVORK-vcpB2LhyqN1jBjk0z5BsouZ57guyALRyCzL4/edit>

Although the student opinion of the textbook and the instructor-provided supplemental materials, such as power points, video lectures, and Webassign homework, was positive, the overall student success rate was not positive, as detailed in the table below.

Fall semester 2015 was used as a control for the overall grade analysis for Fall semester 2016 and Spring semester 2017. The DFW rate increased by 9.2% from Fall semester 2015 to Fall semester 2016, the first semester of across the board OER implementation. From Fall semester 2015 to Spring semester 2017 the DFW rate increased by 13%. However, Georgia Highlands College has consistently experienced an increased DFW rate in MATH 1111, College Algebra, over the last twelve fall-to-fall comparisons; thus, the increased DFW with the implementation of OER materials is not unforeseen. Other factors that could affect the DFW rate is the lack of preparedness of first-time college students for the rigor of college courses, the varied mathematical content knowledge or background of students ranging in ages from 17 to early 60s, or unforeseen personal issues that prevent completion of course**.**

|  |  |  |  |
| --- | --- | --- | --- |
| ***GRADES*** | ***MATH 1111*** ***FALL 2015*** | ***MATH 1111******FALL 2016*** | ***MATH 1111******SPRING 2017*** |
| ***A*** | ***231*** | ***203*** | ***120*** |
| ***B*** | ***247*** | ***250*** | ***136*** |
| ***C*** | ***209*** | ***171*** | ***132*** |
| ***D*** | ***74*** | ***79*** | ***52*** |
| ***F or F$*** | ***121*** | ***186*** | ***138*** |
| ***W or WF*** | ***105*** | ***146*** | ***108*** |
| ***V*** | ***1*** | ***1*** | ***0*** |
| ***I*** | ***0*** | ***2*** | ***0*** |
| ***TOTAL***  | ***N = 988*** | ***N = 1038*** | ***N=686*** |
| ***DFW RATE*** | ***30.4%*** | ***39.6%*** | ***43.4%*** |
| ***AVERAGE on 4.0 scale*** | ***2.45 excluding W, WF, V, and I (n = 882)***  | ***2.23 excluding W, WF, V, I, (n = 889)*** | ***2.08 excluding W, WF, V, I (n = 578)*** |
| ***Standard Deviation***  | ***1.33*** | ***1.44*** | ***1.45*** |

Georgia Highlands College annually conducts general education course assessment. During the 2016-2017 academic year, MATH 1111, College Algebra, focused its assessment on the following two student learning outcomes:

* Students will be able to solve equations.
* Students will be able to use logical mathematical reasoning

To assess whether students are able to solve equations, two common questions, one exponential equation and one logarithmic equation, were asked on the final exam by all MATH 1111 instructors. The performance measure was 75% of the students taking the final exam would attempt the question, the approach and work, other than slight calculation errors, as well as answer were correct. Overall, 57.1% of the students were able to solve an exponential equation appropriately, while 40.3% of the students were able to solve a logarithmic equation correctly. These results are consistent with the previous ten years’ assessment results for MATH 1111 at Georgia Highlands College. Furthermore, these results could lead to a conclusion that the use of Open Educational Resources had little to no effect on the overall student learning.

To assess whether students are able to use logical mathematical reasoning, a common question was asked on the final exam by all MATH 1111 instructors. The performance measure was 75% of the students taking the final exam would attempt the question, the approach and work, other than slight calculation errors, as well as answer were correct. Overall, 42.7% of the students were able to use logical mathematical reasoning appropriately. Again, these results are consistent with the previous two years’ assessment results for MATH 1111 at Georgia Highlands College. A conclusion that use of OER textbook had little to no effect on the overall student learning.

**4. Sustainability Plan**

The MATH 1111 course currently contains supplemental materials intended to help students be successful. The materials were provided and will continue to be provided to all faculty in a master course in Desire to Learn and in Webassign. Faculty was encouraged to use the materials as presented or to modify the materials to fit their personal teaching style. Faculty will be queried for improvements in current materials or additional materials desired. Monitoring of the DFW rates will continue.

**5. Future Plans**

The impact of the use of OER textbook(s) with Webassign on instruction was again mixed. Several faculty commented:

* “This has caused me to be more introspective with regards to teaching material from the perspective of the new text.”
* “The homework problems are too broad and it is difficult to customize to my course.”
* “I spend as much time on my 1111 class as all the rest put together. There is no testing software.”
* “I have to supplement with ‘paper’ homework due to the issues with the problems in Webassign. Also, there have sections (even whole chapters) that I have had to tell the students not to read due to how poorly written they were.”
* “Confusion and then an appreciation of the material presented.”
* “The material is definitely more rigorous which I've incorporated into my instruction with mixed results.”
* “I have had to reword some problems/instructions that I thought were awkward.”

Despite faculty reactions, the Mathematics division at Georgia Highlands College will continue to use the OpenStax *Algebra and Trigonometry* text with Webassign during the 2017-2018 academic year. DFW rates will continue to be monitored. Continued use will be reevaluated in Spring semester 2018.

In the meantime, additional resources for both faculty and students will be developed. Using the format used to implement an OER textbook in MATH 2200, Elementary Statistics, and additional power points will be developed for the primary topics within MATH 1111, College Algebra and added to the master course within Desire to Learn. Shorter ten-to-fifteen minutes videos will be created for both prerequisite topics and content topics.

Georgia Highlands College have also implemented an Open Educational Resource textbook for MATH 2261, Calculus I, in a web-based format only. This textbook and format was piloted in Spring semester 2017. The use of the OER textbook will continue in the web-based course for the 2017-2018 academic year. DFW rates will be monitored.

Our experiences with implementation and impact of OER textbooks was shared through two presentations at the USG Teaching and Learning Conference held in April 2017. Camille Pace and Laura Ralston participated in a roundtable discussion of this grant, “Open Mathematics In Action”. The second presentation, “OER + Faculty Resources + Investment = Student Success”, discussed the implementation and impact of OER materials at Georgia Highlands College. The grade comparison for MATH 1111, College Algebra, has been shared with the Dean of the Mathematics division. These results and the feedback from the faculty and student surveys will be shared with the entire division of Mathematics during the next academic year.