

Application Details

Manage Application: ALG Textbook Transformation Grants Round 8

Award Cycle: Round 8

Internal Submission Deadline: Sunday, December 11, 2016

Application Title: 277

Application ID: #001278

Submitter First Name: Scott

Submitter Last Name: Kersey

Submitter Title: Associate Professor of Mathematics

Submitter Email Address: skersey@georgiasouthern.edu

Submitter Phone Number: 912-478-1963

Submitter Campus Role: Proposal Investigator (Primary or additional)

Applicant First Name: Scott

Applicant Last Name: Kersey

Co-Applicant Name(s): Stephen Carden

Applicant Email Address: skersey@georgiasouthern.edu

Applicant Phone Number: 912-478-1963

Primary Appointment Title: Associate Professor of Mathematics

Institution Name(s): Georgia Southern University

Submission Date: Monday, December 12, 2016

Team Members (Name, Title, Department, Institutions if different, and email address for each):

Scott Kersey, Associate Professor of Mathematics, Department of Mathematical Sciences, skersey@georgiasouthern.edu

Stephen Carden, Assistant Professor of Statistics, Department of Mathematical Sciences, scarden@georgiasouthern.edu

Sponsor, (Name, Title, Department, Institution):

Sharon Taylor, Professor and Chair, Department of Mathematical Sciences, Georgia Southern University

Proposal Title: 277

Course Names, Course Numbers and Semesters Offered:

Calculus I, Math 1441, Fall, Spring and Summer semesters

Statistics I, STAT 2231, Fall, Spring and Summer semesters

Average Number of Students per Course Section: 40 (Calculus I), 30 (Statistics I)

Number of Course Sections Affected by Implementation in Academic Year: 50 (Calculus I), 50 (Statistics I)

Total Number of Students Affected by Implementation in Academic Year: 2000 (Calculus I), 1500 (Statistics I)

List the original course materials for students (including title, whether optional or required, & cost for each item): Calculus I (MATH 1441) Thomas' Calculus with MyMathLab access (\$288.40) or MyMathLab Student Access Kit (\$106.90). Required. Introductory Statistics I (STAT 2231) Basic Practice of Statistics with Launchpad access (\$169.35) or Launchpad access code (\$91.75). Required.

Requested Amount of Funding: \$10,800

Original per Student Cost: \$106.90 -- \$288.40 (Calculus I), \$91.75-\$169.35 (Statistics I)

Post-Proposal Projected Student Cost: 0

Projected Per Student Savings: \$106.90 -- \$288.40 (Calculus I), \$91.75-\$169.35 (Statistics I)

Projected Total Annual Student Savings: \$351,425 -- \$830,825

Creation and Hosting Platforms Used ("n/a" if none):

WeBWork [3]: Open-source online homework management system with Open Problem Library. The library currently contains over 35,000 mathematics and statistics problems [4], and includes an editor for writing problems tailored to one's course. The program is currently installed on a server maintained by a team member (S. Kersey), who has completed a WeBWork system administrator training course hosted by the Mathematical Association (MAA). Both team members have experience using WeBWork in the classroom setting.

Desire2Learn (D2L, Folio) [5]: Virtual Classroom at Georgia Southern University. This will be used for additional notes, handouts, modules and videos associated with the implementation of this project.

Departmental Storage (R: Drive): Hard drive space shared by all faculty within the Department of Mathematical Sciences at Georgia Southern University. This will be used, along with faculty web pages, to archive and share materials with other faculty at GSU upon completion of this project.

Proposal Category: No-Cost-to-Students Learning Materials

Final Semester of Fall 2017

Instruction:

Project Goals:

Save students money on textbooks by replacing the current textbooks with the free OpenStax textbooks *Calculus Volume I* and *Introductory Statistics* [2].

Save students money on online homework systems by replacing MyMathLab (used in Calculus) and LaunchPad (used in Statistics) with the free WebWork homework management system [3] with Open Problem Library (OPL) [4].

Support student success by developing additional course materials and online content adapted to our institutional course learning objectives, including notes, modules and videos that conform to the Quality Matters (QM) [6] standard for online courses. One of the team members (S. Kersey) of this project has completed a QM training course and is certified to develop online course content.

Redesign course syllabi, class schedules, course notes and other materials to coincide with the OpenStax textbooks and WebWork. The flexibility of WebWork's Open Problem Library and custom question creation allows for the development of course content that meets the needs of our students.

Develop assessment methods to measure the impact of these changes on student success. In doing so, we will first assess the effectiveness of the learning materials using current (non-free) materials using a pre-test and post-test in each of the spring and summer sessions. In the fall we will repeat the tests with classes using the open-source (free) materials.

Sustain student impact by making all materials openly available to colleagues through university storage, Desire2Learn exported course modules, WebWork exported problem sets, and faculty web pages.

Upon completion of this project, we will plan an expansion of open-source course content to other mathematics and statistics courses, such as Calculus II and Statistics II, in both the traditional and online formats.

Statement of Transformation:

Description: Replace the current (non-free) textbooks and homework systems with new open-source (free) alternatives for Calculus I and Introduction to Statistics I, and create

additional course content, such as notes, modules and videos, following Quality Matters guidelines [6].

The primary stakeholders are the students who will benefit from a reduced financial burden and more accessible open source content. Students will have access to all course materials (including textbook, homework problems, notes, etc.) on the first day of class, and no longer suffer delays in acquiring course materials because of Financial Aid and other factors.

The secondary stakeholders are faculty. With all resources on-line, there will be no delay in acquiring textbooks or homework access codes, so the instruction and assignment can begin on day one of the semester. Additionally, because it is open-source, instructors will have more control over course content, allowing adaption for different teaching styles.

The primary impact for students is reduced financial burden on students. With 90% of incoming students at Georgia Southern receiving some kind of financial aid in 2014-2015 [8], costs are clearly a major factor affecting student success. As well, by giving students a better learning experience in Calculus I and Statistics I, they will be better prepared to follow the course sequence to upper level classes.

The impact for faculty includes a shorter start-up time each semester and better prepared students entering the upper level classes. As well, with course material freely available and adaptable (including notes, worksheets and homework sets), our courses will be taught more uniformly, and faculty will spend less time in preparation.

The impact for our department and institution includes easier access and greater enrollment for students in the courses that use the free open-source material. As well, with course materials centrally located and shared among faculty, course instruction will be more consistent among different faculty. This is particularly important at Georgia Southern where we have relatively small class sizes rather than large lecture-run classes.

Upon success of our pilot run, the free open-source model can be adapted to other mathematics and statistics classes. This may apply to both face-to-face and online formats. This has the potential to greatly impact the enrollment of students at our institution, as well as their success in their degree programs.

Transformation Action Plan:

As a first step to our action plan, team members have already selected the textbooks (OpenStax' *Calculus I* and *Introductory Statistics*) and homework system (WeBWork) to be used in the transformation.

The next step is the creation of course syllabi, schedules, and materials. This will include course organization, expectations, and goals for new open-source transformation.

Team members will administer standard testing instruments in the semester prior to implementing the new open-source materials. For statistics, the CAOS test [7] will be used, and an existing departmental assessment test will be used for Calculus.

S. Kersey will be creator of course material and instructor of record for Calculus I, and S. Carden will be creator of course material and instructor of record for Statistics I. Team members will collaborate on all other aspects of the transformation, including the creation of new WeBWork problem sets.

The new materials will be set up prior to the first day of class. This includes pre-registering students in WeBWork using class rosters and hosting of course materials in Desire2Learn. At the final stages of implementation, open-source materials will be stored in central locations and made available to faculty.

Quantitative & Qualitative Measures: Upon completion of this project at the end of the Fall 2017 semester, both quantitative and qualitative measures will be applied to assess the efficacy of the transformation to open-source materials. We will compare results from classes using non-free materials to those using the open-source materials outlined in this proposal. Quantitative measures: Comparison of pre- and post-content tests for each class, broken down by course learning objectives, including calculation of a confidence interval estimating the difference between the two samples. Comparison of scores on a common Final Exam. Comparison of DFW (Drop, Fail, Withdrawal) rates between classes. Qualitative measures: Comparison of surveys on student attitudes and opinions regarding course materials. Examination of course/instructor evaluations for comments and feedback regarding the course materials for each course.

Timeline:

January 2017	Give content pre-test to students using current (non-free) course materials.
January 30, 2017	Attend kick-off meeting.
February 2017	Match course objectives with OpenStax text sections and modify syllabi and course schedules accordingly.
March 2017	Complete creation and modification of existing electronic materials, including lecture note outlines to be consistent with OpenStax text notation and terminology.
May 2017	Give content post-test to students using current (non-free) course materials. Give survey to students concerning use of current(non-free) course materials.

June 2017	Complete creation of homework problems sets for WebWorks, including modification of existing (either custom created or from Open Library) problems to be consistent with OpenStax textbook notation and terminology.
July 2017	Upload electronic materials to Desire2Learn for use in Fall 2017 semester.
August 2017	Give content pre-test to students using new (free) course materials.
November 2017	Departmental presentation to faculty introducing open source materials (OpenStax, WeBWorK, lecture notes, etc.). In the following weeks, additional individual meetings for faculty interested in adoption.
December 2017	Give content post-test to students using new (free) course materials. Give survey to students concerning use of new (free) course materials. Analyze data from both courses to evaluate efficacy of open-source materials

Budget:

Dr. Scott Kersey	Compensation for preparation time	\$5,000
Dr. Stephen Carden	Compensation for preparation time	\$5,000
Travel	Kick-off meeting and conference travel	\$800

Sustainability Plan:

After completion of this project, no additional costs are required. Course information and materials will be posted at central locations for faculty to use, including university storage (R: drive), a Desire2Learn exported course, and on faculty web pages.

OpenStax textbooks are open source and free to the public.

TheWeBWorK homework management system and Open Problem Library is open source, and free to install on a local server.

TheWeBWork problems created or modified for our courses will be submitted to WeBWork's Open Problem Library for use by other faculty and institutions, as well as having their source code available on faculty web pages.

Course materials, such as syllabi, weekly schedules, additional notes, modules, videos, and surveys will be made freely available to faculty through university storage, Desire2Learn course templates, and faculty web pages.

Team members will remain departmental point of contact for faculty interested in adoption of our open-source materials for future years.

**Affordable Learning Georgia Textbook Transformation Grants
Rounds Six, Seven, and Eight
For Implementations Beginning Fall Semester 2016
Running Through Fall Semester 2017**

Proposal Form and Narrative

Submitter Name	Scott Kersey
Submitter Title	Associate Professor of Mathematics
Submitter Email	skersey@georgiasouthern.edu
Submitter Phone Number	912-478-1963
Submitter Campus Role	Proposal Investigator (Primary)
Applicant Name	Scott Kersey
Applicant Email	skersey@georgiasouthern.edu
Applicant Phone Number	912-478-1963
Primary Appointment Title	Associate Professor of Mathematics
Institution Name(s)	Georgia Southern University
Team Members	Scott Kersey, Associate Professor of Mathematics, Department of Mathematical Sciences, skersey@georgiasouthern.edu Stephen Carden, Assistant Professor of Statistics, Department of Mathematical Sciences, scarden@georgiasouthern.edu
Sponsor, Title, Department, Institution	Sharon Taylor, Professor and Chair, Department of Mathematical Sciences, Georgia Southern University

Proposal Title	A Sustainable Open Source Implementation of Calculus and Statistics Using Zero-Cost Course Materials and Homework System				
Course Names, Course Numbers and Semesters Offered	Calculus I, MATH 1441, Fall, Spring, and Summer semesters Statistics I, STAT 2231, Fall, Spring, and Summer semesters				
Final Semester of Instruction	Fall 2017				
Average Number of Students Per Course Section	Calc 40 Stat 30	Number of Course Sections Affected by Implementation in Academic Year	Calc 50 Stat 50	Total Number of Students Affected by Implementation in Academic Year	Calc 2000 Stat 1500
Award Category (pick one)	<input checked="" type="checkbox"/> No-or-Low-Cost-to-Students Learning Materials <input type="checkbox"/> OpenStax Textbooks <input type="checkbox"/> Interactive Course-Authoring Tools and Software <input type="checkbox"/> Specific Top 100 Undergraduate Courses				
List the original course materials for students (including title, whether optional or required, & cost for each item)	Calculus I (MATH 1441) <i>Thomas' Calculus</i> with MyMathLab access (\$288.40) or MyMathLab Student Access Kit (\$106.90). Required. Introductory Statistics I (STAT 2231) <i>Basic Practice of Statistics</i> with Launchpad access (\$169.35) or Launchpad access code (\$91.75). Required.				
Requested Amount of Funding	\$10,800				
Original Per Student Cost	Calculus I: \$106.90-\$288.40 Statistics I: \$91.75-\$169.35				

Post-Proposal Projected Per Student Cost	\$0
Projected Per Student Savings	Calculus I: \$106.90-\$288.40 Statistics I: \$91.75-\$169.35
Projected Total Annual Student Savings	\$351,425-\$830,825
Creation and Hosting Platforms Used	<p>WeBWork [3]: Open-source online homework management system with Open Problem Library. The library currently contains over 35,000 mathematics and statistics problems [4], and includes an editor for writing problems tailored to one's course. The program is currently installed on a server maintained by a team member (S. Kersey), who has completed a WeBWork system administrator training course hosted by the Mathematical Association (MAA). Both team members have experience using WeBWork in the classroom setting.</p> <p>Desire2Learn (D2L, Folio) [5]: Virtual Classroom at Georgia Southern University. This will be used for additional notes, handouts, modules and videos associated with the implementation of this project.</p> <p>Departmental Storage (R: Drive): Hard drive space shared by all faculty within the Department of Mathematical Sciences at Georgia Southern University. This will be used, along with faculty web pages, to archive and share materials with other faculty at GSU upon completion of this project.</p>

NARRATIVE

1.1 PROJECT GOALS

- Save students money on textbooks by replacing the current textbooks with the free OpenStax textbooks *Calculus Volume I* and *Introductory Statistics* [2].
- Save students money on online homework systems by replacing MyMathLab (used in Calculus) and LaunchPad (used in Statistics) with the free WebWork homework management system [3] with Open Problem Library (OPL) [4].
- Support student success by developing additional course materials and online content adapted to our institutional course learning objectives, including notes, modules and videos that conform to the Quality Matters (QM) [6] standard for

online courses. One of the team members (S. Kersey) of this project has completed a QM training course and is certified to develop online course content.

- Redesign course syllabi, class schedules, course notes and other materials to coincide with the OpenStax textbooks and WebWork. The flexibility of WebWork's Open Problem Library and custom question creation allows for the development of course content that meets the needs of our students.
- Develop assessment methods to measure the impact of these changes on student success. In doing so, we will first assess the effectiveness of the learning materials using current (non-free) materials using a pre-test and post-test in each of the spring and summer sessions. In the fall we will repeat the tests with classes using the open-source (free) materials.
- Sustain student impact by making all materials openly available to colleagues through university storage, Desire2Learn exported course modules, WebWork exported problem sets, and faculty web pages.
- Upon completion of this project, we will plan an expansion of open-source course content to other mathematics and statistics courses, such as Calculus II and Statistics II, in both the traditional and online formats.

1.2 STATEMENT OF TRANSFORMATION

- Description: Replace the current (non-free) textbooks and homework systems with new open-source (free) alternatives for Calculus I and Introduction to Statistics I, and create additional course content, such as notes, modules and videos, following Quality Matters guidelines [6].
- The primary stakeholders are the students who will benefit from a reduced financial burden and more accessible open source content. Students will have access to all course materials (including textbook, homework problems, notes, etc.) on the first day of class, and no longer suffer delays in acquiring course materials because of Financial Aid and other factors.
- The secondary stakeholders are faculty. With all resources on-line, there will be no delay in acquiring textbooks or homework access codes, so the instruction and assignment can begin on day one of the semester. Additionally, because it is open-source, instructors will have more control over course content, allowing adaption for different teaching styles.
- The primary impact for students is reduced financial burden on students. With 90% of incoming students at Georgia Southern receiving some kind of financial aid in 2014-2015 [8], costs are clearly a major factor affecting student success. As well, by giving students a better learning experience in Calculus I and Statistics I, they will be better prepared to follow the course sequence to upper level classes.
- The impact for faculty includes a shorter start-up time each semester and better prepared students entering the upper level classes. As well, with course material freely available and adaptable (including notes, worksheets and homework sets), our courses will be taught more uniformly, and faculty will spend less time in preparation.

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1.3 TRANSFORMATION ACTION PLAN

- As a first step to our action plan, team members have already selected the textbooks (OpenStax' *Calculus I* and *Introductory Statistics*) and homework system (WeBWork) to be used in the transformation.
- The next step is the creation of course syllabi, schedules, and materials. This will include course organization, expectations, and goals for new open-source transformation.
- Team members will administer standard testing instruments in the semester prior to implementing the new open-source materials. For statistics, the CAOS test [7] will be used, and an existing departmental assessment test will be used for Calculus.
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- The new materials will be set up prior to the first day of class. This includes pre-registering students in WeBWork using class rosters and hosting of course materials in Desire2Learn.
- At the final stages of implementation, open-source materials will be stored in central locations and made available to faculty.

1.4 QUANTITATIVE AND QUALITATIVE MEASURES

Upon completion of this project at the end of the Fall 2017 semester, both quantitative and qualitative measures will be applied to assess the efficacy of the transformation to open-source materials. We will compare results from classes using non-free materials to those using the open-source materials outlined in this proposal.

- Quantitative measures:
 - Comparison of pre- and post- content tests for each class, broken down by course learning objectives, including calculation of a confidence interval estimating the difference between the two samples.
 - Comparison of scores on a common Final Exam.
 - Comparison of DFW (Drop, Fail, Withdrawal) rates between classes.
- Qualitative measures:

- Comparison of surveys on student attitudes and opinions regarding course materials.
- Examination of course/instructor evaluations for comments and feedback regarding the course materials for each course.

1.5 TIMELINE

January 2017	Give content pre-test to students using current (non-free) course materials.
January 30, 2017	Attend kick-off meeting.
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August 2017	Give content pre-test to students using new (free) course materials.
November 2017	Departmental presentation introducing open source materials (OpenStax, WeBWork, lecture notes, etc.).

	In the following weeks, additional individual meetings for faculty interested in adoption.
December 2017	<p>Give content post-test to students using new (free) course materials.</p> <p>Give survey to students concerning use of new (free) course materials.</p> <p>Analyze data from both courses to evaluate efficacy of open-source materials.</p>

1.6 BUDGET

Dr. Scott Kersey	Compensation for preparation time.	\$5000
Dr. Stephen Carden	Compensation for preparation time.	\$5000
Travel	Kick-off meeting and conference travel.	\$800

1.7 SUSTAINABILITY PLAN

After completion of this project, no additional costs are required. Course information and materials will be posted at central locations for faculty to use, including university storage (R: drive), a Desire2Learn exported course, and on faculty web pages.

- OpenStax textbooks are open source and free to the public.
- TheWeBWork homework management system and Open Problem Library is open source, and free to install on a local server.
- TheWeBWork problems created or modified for our courses will be submitted to WeBWork's Open Problem Library for use by other faculty and institutions, as well as having their source code available on faculty web pages.
- Course materials, such as syllabi, weekly schedules, additional notes, modules, videos, and surveys will be made freely available to faculty through university storage, Desire2Learn course templates, and faculty web pages.
- Team members will remain departmental point of contact for faculty interested in adoption of our open-source materials for future years.

1.8 REFERENCES & ATTACHMENTS

On-line Resources:

1. Georgia Southern: www.georgiasouthern.edu/
2. OpenStax Textbooks: openstax.org/subjects/math
3. Webwork: webwork.maa.org/
4. Open Problem Library: webwork.maa.org/wiki/Open_Problem_Library
5. Desire2Learn (Folio): <https://georgiasouthern.desire2learn.com/>
6. Quality Matters: www.qualitymatters.org
7. CAOS (Comprehensive Assessment of Outcomes in a first Statistics Course): <https://apps3.cehd.umn.edu/artist/caos.html>
8. National Center for Educational Statistics (NCES): nces.ed.gov/collegenavigator.

See attached letter of support from sponsoring Department Chair, Dr. Sharon Taylor.



DEPARTMENT OF
MATHEMATICAL SCIENCES

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December 6, 2016

To Whom It May Concern:

This letter is in support of the Affordable Learning Grant submitted by Dr. Scott Kersey and Dr. Stephen Carden. I find their proposal to have significant merit in terms of decreasing the financial burden of textbooks for students as well as contributing to the collection of online homework problems for a broad audience.

Drs. Kersey and Carden have been using the WeBWorK online homework system from the Mathematical Association of America (MAA) for several semesters. Each has found the problems already created to be quite useful. When they feel the need to add problems for their students, the process of adding to the database is also quite easy.

Their experiences with the WeBWorK system, as well as the costly and not as easy to use commercial online homework systems available with textbooks, prompted their desire to pursue the ALG opportunity. By capitalizing on their previous successes with WeBWorK, utilizing existing OpenStax materials, and adding to these resources, Drs. Kersey and Carden can lower the costs for many of our students.

Anticipating Drs. Kersey and Carden's successful implementation of their efforts during Fall 2017, we expect to recruit additional faculty to participate in the program. In the past, faculty have expressed dissatisfaction with the limitations of the commercial products as well as the high cost of these materials. With the no-cost OpenStax and WeBWorK options, participation by other faculty in the department is a given. This project can be sustained at no cost to the department, USG, or the students. Long term financial relief for students can be easily attained through this project.

I support Drs. Kersey and Carden's efforts to transform not only the way homework is handled in our department, but to use the OpenStax resources to transform teaching and learning in our department.

Please feel free to contact me if you need additional information.

Sincerely,

A handwritten signature in cursive script that reads "Sharon Taylor".

Sharon Taylor
Department Chair