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Application Summary

Competition Details

Competition Title:	Textbook Transformation Grants, Round Seventeen (Summer 2020 - Summer 2021)
Category:	University System of Georgia
Award Cycle:	Round 17
Submission Deadline:	04/20/2020 at 11:59 PM

Application Information

Submitted By:	Cathy Hakes
Appplication ID:	4760
Application Title:	523
Date Submitted:	04/21/2020 at 8:17 AM

Personal Details

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Submitter Phone Number:	678-407-5875
Submitter Title:	Executive Director, ORSP and Accreditation

Application Details

Proposal Title
523

Requested Amount of Funding
$25,800

Priority Category (if applicable)
Gateways to Completion (G2C)

Course Title(s)
Precalculus, MATH 1113; College Algebra, MATH 1111; and Corequisite College Algebra, MATH 0999/1111

Course Number(s)
MATH 1113, MATH 1111, and MATH 0999/1111

Team Member 1 Name
Amy H Erickson

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Team Member 3 Name
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Additional Team Members (Name and email address for each)
Tonya Georgia, tdegeorge@ggc.edu

Sponsor Name
Joseph Sloop

Sponsor Title
Interim Dean

Sponsor Department
School of Science and Technology

Total Number of Student Section Enrollments Affected by Project in One Academic Year
4,250

Average Number of Student Section Enrollments Affected per Summer Semester
340

Average Number of Student Section Enrollments Affected per Fall Semester
2,250

Average Number of Student Section Enrollments Affected per Spring Semester
1,660

Original Required Commercial Materials (title, author, price, and bookstore or retailer URL showing price)
Title: Algebra and Trigonometry – MyMathLab, 6th Ed. ISBN: 9780134758848

Author: Robert F. Blitzer

Cost: $135.70

URL: Please copy and paste this URL.

ttps://ggc.bncollege.com/shop/ggc/textbook/algebratrigonometrymymathlab-600008047261

Original Total Cost per Student
$135.70

Post-Project Cost per Student
$0-$22

Post-Project Savings per Student
$135.70

Projected Total Annual Student Savings per Academic Year
$441,025

Using OpenStax Textbook?
Yes

Project Goals

This textbook transformation project aims to adopt and adapt a no-cost textbook and an online homework system for MATH 1113 (Precalculus) and the prerequisite courses MATH 1111 (College Algebra) and MATH 0999/1111 (Corequisite College Algebra). These three courses currently all use the same textbook, and we plan to continue with that model. **The project team will develop no-cost materials such as audio-visual ancillaries, guided notes, PowerPoint presentations, and instructor resources** as replacements for the required MyMathLab textbook for these courses. Moreover, the project will provide a homework system that will be no-cost or low-cost (at most $22 per student), depending on the results of classroom testing. By the end of the project, we anticipate savings between $369,525 and $441,025.

Numerous studies indicate that the costs associated with college can negatively affect student satisfaction, retention, and academic progress (Clinton 2019; Hilton 2019; Venegas-Muggli 2019; Trombitas 2012; Redden 2011). MATH 1113 is a required course for all science majors at Georgia Gwinnett College (GGC), impacting hundreds of students each year. Given that GGC is an access institution, a significant number of students come in needing MATH 0999/1111 or MATH 1111 before they can take MATH 1113. Additionally, a large portion of our students are from lower socioeconomic classes and cannot afford the higher costs associated with their education. This project hopes to provide a more accessible and equitable pathway for students entering college. As such, this textbook transformation project has three main goals:

1. Increase student satisfaction and engagement by adapting a no- or low-cost textbook and online homework system and curating and developing materials such as audio-visual ancillaries, guided notes, PowerPoint presentations, and instructor resources,
2. Improve student success outcomes by integrating materials more fully through our MATH 1113 and prerequisite MATH 1111 or MATH 0999/1111 courses that are fully aligned with course outcome goals, and
3. Improve student retention and progression by lowering the economic barriers associated with higher education and narrowing the student achievement gap.

Statement of Transformation

Overview of the Transformation

Since the 1970s, textbooks costs have risen a staggering 1,000% (Del Valle 2019). According to a study of the Government Accountability Office, textbook cost between 2002 and 2013 rose nearly three times the rate of inflation, with students spending as much as $1,200 on books and supplies (Weisbaum 2014; Perry 2016). Since then, student spending has declined to about $415 on course materials in 2018-2019 (Hazelrigg 2019). Textbook publishers claim that the options they provide through digital version and subscription-style offerings are making textbooks more affordable (Del Valle 2019). Digital versions, however, still require students to pay for access codes separately and, more importantly, do not allow students to recoup their money by reselling since digital/key codes can only be used by an individual for one semester (Carns 2016, Senak 2014). Ethan Senak, higher education associate at US. PIRG, also stated, "Even as they move into e-textbooks, publishers incorporate paywalls, expiration dates and printing restrictions that further continue the practices they've used to control the traditional market." (Weisbaum 2014) This trend has led students to become more dependent on online guides, course notes, or even in illegally downloading textbooks—all these to ensure that they pass their courses and graduate (Evans 2014). The high cost of textbooks and ensuing public outcry, however, are bringing to the forefront the need for other alternatives, such as Open Educational Resources (OER). OER are now included in most institutions' library resources websites (for example at UWM, UMN, and SUNY Geneseo) and low-cost to no-cost textbooks initiatives are being implemented in parts of the country. An example is the State-funded Zero-Textbook-Cost initiative in California, which awarded grants to community colleges to create 23 associate-degree pathways and 14 certificate pathways, thus requiring OER through entire degree or certificate pathways (Burke 2019). The University System of Georgia's Affordable Learning Georgia (ALG) Textbook Transformation is another important initiative that so far has helped provide critical savings to 417,169 students, resulting in $69.2 million savings in textbook purchases (ALG Statistics).

The proposed ALG project aspires to help further reduce the educational expenses of over 4,000 students annually by replacing an expensive textbook that is used across three major math gateway courses. Christopher Ettese, CEO of Flat World Knowledge, supports the idea of expanding into online textbooks for multiple courses: "Instead of tackling one upper-level course at a time, OER and affordable textbook providers may over time focus more on degree programs with zero textbook cost. The ability to measure learning across an entire degree program is really where we're headed in the future rather than just on a course-by-course basis." (Straumsheim 2015). At Georgia Gwinnett College, students currently enrolled in MATH 1113, MATH 1111, and MATH 0999/1111 are required to purchase the $135.70 MyMathLab software, which includes an e-Textbook. Expensive software costs often lead to students not buying the software at all (Redden 2011) or relying on the free two-week trial period given by Pearson, the company that sells the software. Students who cannot afford the cost of the software allow the free trial to elapse and continue with their enrolled course with no access to materials. This decision affects their overall progress in the course and often results in failure. Currently, the DFW rates in MATH 1113 is at 62.5%. By providing the course materials on the first day of class at no cost to the students, we anticipate that the DFW rates will decrease and students will likely progress to their next mathematics or discipline-related course.

While the cost itself is an issue, MyMathLab gives instructors the freedom to choose from a large database of material, which leads to significant variation in instructional content across sections. Although the course goals are outlined for instructors to follow, students in the various sections have expressed concern about the wide variety of content, textbook resources/ancillary materials, and instructional materials used in these courses, with little cohesiveness among them. This is a concern for all three of the courses in this proposal.

Mathematics is built on sequential learning. Thus, there currently exists some overlap of content material in MATH 1111 and MATH 1113, with approximately one-third of the course material in MATH 1113 focusing on expanding content from MATH 1111. To successfully move through this math sequence, students have to fully understand previously taught concepts in order to move on to more complex ones. If the foundation they received from secondary school or disparate instructional content in the current MATH 0999/1111 or MATH 1111 is shaky, they will likely struggle when they move on to MATH 1113, and a smaller percentage of students who take College Algebra or Corequisite College Algebra end up passing Precalculus. Moreover, if the academic support they receive at this phase is inadequate, they may not fully overcome their struggles with, for instance, math anxiety. Through this project, the team members aspire to provide a solution to issues that we have identified in teaching the three mathematics courses using MyMathLab: the replacement to a well-organized, engaging, free, online-accessible, mathematics textbook and resource materials.

The team will test various online homework systems in the classroom for quality control and student satisfaction and then choose ONE option for the courses. After the test and the end of the project, the team will provide either a no-cost or low-cost (at most $22) homework system to accompany the no-cost textbook and materials.

Project's transformative impact on course and department

The proposed project is novel since the transformation aims to eliminate the need for students to purchase materials across three major math courses. It also aims to adapt no- or low-cost materials that align specifically with the objectives of the courses and to enhance specific targeted areas of the course curricula with which students are known to struggle. In addition, we will provide quality content materials and audio-visual ancillary materials to enhance and supplement the no- or low-cost resources. These materials will be designed to help instructors provide similar content and tools across all sections. By compiling and developing substantive materials and resources, students will be better prepared to tackle more demanding subjects of the course and progress to their next level of studies. In addition, we will build upon and connect topics covered in MATH 1111 with content in MATH 1113, addressing the problem of cohesiveness stated earlier.

We expect faculty in mathematics at Georgia Gwinnett College who teach these courses will benefit from the materials developed, revised, and curated. By providing faculty with a set list of already culled resources such as videos and guides notes to choose from, faculty will be more apt to use these resources in their classroom, making things more consistent across the large number of sections. In addition, this could encourage faculty to the wider use of free online textbooks within the GGC mathematics program. Through this ALG Textbook grant, the team will be able to create a model or template for the conversion of multi-section, multi-semester courses, such as Calculus or Chemistry, to no- or low-cost materials.

Project's transformative impact on institution

Over one-third of GGC's student population enroll in MATH 1111 and MATH 1113, an Area A course, each year. All Science, Technology, Engineering, and Mathematics (STEM) majors at GGC and across USG must take MATH 1113. Since we are an access institution, we attract a large population of students who are underprepared for college, some of whom need to enroll or start in MATH 0999/1111. This is likely the case for STEM majors at access institutions across the nation. Providing students free access to course materials through OER at the beginning of their educational careers that then moves with them in multiple courses will benefit student learning and retention. In addition, given the rising costs of textbooks and software, we believe this model can serve as an example for other institutions with similar student bodies. By creating and modifying content that better fits our course goals and objectives, other institutions will have a blueprint for how to make these adjustments to better suit the needs of their students.

Transformation Action Plan

Overview of Transformation Plan

The "textbook" we plan to transform is MyMathLab. MyMathLab is an online learning platform that includes online homework, tutorial, and assessment. To replace this platform, the project team will develop no-cost materials such as audio-visual ancillaries, guided notes, PowerPoint presentations, and instructor resources including test banks and sample assessments.

To begin the transformation, the course materials under consideration will come from a variety of online sources such as those listed below.

- Open Textbook Library
- OpenStax
- OER Commons
- MERLOT
- GALILEO Open Learning Materials

Specific resources we plan to consider include:

Open College Algebra and Precalculus textbooks

- Jay Abramson's Algebra and Trigonometry. This text has a similar list of topics but includes fitting models to data (something our current textbook lacks); additionally, this textbook is linked to three online homework systems, Edfinity, OpenStax's Rover, and MyOpenMath.
- Anna Kuczynska's Intermediate Algebra and Trigonometry. This text includes multiple prerequisite chapters that would be quite suitable for our corequisite course.
- Carl Stitz and Jeff Zeager's Precalculus. This text appears to cover almost all – if not all – the topics in both Precalculus and College Algebra.

Open courseware

- College of Coastal Georgia MATH 1111, MATH 1112, and MATH 1113
- UNG College Algebra
- Georgia College and State University MATH 1111
- Open Course Library Precalculus I and Precalculus II

Applets

- Mathlets: Java Applets for Math Explorations
- National Library of Virtual Manipulatives
- Wolfram Demonstrations Project
- Interactive Mathematics
- Math Forum

One of the following online homework systems

- WeBWorK is an online homework system developed and maintained by the Mathematical Association of America. It is an open-source, stable system with over 35,000 problems in it. If GGC downloads and installs WeBWorK to a GGC server, it will be free for students.
- MyOpenMath is a free and open online homework system, and it has pre-built courses for both Stitz and Zeager's and Abramson's texts referenced above.

- Rover is an online homework system created by OpenStax. The cost is $22 per student per course, and this fee provides full access until students pass the course.
- Edfinity is an "OpenStax Ally" and has algorithmic problems powered by WeBWorK. The cost for this system can be paid by students or by departments and has a maximum course cost of $20 per student for the texts under consideration.

Online test bank

- University of Maryland Mathematics Test bank
- Kyote College Algebra Placement Exam
- Varsity Tutors College Algebra Practice Tests
- Canvas Precalculus Practice Tests
- CLEP Precalculus Practice Tests
- SOS Math Precalculus Practice Tests

PowerPoint Presentations will be created by team members or culled from these resources.

- OpenStax
- Lumen College Algebra
- Shawtrl College Algebra
- USF College Algebra
- Mr. Wright's Precalculus
- Pete's PowerPoint Station Precalculus
- PowerShow Precalculus

These resources will be adapted to fit existing University System of Georgia required topics for each course, as follows. Preliminary faculty assignments are indicated in parentheses.

MATH 0099/1111 (Corequisite and stand-alone College Algebra) Topics

- Review topics: factoring, polynomial and rational expressions, radicals and complex numbers, linear equations, linear inequalities, quadratic equations, graphs of first- and second-degree equations (A. Erickson)
- Relations, functions and their graphs (A. Erickson)
- Quadratic and rational inequalities (J. Roberts)
- Linear functions of a single variable with applications (J. Roberts)
- Quadratic functions of a single variable with applications (J. Roberts)
- Systems of equations with applications (K. Erickson)
- Polynomial functions of a single variable (K. Erickson)
- Exponential and logarithmic functions (T. DeGeorge)
- Additional topics: absolute value equations and inequalities, circles, and the distance formula (K. Erickson)

MATH 1113 (Precalculus) Topics

- Review topics: quadratics, graphing calculator (A. Erickson)
- Polynomial functions (K. Erickson)
- Rational functions (K. Erickson)
- Exponential and logarithmic functions (T. DeGeorge)
- Trigonometric functions (K. Pinzon)

- Systems of equations, matrices, and determinants (K. Erickson)
- Additional topics: polar coordinates, conic sections (K. Pinzon)

Team members' roles

Team member Amy H. Erickson, Associate Professor of Mathematics, will serve as project manager, librarian, subject matter expert, instructional designer, and instructor of record for MATH 1111 and MATH 0999/1111. Dr. Erickson has worked on Course-Embedded Research Experience (CURE) grants for both College Algebra and Precalculus and has created and revised assignments and assessments for the last two years in College Algebra using specifications grading. She will consult with previous ALG grant recipients in Mathematics at GGC to leverage their experience and material. She will coordinate efforts to curate resources onto Brightspace (D2L) and other platforms for dissemination and create the final report. She will assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, and assessments for all topics with a focus on Prerequisite Skills and Functions and Their Graphs.

Team member Kathy Pinzon, Associate Professor of Mathematics, will lead the evaluation effort and serve as subject matter expert, instructional designer, and instructor of record for Precalculus. Dr. Pinzon chaired the Curriculum Alignment Committee and is thus extremely well-versed in the topics of College Algebra and Precalculus. She has extensive experience with surveys and assessment data analysis from serving as Principal Investigator for Course-Embedded Research Experience (CURE) grants and another Affordable Learning Georgia grant for Discrete Mathematics. She will coordinate efforts to obtain IRB approval, administer consent forms and surveys, and collect and analyze data. She will assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, and assignments for all topics with a focus on Trigonometric Functions, Polar Coordinates, and Conic Sections.

Team member Keith Erickson, Associate Professor of Mathematics, will coordinate alignment of topics and material across all three courses and serve as subject matter expert, instructional designer, and instructor of record for Corequisite College Algebra and Precalculus. Dr. Erickson has extensive experience with Course-Embedded Research Experiences (CUREs) for both College Algebra and Precalculus and has developed numerous student projects across many courses in GGC's Applied Math program. He will assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, and assignments for all topics with a focus on Systems of Equations with Matrices and Determinants, Polynomial Functions, Circles, and the Distance Formula.

Team member Joshua Roberts, Assistant Professor of Mathematics, will coordinate production of audio-visual ancillary material and serve as subject matter expert, instructional designer, and instructor of record for College Algebra. Dr. Roberts was a Mathematical Association of America Project NExT Fellow and, as a Fellow, developed expertise on the production of videos and video notes for students in many courses. He will coordinate efforts to produce videos on all major topics of the courses, advising the team on best practices for the implementation of this type of OER. He will assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, assessments, and assignments for all topics with a focus on Linear, Quadratic, Rational, and Absolute Value Functions and Inequalities.

Team member Tonya DeGeorge, Instructor of Mathematics, will serve as a subject matter expert, instructional designer, and instructor of record for Precalculus. Ms. DeGeorge is working on her Ph.D. in Mathematics Education and is a valuable resource for research in the Scholarship of Teaching and Learning (SoTL) and has created a set of guided notes for Precalculus. She will assist Dr. Pinzon more extensively in her evaluation efforts and Dr. Erickson in curating resources onto Brightspace (D2L). She will also assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, and assignments for all topics with a focus on Exponential and Logarithmic Functions.

Plan for providing access

- During the project terms, materials will be available to students via Brightspace (D2L) in addition to the

resources noted above.

- Students will continue to be able to check out graphing calculators from the Kaufman Library.
- At the conclusion of the project, the PIs will also make the course materials available at GGC's Library Research Guides and/or GALILEO Open Learning Materials.

Quantitative & Qualitative Measures

The PIs will utilize questionnaires and class performance data in order to determine the accomplishment of project goals. In addition, the PIs will conduct limited focus groups consisting of sampled students to determine the impact of providing no- or low-cost textbooks and resources. During the Summer of 2020, the PIs will obtain IRB approval, ensuring compliance with institutional requirements in administering student questionnaires and conducting limited focus group interviews. Data collection will be conducted during the pilot Spring and Summer 2021 terms.

GOAL 1: (Student Satisfaction and Engagement)

Quantitative Measures, Methods, and Tools

The PIs will survey the students at the middle and end of each semester to evaluate the effectiveness and engagement of the proposed open source resources, including the PI-created ancillary materials. The questionnaire will ask students to rate questions on a Likert scale of Strongly Disagree to Strongly Agree and will consist of questions focusing on the following main ideas:

- The materials are always easily and reliably accessed.
- The materials are well-organized so that the necessary information can be found quickly.
- The materials clearly explain concepts and are useful to learn the content.
- The materials have enough exercises and examples to support students' learning needs.
- The guided notes were useful and engaging.
- The videos were useful and engaging.

Qualitative Measures, Methods, and Tools

The survey will also include open-ended questions, such as:

- What did you like about the new course materials?
- How can the new course materials be improved?

GOAL 2: (Student Success)

Quantitative Measures, Methods, and Tools

The PIs will collect the following data regarding students' performance in the course:

1. Student performance on common assessment questions in the final exam corresponding to each learning outcome of the courses. This data will be gathered from faculty teaching the classes.
2. Student grades on a final common assessment in all sections of the courses. This data will be gathered from faculty teaching the class.
3. Grade distribution in all sections of the courses. This data will be gathered from Banner and will be compared with existing historical grade distribution data for these classes.

Qualitative Measures, Methods, and Tools

These open-ended questions on student success will be included in the above-mentioned survey students complete at the end of the semester.

- Did the availability of free online textbook help improve your success in the course? If so, how did it impact your learning and success in the course?
- If you took College Algebra and Precalculus using the same resources, did you find that the topics in College Algebra prepared you for the topics in Precalculus? How did using the same resources impact your learning and success in both courses?
- Did you see your skills set and knowledge increase as you progressed through the course?

GOAL 3: (Student Retention through Zero Cost)

Quantitative Measures, Methods, and Tools

The PIs will collect the following data regarding students' retention:

1. Percentages of students moving on to the follow-on courses will be compared to historical data.
2. Grades in the follow-on courses will be compared to historical data.
3. Percentages of students completing homework on open source will be compared to historical data.

Qualitative Measures, Methods, and Tools

These open-ended questions on student success will be included in the above-mentioned survey students complete at the end of the semester.

- Are you more likely to continue in the next course knowing the materials are no- or low-cost?
- How will you benefit in the next course using these open-source materials?

In addition, the PIs will compare the cost of the current textbook with the cost of the new learning materials (expected to be free) to determine the overall cost savings.

Timeline

The proposed textbook transformation project will progress along the following timeline:

- May 29, 2020: Kickoff Online Meeting

- Summer 2020: An initial meeting will be held mid-May to develop protocols and a more-detailed summer schedule of expectations. The team members will use summer 2020 semester to identify, gather, and map OER resources to the course objectives and develop plans for creation of audio-visual ancillary materials, guided notes, PowerPoint slideshows, and instructor resources to supplement the no- or low-cost text and online homework system. Material developed in previous semesters will be compiled and reviewed to narrow the list of tasks for fall. The plans will include a detailed Schedule of Topics and a Table of Contents for each course that lists projected resources. They will also develop plans for curation of relevant resources onto Brightspace (D2L) for dissemination. Much of this work will be done virtually via shared documents and email. Preliminary material will be selected and prepared by August 3 for small-scale piloting in two sections of MATH 0999/1111 starting August 10.

- Fall 2020: The team members will use fall 2020 to test the OER and create and revise the content outlined in the summer, meeting on a weekly basis to coordinate efforts. Although revisions will be expected, a complete set of resources for each course will be fully curated by December 15 for large-scale piloting in spring. Protocols will be developed for incorporating additional revisions in real time through the life of this project and beyond. IRB approval will be obtained and preliminary feedback from students in the two MATH 0999/1111 courses will be collected. An evaluation plan and instruments for use in spring will also be developed during this semester.

- Spring 2021: Full implementation will take place in MATH 0999/1111, MATH 1111, and MATH 1113. The OER and material will be implemented in 3-5 sections of each course in spring 2021 for a total of 9-15 sections assigned to the five faculty team members. Two of the team members are also on the faculty scheduling committee for the mathematics discipline and will coordinate with the discipline chair to ensure course assignments as discussed above. Team members will meet weekly to discuss and coordinate any issues or modifications to the material following established protocols. More evaluation data, as outlined above, will be collected at the end of spring 2020 following the IRB approval obtained in the fall.

- Summer 2021: The team members expect to continue using the new materials in summer 2021 in additional sections and will collect more data. Summer sections will serve primarily to test the curated courses for dissemination and continuation into future semesters. Minor revisions may be made to the material during this time, following established protocols. Data analysis for spring semester will occur during this time. All relevant material will be curated onto Brightspace (D2L) and GGC's Library Research Guides. A report will be created and submitted by the end of the grant period. Lastly, PIs expect to work on dissemination efforts by presenting at course coordination, discipline meetings, and conferences, and making resources available to all GGC faculty.

Budget

Type of Grant: Large Scale

Amount: $25,800

Justification:

A. PERSONNEL: $20,000

Funds are requested to cover the compensation and fringe (FICA/SS, FICA Med, Retirement) of Drs. A. Erickson, Pinzon, K. Erickson, Roberts, and Ms. DeGeorge at $5000 each.

- Dr. Amy H. Erickson will serve as project manager, taking the lead in compiling and mapping OER resources to course objectives and curating these resources. She will participate in developing and testing course content and assignment materials for College Algebra and Corequisite College Algebra and will be responsible for the topics of Prerequisite Skills and Functions and Their Graphs.
- Dr. Kathy Pinzon will lead the evaluation effort for this project, including obtaining IRB approval, creating assessment tools, obtaining consent, administering surveys, and collecting and analyzing data. She will participate in developing and testing course content and assignment materials for Precalculus and will be responsible for the topics of Trigonometric Functions, Polar Coordinates, and Conic Sections.
- Dr. Keith Erickson will be responsible for the coordination and alignment of material and topics across the three courses. He will assist with data curation and evaluation and participate in developing and testing course content and assignment materials for Precalculus, College Algebra, and Corequisite College Algebra. He will be responsible for the topics of Systems of Equations with Matrices and Determinants, Polynomial Functions, and Circles and the Distance Formula.
- Dr. Joshua Roberts will lead in the effort to compile and develop quality videos for major topics of each course. He will participate in developing and testing course content and assignment materials for College Algebra and be responsible for the topics of Linear, Quadratic, Rational, and Absolute Value Equations and Inequalities.
- Ms. Tonya DeGeorge will assist in evaluation and curation. She will participate in developing and testing course content and assignment materials for Precalculus and College Algebra and be responsible for the topics of Exponential and Logarithmic Functions.

B. TRAVEL: $800

In lieu of the kickoff meeting (now online), the $800 funds are requested for a team member to attend the Mathematical Association of America's Southeastern Section conference. The purpose of the request is to disseminate information on how we developed our replacement online materials and the results of our efforts. Because of the many benefits of using OER, we also aim to encourage colleagues to adopt them. Funds will cover mileage, lodging, per diem, and other travel requirements. We do not need supplies for the project.

Sustainability Plan

MATH 1113 (Precalculus) is a required course for all science majors at GGC with either College MATH1111 (Algebra) or MATH 0999/1111 (Corequisite College Algebra) serving as prerequisite courses. The material compiled and developed here would impact over one-third of the students at GGC and lead to considerable improvement in student success, engagement, retention, and savings via the mechanisms described above.

The PIs expect to disseminate the material onto Brightspace (D2L) and present results to faculty colleagues at course coordination and discipline meetings and at conferences. Team members will collaborate with future course coordinators to ensure that the materials are kept up-to-date and organized following established protocols. After the grant is over, we will continue our work with Ms. Bethany Nash, our Systems Librarian. By providing an abundance of varying curated resources such as videos and guided notes in an easily accessible location, maintained over time, and customized to align with specific course outcome goals, faculty will be more apt to continue to use these resources in their courses. Additionally, this would encourage faculty to adopt free online resources more widely within the GGC mathematics program. Through this large-scale ALG Textbook grant, the team will be able to create a model or template for the conversion of multi-section, multi-semester courses, such as Calculus or Chemistry, to no- or low-cost materials.

A centralized online location will allow non-GGC faculty and students to access the materials easily. The PIs also see an opportunity to request and use additional mini-grant funds in the future to add emerging technologies to the curriculum.

Acknowledgment

Grant Acceptance

[Acknowledged] I understand and acknowledge that acceptance of Affordable Learning Georgia grant funding constitutes a commitment to comply with the required activities listed in the RFP and that my submitted proposal will serve as the statement of work that must be completed by my project team. I further understand and acknowledge that failure to complete the deliverables in the statement of work may result in termination of the agreement and funding.

Georgia Gwinnett
COLLEGE

School of Science & Technology

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Lawrenceville, GA 30043
Phone: 678-407-5602
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March 16, 2020

Re: Affordable Learning Georgia, University System of Georgia

Dear Grant Selection Committee:

I am pleased to write this letter of support for Drs. Amy H. Erickson, Katherine Pinzon, Keith Erickson, Joshua Roberts, and Ms. Tonya DeGeorge for their *Low cost transformation of Precalculus and College Algebra* ALG grant application.

This proposal is to adapt a no- or low-cost textbook and online homework system and develop supplementary instructional materials for the course sequence consisting of MATH 1113 Precalculus with prerequisite MATH 1111 College Algebra or MATH 0999/1111 Corequisite College Algebra. This will lower the costs to students associated with this course and will likely improve student satisfaction, academic performance, and retention.

Drs. A. Erickson, Pinzon, K. Erickson, Roberts, and Ms. DeGeorge have each taught these courses for several years. They have the expertise and skills to successfully implement the proposed action plan within the grant. If awarded, I will support their endeavors by providing the necessary resources to develop the proposed no- or low-cost learning materials.

Thank you for your consideration and please let me know if I can provide any additional information.

Sincerely,

Joseph Sloop, Ph.D.
Interim Dean, School of Science and Technology
Georgia Gwinnett College

Textbook Transformation Grants, Round Seventeen (Summer 2020 – Summer 2021)

Proposal Form and Narrative

Applicant, Team, and Sponsor Information

Institution(s)	Georgia Gwinnett College
Applicant Name	Amy H Erickson
Applicant Email	aerickso@ggc.edu
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Applicant Position/Title	Associate Professor
Submitter Name	Cathy Hakes
Submitter Email	chakes@ggc.edu
Submitter Phone #	678-407-5875
Submitter Position	Executive Director, Office of Research and Sponsored Programs

Team Members' first/last names and email addresses

	Name	Email Address
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Team Member 2	Katherine Pinzon	kpinzon@ggc.edu
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Team Member 6		
Team Member 7		
Team Member 8		

Other team members to add.

Sponsor's name, title, department, and institution. The sponsor is the provider of your Letter of Support.

Dr. Joseph Sloop, Interim Dean of School of Science and Technology, Georgia Gwinnett College

Project Information and Impact Data

Title of the Project: Low-cost Transformation of Precalculus and College Algebra

Priority Category / Categories	Gateways to Completion (G2C)
Requested Amount of Funding	$25,800
Course Names and Course Numbers	Precalculus, MATH 1113 College Algebra, MATH 1111 Corequisite College Algebra, MATH 0999/1111
Final Semester of Project	Summer 2021
Total Number of Student Section Enrollments Affected by Project in One Academic Year	4250
Average Number of Student Section Enrollments Affected per Summer Semester	340
Average Number of Student Section Enrollments Affected per Fall Semester	2250
Average Number of Student Section Enrollments Affected per Spring Semester	1660
Original Required Commercial Materials	Title: Algebra and Trigonometry – MyMathLab, 6th Ed. ISBN: 9780134758848 Author: Robert F. Blitzer Cost: $135.70 URL: Please copy and paste URL https://ggc.bncollege.com/shop/ggc/textbook/algebratrigonometrymymathlab-600008047261
Average Price of Original Required Materials Per Student Section Enrollment	$135.70

Average Post-Project Cost Per Student Section Enrollment	$0 - $22
Average Post-Project Savings Per Student Section Enrollment	$135.70
Projected Total Annual Student Savings Per Academic Year	$441,025
Using OpenStax Textbook?	Yes

Narrative Section

1. PROJECT GOALS

This textbook transformation project aims to adopt and adapt a no-cost textbook and an online homework system for MATH 1113 (Precalculus) and the prerequisite courses MATH 1111 (College Algebra) and MATH 0999/1111 (Corequisite College Algebra). These three courses currently all use the same textbook, and we plan to continue with that model. **The project team will develop no-cost materials such as audio-visual ancillaries, guided notes, PowerPoint presentations, and instructor resources** as replacements for the required MyMathLab textbook for these courses. Moreover, the project will provide a homework system that will be no-cost or low-cost (at most $22 per student), depending on the results of classroom testing. By the end of the project, we anticipate savings between $369,525 and $441,025.

Numerous studies indicate that the costs associated with college can negatively affect student satisfaction, retention, and academic progress (Clinton 2019; Hilton 2019; Venegas-Muggli 2019; Trombitas 2012; Redden 2011). MATH 1113 is a required course for all science majors at Georgia Gwinnett College (GGC), impacting hundreds of students each year. Given that GGC is an access institution, a significant number of students come in needing MATH 0999/1111 or MATH 1111 before they can take MATH 1113. Additionally, a large portion of our students are from lower socioeconomic classes and cannot afford the higher costs associated with their education. This project hopes to provide a more accessible and equitable pathway for students entering college. As such, this textbook transformation project has three main goals:

1) Increase student satisfaction and engagement by adapting a no- or low-cost textbook and online homework system and curating and developing materials such as audio-visual ancillaries, guided notes, PowerPoint presentations, and instructor resources,

2) Improve student success outcomes by integrating materials more fully through our MATH 1113 and prerequisite MATH 1111 or MATH 0999/1111 courses that are fully aligned with course outcome goals, and

3) Improve student retention and progression by lowering the economic barriers associated with higher education and narrowing the student achievement gap.

2. STATEMENT OF TRANSFORMATION

Overview of the Transformation

Since the 1970s, textbooks costs have risen a staggering 1,000% (Del Valle 2019). According to a study of the Government Accountability Office, textbook cost between 2002 and 2013 rose nearly three times the rate of inflation, with students spending as much as $1,200 on books and

supplies (Weisbaum 2014; Perry 2016). Since then, student spending has declined to about $415 on course materials in 2018-2019 (Hazelrigg 2019). Textbook publishers claim that the options they provide through digital version and subscription-style offerings are making textbooks more affordable (Del Valle 2019). Digital versions, however, still require students to pay for access codes separately and, more importantly, do not allow students to recoup their money by reselling since digital/key codes can only be used by an individual for one semester (Carns 2016, Senak 2014). Ethan Senak, higher education associate at US. PIRG, also stated, "Even as they move into e-textbooks, publishers incorporate paywalls, expiration dates and printing restrictions that further continue the practices they've used to control the traditional market." (Weisbaum 2014) This trend has led students to become more dependent on online guides, course notes, or even in illegally downloading textbooks—all these to ensure that they pass their courses and graduate (Evans 2014). The high cost of textbooks and ensuing public outcry, however, are bringing to the forefront the need for other alternatives, such as Open Educational Resources (OER). OER are now included in most institutions' library resources websites (for example at UWM, UMN, and SUNY Geneseo) and low-cost to no-cost textbooks initiatives are being implemented in parts of the country. An example is the State-funded Zero-Textbook-Cost initiative in California, which awarded grants to community colleges to create 23 associate-degree pathways and 14 certificate pathways, thus requiring OER through entire degree or certificate pathways (Burke 2019). The University System of Georgia's Affordable Learning Georgia (ALG) Textbook Transformation is another important initiative that so far has helped provide critical savings to 417,169 students, resulting in $69.2 million savings in textbook purchases (ALG Statistics).

The proposed ALG project aspires to help further reduce the educational expenses of over 4,000 students annually by replacing an expensive textbook that is used across three major math gateway courses. Christopher Ettese, CEO of Flat World Knowledge, supports the idea of expanding into online textbooks for multiple courses: "Instead of tackling one upper-level course at a time, OER and affordable textbook providers may over time focus more on degree programs with zero textbook cost. The ability to measure learning across an entire degree program is really where we're headed in the future rather than just on a course-by-course basis." (Straumsheim 2015). At Georgia Gwinnett College, students currently enrolled in MATH 1113, MATH 1111, and MATH 0999/1111 are required to purchase the $135.70 MyMathLab software, which includes an e-Textbook. Expensive software costs often lead to students not buying the software at all (Redden 2011) or relying on the free two-week trial period given by Pearson, the company that sells the software. Students who cannot afford the cost of the software allow the free trial to elapse and continue with their enrolled course with no access to materials. This decision affects their overall progress in the course and often results in failure. Currently, the DFW rates in MATH 1113 is at 62.5%. By providing the course materials on the first day of class at no cost to the students, we anticipate that the DFW rates will decrease and students will likely progress to their next mathematics or discipline-related course.

While the cost itself is an issue, MyMathLab gives instructors the freedom to choose from a large database of material, which leads to significant variation in instructional content across sections. Although the course goals are outlined for instructors to follow, students in the various

sections have expressed concern about the wide variety of content, textbook resources/ancillary materials, and instructional materials used in these courses, with little cohesiveness among them. This is a concern for all three of the courses in this proposal.

Mathematics is built on sequential learning. Thus, there currently exists some overlap of content material in MATH 1111 and MATH 1113, with approximately one-third of the course material in MATH 1113 focusing on expanding content from MATH 1111. To successfully move through this math sequence, students have to fully understand previously taught concepts in order to move on to more complex ones. If the foundation they received from secondary school or disparate instructional content in the current MATH 0999/1111 or MATH 1111 is shaky, they will likely struggle when they move on to MATH 1113, and a smaller percentage of students who take College Algebra or Corequisite College Algebra end up passing Precalculus. Moreover, if the academic support they receive at this phase is inadequate, they may not fully overcome their struggles with, for instance, math anxiety. Through this project, the team members aspire to provide a solution to issues that we have identified in teaching the three mathematics courses using MyMathLab: the replacement to a well-organized, engaging, free, online-accessible, mathematics textbook and resource materials.

The team will test various online homework systems in the classroom for quality control and student satisfaction and then choose ONE option for the courses. After the test and the end of the project, the team will provide either a no-cost or low-cost (at most $22) homework system to accompany the no-cost textbook and materials.

Project's transformative impact on course and department

The proposed project is novel since the transformation aims to eliminate the need for students to purchase materials across three major math courses. It also aims to adapt no- or low-cost materials that align specifically with the objectives of the courses and to enhance specific targeted areas of the course curricula with which students are known to struggle. In addition, we will provide quality content materials and audio-visual ancillary materials to enhance and supplement the no- or low-cost resources. These materials will be designed to help instructors provide similar content and tools across all sections. By compiling and developing substantive materials and resources, students will be better prepared to tackle more demanding subjects of the course and progress to their next level of studies. In addition, we will build upon and connect topics covered in MATH 1111 with content in MATH 1113, addressing the problem of cohesiveness stated earlier.

We expect faculty in mathematics at Georgia Gwinnett College who teach these courses will benefit from the materials developed, revised, and curated. By providing faculty with a set list of already culled resources such as videos and guides notes to choose from, faculty will be more apt to use these resources in their classroom, making things more consistent across the large number of sections. In addition, this could encourage faculty to the wider use of free online textbooks within the GGC mathematics program. Through this ALG Textbook grant, the team

will be able to create a model or template for the conversion of multi-section, multi-semester courses, such as Calculus or Chemistry, to no- or low-cost materials.

Project's transformative impact on institution

Over one-third of GGC's student population enroll in MATH 1111 and MATH 1113, an Area A course, each year. All Science, Technology, Engineering, and Mathematics (STEM) majors at GGC and across USG must take MATH 1113. Since we are an access institution, we attract a large population of students who are underprepared for college, some of whom need to enroll or start in MATH 0999/1111. This is likely the case for STEM majors at access institutions across the nation. Providing students free access to course materials through OER at the beginning of their educational careers that then moves with them in multiple courses will benefit student learning and retention. In addition, given the rising costs of textbooks and software, we believe this model can serve as an example for other institutions with similar student bodies. By creating and modifying content that better fits our course goals and objectives, other institutions will have a blueprint for how to make these adjustments to better suit the needs of their students.

3. TRANSFORMATION ACTION PLAN

Overview of Transformation Plan

The "textbook" we plan to transform is MyMathLab. MyMathLab is an online learning platform that includes online homework, tutorial, and assessment. To replace this platform, the project team will develop no-cost materials such as audio-visual ancillaries, guided notes, PowerPoint presentations, and instructor resources including test banks and sample assessments.

To begin the transformation, the course materials under consideration will come from a variety of online sources such as those listed below.

- Open Textbook Library
- OpenStax
- OER Commons
- MERLOT
- GALILEO Open Learning Materials

Specific resources we plan to consider include:

- Open College Algebra and Precalculus textbooks
    - Jay Abramson's *Algebra and Trigonometry*. This text has a similar list of topics but includes fitting models to data (something our current textbook lacks); additionally, this textbook is linked to three online homework systems, Edfinity, OpenStax's Rover, and MyOpenMath.
    - Anna Kuczynska's *Intermediate Algebra and Trigonometry*. This text includes multiple prerequisite chapters that would be quite suitable for our corequisite course.

    - Carl Stitz and Jeff Zeager's *Precalculus*. This text appears to cover almost all – if not all – the topics in both Precalculus and College Algebra.
- Open courseware
    - College of Coastal Georgia MATH 1111, MATH 1112, and MATH 1113
    - UNG College Algebra
    - Georgia College and State University MATH 1111
    - Open Course Library Precalculus I and Precalculus II
- Applets
    - Mathlets: Java Applets for Math Explorations
    - National Library of Virtual Manipulatives
    - Wolfram Demonstrations Project
    - Interactive Mathematics
    - Math Forum
- One of the following online homework systems
    - WeBWorK is an online homework system developed and maintained by the Mathematical Association of America. It is an open-source, stable system with over 35,000 problems in it. If GGC downloads and installs WeBWorK to a GGC server, it will be free for students.
    - MyOpenMath is a free and open online homework system, and it has pre-built courses for both Stitz and Zeager's and Abramson's texts referenced above.
    - Rover is an online homework system created by OpenStax. The cost is $22 per student per course, and this fee provides full access until students pass the course.
    - Edfinity is an "OpenStax Ally" and has algorithmic problems powered by WeBWorK. The cost for this system can be paid by students or by departments and has a maximum course cost of $20 per student for the texts under consideration.
- Online test bank
    - University of Maryland Mathematics Test bank
    - Kyote College Algebra Placement Exam
    - Varsity Tutors College Algebra Practice Tests
    - Canvas Precalculus Practice Tests
    - CLEP Precalculus Practice Tests
    - SOS Math Precalculus Practice Tests
- PowerPoint Presentations will be created by team members or culled from these resources.
    - OpenStax
    - Lumen College Algebra
    - Shawtrl College Algebra
    - USF College Algebra
    - Mr. Wright's Precalculus
    - Pete's PowerPoint Station Precalculus

- PowerShow Precalculus

These resources will be adapted to fit existing University System of Georgia required topics for each course, as follows. Preliminary faculty assignments are indicated in parentheses.

MATH 0099/1111 (Corequisite and stand-alone College Algebra) Topics

- Review topics: factoring, polynomial and rational expressions, radicals and complex numbers, linear equations, linear inequalities, quadratic equations, graphs of first- and second-degree equations (A. Erickson)
- Relations, functions and their graphs (A. Erickson)
- Quadratic and rational inequalities (J. Roberts)
- Linear functions of a single variable with applications (J. Roberts)
- Quadratic functions of a single variable with applications (J. Roberts)
- Systems of equations with applications (K. Erickson)
- Polynomial functions of a single variable (K. Erickson)
- Exponential and logarithmic functions (T. DeGeorge)
- Additional topics: absolute value equations and inequalities, circles, and the distance formula (K. Erickson)

MATH 1113 (Precalculus) Topics

- Review topics: quadratics, graphing calculator (A. Erickson)
- Polynomial functions (K. Erickson)
- Rational functions (K. Erickson)
- Exponential and logarithmic functions (T. DeGeorge)
- Trigonometric functions (K. Pinzon)
- Systems of equations, matrices, and determinants (K. Erickson)
- Additional topics: polar coordinates, conic sections (K. Pinzon)

Team members' roles

Team member Amy H. Erickson, Associate Professor of Mathematics, will serve as project manager, librarian, subject matter expert, instructional designer, and instructor of record for MATH 1111 and MATH 0999/1111. Dr. Erickson has worked on Course-Embedded Research Experience (CURE) grants for both College Algebra and Precalculus and has created and revised assignments and assessments for the last two years in College Algebra using specifications grading. She will consult with previous ALG grant recipients in Mathematics at GGC to leverage their experience and material. She will coordinate efforts to curate resources onto Brightspace (D2L) and other platforms for dissemination and create the final report. She will assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, and assessments for all topics with a focus on Prerequisite Skills and Functions and Their Graphs.

Team member Kathy Pinzon, Associate Professor of Mathematics, will lead the evaluation effort and serve as subject matter expert, instructional designer, and instructor of record for Precalculus. Dr. Pinzon chaired the Curriculum Alignment Committee and is thus extremely well-versed in the topics of College Algebra and Precalculus. She has extensive experience with surveys and assessment data analysis from serving as Principal Investigator for Course-Embedded Research Experience (CURE) grants and another Affordable Learning Georgia grant for Discrete Mathematics. She will coordinate efforts to obtain IRB approval, administer consent forms and surveys, and collect and analyze data. She will assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, and assignments for all topics with a focus on Trigonometric Functions, Polar Coordinates, and Conic Sections.

Team member Keith Erickson, Associate Professor of Mathematics, will coordinate alignment of topics and material across all three courses and serve as subject matter expert, instructional designer, and instructor of record for Corequisite College Algebra and Precalculus. Dr. Erickson has extensive experience with Course-Embedded Research Experiences (CUREs) for both College Algebra and Precalculus and has developed numerous student projects across many courses in GGC's Applied Math program. He will assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, and assignments for all topics with a focus on Systems of Equations with Matrices and Determinants, Polynomial Functions, Circles, and the Distance Formula.

Team member Joshua Roberts, Assistant Professor of Mathematics, will coordinate production of audio-visual ancillary material and serve as subject matter expert, instructional designer, and instructor of record for College Algebra. Dr. Roberts was a Mathematical Association of America Project NExT Fellow and, as a Fellow, developed expertise on the production of videos and video notes for students in many courses. He will coordinate efforts to produce videos on all major topics of the courses, advising the team on best practices for the implementation of this type of OER. He will assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, assessments, and assignments for all topics with a focus on Linear, Quadratic, Rational, and Absolute Value Functions and Inequalities.

Team member Tonya DeGeorge, Instructor of Mathematics, will serve as a subject matter expert, instructional designer, and instructor of record for Precalculus. Ms. DeGeorge is working on her Ph.D. in Mathematics Education and is a valuable resource for research in the Scholarship of Teaching and Learning (SoTL) and has created a set of guided notes for Precalculus. She will assist Dr. Pinzon more extensively in her evaluation efforts and Dr. Erickson in curating resources onto Brightspace (D2L). She will also assist in developing course materials like audio-visual ancillaries, guided notes, PowerPoint presentations, and assignments for all topics with a focus on Exponential and Logarithmic Functions.

Plan for providing access

- During the project terms, materials will be available to students via Brightspace (D2L) in addition to the resources noted above.

- Students will continue to be able to check out graphing calculators from the Kaufman Library.
- At the conclusion of the project, the PIs will also make the course materials available at GGC's Library Research Guides and/or GALILEO Open Learning Materials.

4. QUANTITATIVE AND QUALITATIVE MEASURES

The PIs will utilize questionnaires and class performance data in order to determine the accomplishment of project goals. In addition, the PIs will conduct limited focus groups consisting of sampled students to determine the impact of providing no- or low-cost textbooks and resources. During the Summer of 2020, the PIs will obtain IRB approval, ensuring compliance with institutional requirements in administering student questionnaires and conducting limited focus group interviews. Data collection will be conducted during the pilot Spring and Summer 2021 terms.

GOAL 1: (Student Satisfaction and Engagement)

Quantitative Measures, Methods, and Tools

The PIs will survey the students at the middle and end of each semester to evaluate the effectiveness and engagement of the proposed open source resources, including the PI-created ancillary materials. The questionnaire will ask students to rate questions on a Likert scale of Strongly Disagree to Strongly Agree and will consist of questions focusing on the following main ideas:

- The materials are always easily and reliably accessed.
- The materials are well-organized so that the necessary information can be found quickly.
- The materials clearly explain concepts and are useful to learn the content.
- The materials have enough exercises and examples to support students' learning needs.
- The guided notes were useful and engaging.
- The videos were useful and engaging.

Qualitative Measures, Methods, and Tools

The survey will also include open-ended questions, such as:

- What did you like about the new course materials?
- How can the new course materials be improved?

GOAL 2: (Student Success)

Quantitative Measures, Methods, and Tools

The PIs will collect the following data regarding students' performance in the course:

1. Student performance on common assessment questions in the final exam corresponding to each learning outcome of the courses. This data will be gathered from faculty teaching the classes.

2. Student grades on a final common assessment in all sections of the courses. This data will be gathered from faculty teaching the class.
3. Grade distribution in all sections of the courses. This data will be gathered from Banner and will be compared with existing historical grade distribution data for these classes.

Qualitative Measures, Methods, and Tools

These open-ended questions on student success will be included in the above-mentioned survey students complete at the end of the semester.

- Did the availability of free online textbook help improve your success in the course? If so, how did it impact your learning and success in the course?
- If you took College Algebra and Precalculus using the same resources, did you find that the topics in College Algebra prepared you for the topics in Precalculus? How did using the same resources impact your learning and success in both courses?
- Did you see your skills set and knowledge increase as you progressed through the course?

GOAL 3: (Student Retention through Zero Cost)

Quantitative Measures, Methods, and Tools

The PIs will collect the following data regarding students' retention:

1. Percentages of students moving on to the follow-on courses will be compared to historical data.
2. Grades in the follow-on courses will be compared to historical data.
3. Percentages of students completing homework on open source will be compared to historical data.

Qualitative Measures, Methods, and Tools

These open-ended questions on student success will be included in the above-mentioned survey students complete at the end of the semester.

- Are you more likely to continue in the next course knowing the materials are no- or low-cost?
- How will you benefit in the next course using these open-source materials?

In addition, the PIs will compare the cost of the current textbook with the cost of the new learning materials (expected to be free) to determine the overall cost savings.

5. TIMELINE

The proposed textbook transformation project will progress along the following timeline:

- May 29, 2020: Kickoff Online Meeting

- Summer 2020: An initial meeting will be held mid-May to develop protocols and a more-detailed summer schedule of expectations. The team members will use summer 2020 semester to identify, gather, and map OER resources to the course objectives and develop plans for creation of audio-visual ancillary materials, guided notes, PowerPoint slideshows, and instructor resources to supplement the no- or low-cost text and online homework system. Material developed in previous semesters will be compiled and reviewed to narrow the list of tasks for fall. The plans will include a detailed Schedule of Topics and a Table of Contents for each course that lists projected resources. They will also develop plans for curation of relevant resources onto Brightspace (D2L) for dissemination. Much of this work will be done virtually via shared documents and email. Preliminary material will be selected and prepared by August 3 for small-scale piloting in two sections of MATH 0999/1111 starting August 10.

- Fall 2020: The team members will use fall 2020 to test the OER and create and revise the content outlined in the summer, meeting on a weekly basis to coordinate efforts. Although revisions will be expected, a complete set of resources for each course will be fully curated by December 15 for large-scale piloting in spring. Protocols will be developed for incorporating additional revisions in real time through the life of this project and beyond. IRB approval will be obtained and preliminary feedback from students in the two MATH 0999/1111 courses will be collected. An evaluation plan and instruments for use in spring will also be developed during this semester.

- Spring 2021: Full implementation will take place in MATH 0999/1111, MATH 1111, and MATH 1113. The OER and material will be implemented in 3-5 sections of each course in spring 2021 for a total of 9-15 sections assigned to the five faculty team members. Two of the team members are also on the faculty scheduling committee for the mathematics discipline and will coordinate with the discipline chair to ensure course assignments as discussed above. Team members will meet weekly to discuss and coordinate any issues or modifications to the material following established protocols. More evaluation data, as outlined above, will be collected at the end of spring 2020 following the IRB approval obtained in the fall.

- Summer 2021: The team members expect to continue using the new materials in summer 2021 in additional sections and will collect more data. Summer sections will serve primarily to test the curated courses for dissemination and continuation into future semesters. Minor revisions may be made to the material during this time, following established protocols. Data analysis for spring semester will occur during this time. All relevant material will be curated onto Brightspace (D2L) and GGC's Library Research Guides. A report will be created and submitted by the end of the grant period. Lastly, PIs expect to work on dissemination efforts by presenting at course coordination, discipline meetings, and conferences, and making resources available to all GGC faculty.

6. BUDGET

Type of Grant: Large Scale
Amount: $25,800
Justification:

A. PERSONNEL: $20,000

Funds are requested to cover the compensation and fringe (FICA/SS, FICA Med, Retirement) of Drs. A. Erickson, Pinzon, K. Erickson, Roberts, and Ms. DeGeorge at $5000 each.

- Dr. Amy H. Erickson will serve as project manager, taking the lead in compiling and mapping OER resources to course objectives and curating these resources. She will participate in developing and testing course content and assignment materials for College Algebra and Corequisite College Algebra and will be responsible for the topics of Prerequisite Skills and Functions and Their Graphs.
- Dr. Kathy Pinzon will lead the evaluation effort for this project, including obtaining IRB approval, creating assessment tools, obtaining consent, administering surveys, and collecting and analyzing data. She will participate in developing and testing course content and assignment materials for Precalculus and will be responsible for the topics of Trigonometric Functions, Polar Coordinates, and Conic Sections.
- Dr. Keith Erickson will be responsible for the coordination and alignment of material and topics across the three courses. He will assist with data curation and evaluation and participate in developing and testing course content and assignment materials for Precalculus, College Algebra, and Corequisite College Algebra. He will be responsible for the topics of Systems of Equations with Matrices and Determinants, Polynomial Functions, and Circles and the Distance Formula.
- Dr. Joshua Roberts will lead in the effort to compile and develop quality videos for major topics of each course. He will participate in developing and testing course content and assignment materials for College Algebra and be responsible for the topics of Linear, Quadratic, Rational, and Absolute Value Equations and Inequalities.
- Ms. Tonya DeGeorge will assist in evaluation and curation. She will participate in developing and testing course content and assignment materials for Precalculus and College Algebra and be responsible for the topics of Exponential and Logarithmic Functions.

B. TRAVEL: $800

In lieu of the kickoff meeting (now online), the $800 funds are requested for a team member to attend the Mathematical Association of America's Southeastern Section conference. The purpose of the request is to disseminate information on how we developed our replacement online materials and the results of our efforts. Because of the many benefits of using OER, we also aim to encourage colleagues to adopt them. Funds will cover mileage, lodging, per diem, and other travel requirements. We do not need supplies for the project.

7. SUSTAINABILITY PLAN

MATH 1113 (Precalculus) is a required course for all science majors at GGC with either College MATH1111 (Algebra) or MATH 0999/1111 (Corequisite College Algebra) serving as prerequisite courses. The material compiled and developed here would impact over one-third of the students at GGC and lead to considerable improvement in student success, engagement, retention, and savings via the mechanisms described above.

The PIs expect to disseminate the material onto Brightspace (D2L) and present results to faculty colleagues at course coordination and discipline meetings and at conferences. Team members will collaborate with future course coordinators to ensure that the materials are kept up-to-date and organized following established protocols. After the grant is over, we will continue our work with Ms. Bethany Nash, our Systems Librarian. By providing an abundance of varying curated resources such as videos and guided notes in an easily accessible location, maintained over time, and customized to align with specific course outcome goals, faculty will be more apt to continue to use these resources in their courses. Additionally, this would encourage faculty to adopt free online resources more widely within the GGC mathematics program. Through this large-scale ALG Textbook grant, the team will be able to create a model or template for the conversion of multi-section, multi-semester courses, such as Calculus or Chemistry, to no- or low-cost materials.

A centralized online location will allow non-GGC faculty and students to access the materials easily. The PIs also see an opportunity to request and use additional mini-grant funds in the future to add emerging technologies to the curriculum.

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