Affordable Materials Grants, Round 18:

Transformation Grants

(Fall 2020 – Fall 2021)

Proposal Form and Narrative

# Applicant and Team Information

| Requested information | Answer |
| --- | --- |
| Institution(s) | Georgia Gwinnett College |
| Applicant name | Katherine Pinzon |
| Applicant email | [kpinzon@ggc.edu](mailto:kpinzon@ggc.edu) |
| Applicant position/title | Associate Professor of Mathematics |
| Submitter name | Cathy Hakes |
| Submitter email | chakes@ggc.edu |
| Submitter position/title | Executive Director, Office of Research, Sponsored Programs & Accreditation |

Please provide the first/last names and email addresses of all team members within the proposed project. Include the applicant (Project Lead) in this list. Do not include prefixes or suffixes such as Ms., Dr., Ph.D., etc.

| Team member | Name | Email address |
| --- | --- | --- |
| Team member 1 | Katherine Pinzon | [kpinzon@ggc.edu](mailto:kpinzon@ggc.edu) |
| Team member 2 | Tonya DeGeorge | [tdegeorge@ggc.edu](mailto:tdegeorge@ggc.edu) |
| Team member 3 | Joshua Roberts | [roberts7@ggc.edu](mailto:roberts7@ggc.edu) |
| Team member 4 | Barbara Mann | [bmann@ggc.edu](mailto:bmann@ggc.edu) |
| Team member 5 | Christine Robinson | [crobinson@ggc.edu](mailto:crobinson@ggc.edu) |
| Team member 6 |  |  |

If you have any more team members to add, please enter their names and email addresses in the text box below.

|  |
| --- |
| Not applicable |

**PROJECT TITLE: Low-cost Transformation of Calculus**

# Project Information

| Requested information | Answer |
| --- | --- |
| Priority Category / Categories  *Projects in these categories will receive three extra points in the final score for fitting a priority of these particular rounds of Transformation Grants. The type of funding for the project is determined by the funding categories criteria above. As of Round 18, projects can be a part of more than one category. Note that the below categories only indicate priority, not which applications qualify for a grant. Select all that apply.* | *Priority categories:*   * *Departmental Scaling Projects* * *Collaborative Projects with Professional Support* |
| Requested Total Amount of Funding  *$30,000 maximum total award per grant* | *$15,000* |
| Final Semester of Project | *Fall 2021* |
| Using OpenStax Textbook?  *This is to indicate to OpenStax that they can provide additional support and resources to your team during the adoption process.* | *Yes* |

# Impact Data

Please fill in the data below with impact data in below with *one course taught by one instructor* in each table, and only include courses and instructors that are specifically part of the scope of this grant proposal. Add or remove tables as needed. **Please only put a single averaged or totaled (as appropriate) number in each box. Do not put ranges or mathematical equations in any of these boxes.**

For a multi-course project, if a significant amount of students are assumed to take courses in a sequence and only one textbook is used for these courses, please take this into account in your total *(i.e. only include that book in the first course they would purchase it for OR adjust the number of students affected. Please explain in the notes section if making such adjustments).*

## Course 1

| Row # | Requested information | Answer |
| --- | --- | --- |
| N/A | Course title and number | MATH 2200 Calculus I |
| N/A | Course instructor | Katherine Pinzon |
| 1 | Average number of students enrolled per section | 28 |
| 2 | Average number of affected course sections scheduled in a summer semester | 1 |
| 3 | Average number of affected course sections scheduled in a fall semester | 2 |
| 4 | Average number of affected course sections scheduled in a spring semester | 1 |
| 5 | Total number of course sections scheduled in an academic year  *Add up rows 2-4.* | 4 |
| 6 | Total number of student section enrollments per academic year  *Multiply row 1 and row 5.* | 112 |
| 7 | Original required commercial materials  *Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Calculus: Early Transcendentals by Briggs, Cochran – MyLabMath Access - $135.70 [URL](https://ggc.bncollege.com/shop/ggc/textbook/calculusearly-transmylabmath-access-600008318073?sectionId=95379030&displayStoreId=54053&sectionList=&booksAddedforSec=&fromTBList=true) |
| 8 | Original cost per student section enrollment  *Add up the cost of all materials in row 7.* | $135.70 |
| 9 | Average post-project cost per student section enrollment | $25 |
| 10 | Average post-project savings per student section enrollment  *Subtract row 9 from row 8.* | $110.70 |
| 11 | Projected total annual student savings per academic year  *Multiply row 10 and row 6.* | $12,398.4 |

## Course 2

| Row # | Requested information | Answer |
| --- | --- | --- |
| N/A | Course title and number | MATH 2200 Calculus I |
| N/A | Course instructor | Tonya DeGeorge |
| 1 | Average number of students enrolled per section | 28 |
| 2 | Average number of affected course sections scheduled in a summer semester | 1 |
| 3 | Average number of affected course sections scheduled in a fall semester | 2 |
| 4 | Average number of affected course sections scheduled in a spring semester | 1 |
| 5 | Total number of course sections scheduled in an academic year  *Add up rows 2-4.* | 4 |
| 6 | Total number of student section enrollments per academic year  *Multiply row 1 and row 5.* | 112 |
| 7 | Original required commercial materials  *Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Calculus: Early Transcendentals by Briggs, Cochran – MyLabMath Access - $135.70 [URL](https://ggc.bncollege.com/shop/ggc/textbook/calculusearly-transmylabmath-access-600008318073?sectionId=95379030&displayStoreId=54053&sectionList=&booksAddedforSec=&fromTBList=true) |
| 8 | Original cost per student section enrollment  *Add up the cost of all materials in row 7.* | $135.70 |
| 9 | Average post-project cost per student section enrollment | $25 |
| 10 | Average post-project savings per student section enrollment  *Subtract row 9 from row 8.* | $110.70 |
| 11 | Projected total annual student savings per academic year  *Multiply row 10 and row 6.* | $12,398.4 |

## Course 3

| Row # | Requested information | Answer |
| --- | --- | --- |
| N/A | Course title and number | MATH 2200 Calculus I |
| N/A | Course instructor | Departmental Scaling (Fall 2021, end of grant) |
| 1 | Average number of students enrolled per section | 28 |
| 2 | Average number of affected course sections scheduled in a summer semester | 0 |
| 3 | Average number of affected course sections scheduled in a fall semester (2021) | 12 |
| 4 | Average number of affected course sections scheduled in a spring semester | 0 |
| 5 | Total number of course sections scheduled in an academic year  *Add up rows 2-4.* | 12 |
| 6 | Total number of student section enrollments per academic year  *Multiply row 1 and row 5.* | 336 |
| 7 | Original required commercial materials  *Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Calculus: Early Transcendentals by Briggs, Cochran – MyLabMath Access - $135.70 [URL](https://ggc.bncollege.com/shop/ggc/textbook/calculusearly-transmylabmath-access-600008318073?sectionId=95379030&displayStoreId=54053&sectionList=&booksAddedforSec=&fromTBList=true) |
| 8 | Original cost per student section enrollment  *Add up the cost of all materials in row 7.* | $135.70 |
| 9 | Average post-project cost per student section enrollment | $25 |
| 10 | Average post-project savings per student section enrollment  *Subtract row 9 from row 8.* | $110.70 |
| 11 | Projected total annual student savings per academic year  *Multiply row 10 and row 6.* | $37,195.20 |

**Narrative Section**

**1. PROJECT GOALS**

The proposed textbook transformation project aims to adopt and adapt a no-cost textbook and an online homework system for MATH 2200 Calculus I. This course currently is the first in a three-course sequence (MATH 2200, MATH 2210, and MATH 2220) that all use the same textbook, and we plan to continue the adoption of Open Educational Resources (OER) after this initial revision of Calculus I. 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 MyLabMath textbook for this course. In addition, a no-cost or low-cost (at most $25 per student) homework system will be used by students after it has been adapted and tested by the team. Over the course of the three semesters of the project, the initial savings will be $61,992. However, by the end of the project and with full departmental scaling, we anticipate savings of more than $100,000 annually.

Studies conducted by Clinton (2019), Trombitas (2012) and Redden, 2011 indicate that the costs associated with college can negatively affect student satisfaction, retention, and academic progress. Furthermore, studies have shown that student outcomes when using OER materials are as good as, or better, than when using traditional materials; moreover, student and faculty attitudes toward OER material is overwhelmingly positive (Hilton, 2019; Venegas-Muggli, 2019). MATH 2200 is a required course for almost all Science, Technology, Engineering, and Mathematics (STEM) majors at Georgia Gwinnett College (GGC), impacting hundreds of students each year. The path to MATH 2200 may include MATH 0999/1111 College Algebra with Corequisite Support or MATH 1111 College Algebra, and then MATH 1113 Precalculus. This leads to extremely high textbook costs over the 2-3 semesters before they complete their mathematics requirements. Through this project, the team hopes to remove these economic barriers and provide students the opportunity and motivation to want to continue their STEM paths. As such, this textbook transformation project has three main goals:

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

1. Improve student success outcomes by continuing to integrate OER materials across mathematics courses required in our degree program, including aligning the materials with the prerequisite sequence, MATH 1111 and MATH 1113, and ensuring adequate coverage of the course outcome goals; and

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

**2. STATEMENT OF TRANSFORMATION**

**Current state of the course, department, and/or institution**

At GGC, students currently enrolled in mathematics courses for STEM majors are required to purchase an access code to the MyLabMath software, which includes an e-Textbook. These access codes cost $137.50, which can sometimes be used for multiple semesters. However, given that many mathematics courses for STEM majors require MyLabMath, students would have to purchase the access codes at least 2-3 times for different textbooks just to get through the mathematics sequence. The current program gives students a free two-week trial period after which the expensive software costs often lead to students not buying the software at all (Redden, 2011). When those students cannot afford the cost of the software, they allow the free trial to elapse and continue in the course with no access to the material, assignments or practice exercises. This decision negatively affects their progress in the course and often results in failure. This trend continues throughout their degree program in all courses requiring these expensive materials. Given that the calculus sequence is another sequence that currently requires students to purchase MyLabMath software, students often have difficulty paying such high costs over multiple semesters/years.

The long-term goal is to provide students with a degree program with zero textbook cost, thus to “measure learning across an entire degree program rather than just on a course-by-course basis” (Straumsheim, 2015, para 15). GGC has already begun this endeavor through its currently funded ALG Textbook Transformation grant (awarded in Round 17), which is headed by Dr. Amy H Erickson and includes the present project team. Dr. Erickson’s project was designed to transform the MyLabMath textbook for prerequisite courses MATH 0999/1111 (Corequisite College Algebra) and MATH 1111 (College Algebra), and MATH 1113 (Precalculus). The newly proposed project will allow students to advance to the next level, MATH 2200 (Calculus I), again without the financial burden of a costly textbook and homework system. Our future plans, as discussed in the sustainability plan, include continuing the transformation of the entire Calculus sequence, thus creating a STEM multi-course, multi-semester degree program sequence that provides students free course materials and a low-cost homework system. By continuing this work, we anticipate that the current DFW rate in Calculus I of 34% will decrease and students will be retained and a higher rate and progress in their STEM degree plans to their next mathematics or discipline-related course, helping them get to and complete upper-level major courses successfully.

**Overall description of the project**

STEM students and those of lower socio-economic status are impacted more by the creation and implementation of up-to-date OER materials. They tend to have a more positive attitude about the implementation as well (Nipa, 2019). This accounts for a significant portion of the GGC student population and the continued improvement across multiple courses should have a greater impact on their success both in their courses and in their degree program. The proposed project aspires to further reduce the educational expenses of almost 1,000 students annually by replacing an expensive textbook that is used in MATH 2200, but also across the next two courses in the calculus sequence, with no-cost materials and by adopting a low-cost online homework system. While the scope of this project will be MATH 2200, we intend to extend our work into the next two courses in the sequence in the future.

**Project Impact**

*Impact on course.*

As noted above, the project aims to build on the success of previous textbook transformation grants in prerequisite general education courses, particularly MATH 1111 and 1113, and adapt no- or low-cost materials that align specifically with the objectives of the course. In addition, we will provide quality content materials and audio-visual ancillary materials to enhance and supplement the no- and low-cost resources. These materials will be designed to help instructors provide similar content and tools across all sections.

*Impact on department.*

While the cost of materials is a major concern, we also recognize the importance of creating cohesiveness across courses within the discipline. Since we, the PIs of this group, have been working with Dr. Erickson on OER materials for MATH 1111 and MATH 1113, we intend to align resources of these courses to the upper-level sequence as well. Given that we are currently working on creating materials for those prerequisite courses, we have created a system and an outline that we believe will transfer over well into the Calculus sequence. This will ensure students are familiar with and have seen content presented in similar manners with recurring themes and spiraling frameworks throughout their educational career at GGC, starting with our general education courses. It will also provide cohesion for faculty and students among the materials presented at all levels, including the use of Edfinity, the low-cost online homework system chosen by the ALG round 17 grant team for the MATH 2200 prerequisite courses. Sticking with a single homework system that can be used across multiple courses within the discipline will help make adoption more feasible for all faculty and will help students transition from one course to the next with ease. We consider Edfinity the best low-cost option for our MATH 1111 and MATH 1113 courses and we intend to explore the use of Edfinity in MATH 2200 as well. However, we remain open to using other platforms and are currently in conversations with the mathematics discipline in other possible avenues, such as hosting a WebWork server that may provide no-cost software for all our students (this would require GGC as an institution to agree to host the server for our students). Ensuring students have the necessary tools and skills in prerequisite courses means we have prepared them to take courses, such as MATH 2200. In addition, once students are enrolled in upper-level course, we feel we, as an institution, need to continue to support them in their learning as they advance through their STEM degree programs. Continuing this support beyond MATH 1113 will create a more cohesive curriculum and experience, thus preparing and encouraging students to move into STEM careers.

*Impact on institution.*

We expect mathematics faculty at GGC who teach this course will benefit from the materials. We understand instructors teach differently and require different needs, and thus, we are providing multiple resources to make the transition easier and more welcoming. In addition, resources created will be easily accessible to all students – something instructors will not have to worry about in their own teaching. In addition, it will bridge the gap between the type of content and learning expectations, as well as exposure to online homework systems, between general education courses and upper level courses. By providing faculty with a set list of already culled resources, such as videos and guided notes, faculty will be more apt to use these resources in their classroom, making things more consistent across the large number of sections. This could encourage faculty to the wider use of free online textbooks within the GGC mathematics program. Through this ALG affordable materials grant, the team will be able to enhance the model or template for the conversion of multi-section, multi-semester courses to no- or low-cost materials, eventually expanding to all mathematics courses within a STEM path.

**3. ACTION PLAN**

**Roles of each team member**

Team member Kathy Pinzon, Associate Professor of Mathematics, will serve as project manager, will lead the evaluation effort and serve as subject matter expert, instructional designer, and instructor of record. She has extensive experience with surveys and assessment data analysis from serving as Principal Investigator for Course-Embedded Research Experience (CURE) grants and coPI for other Affordable Learning Georgia grants for Discrete Mathematics, College Algebra and Precalculus. 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 by editing notes and Power Points and ensuring they are accessible for students. In addition, she will provide answer keys to guided notes and instructor guides Power Points.

Team member Joshua Roberts, Assistant Professor of Mathematics, will coordinate production of audio-visual ancillary material and serve as subject matter expert, and instructional designer. 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 by creating online homework, making sure it aligns with the course topics and is similar in feedback and design to the program currently used. Also, he will work on creating and finding videos for each topic aligned with the notes.

Team member Tonya DeGeorge, Instructor of Mathematics, will serve as a subject matter expert, instructional designer, and instructor of record. 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 is currently on Dr. Erickson’s team creating guided notes for College Algebra and Precalculus. She will assist Dr. Pinzon more extensively in her evaluation efforts and will coordinate efforts to curate resources onto Brightspace (D2L) and other platforms for dissemination and create the final report. She will also assist in developing course materials such as the guided notes, PowerPoint presentations, and any active learning assignments that align with course topics/goals.

Team Member Barb Mann, librarian, will help define search terms and vocabulary, give direction on possible resources, ensure that the materials created are correctly credited, cited, and licensed under Creative Commons.

Team Member Chris Robinson as design specialist will help ensure that the materials created meet accessibility guidelines, can be disseminated to the discipline, the institution, and the greater mathematics community in a manner that is easily accessed and updated.

**Review of existing open, no-cost, and/or low-cost course materials for the course(s)**

The “textbook” we plan to transform is MyLabMath. MyLabMath 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](http://open.umn.edu/opentextbooks)[OpenStax](http://openstax.org/)[OER Commons](http://www.oercommons.org/)[MERLOT](https://www.merlot.org/)[GALILEO Open Learning Materials](https://oer.galileo.usg.edu/)

Specific resources we plan to consider include:

Open Calculus textbooks

Strang and Herman’s [*Calculus Volume 1*](https://openstax.org/details/books/calculus-volume-1)*.* 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 online homework systems, [Edfinity](https://edfinity.com/), and OpenStax’s [Rover](https://openstax.org/rover-by-openstax).

Gregory Hartman’s [*APEX Calculus*](http://www.apexcalculus.com/)*.* This text offers interactive 3-D graphics where images of objects in space can be manipulated.

Matt Boelkin’s [*Active Calculus*](https://activecalculus.org/)*.* This text provides an activity book with over 200 exercises that help engage students in active learning.

One online homework system to replace MyLabMath

[Edfinity](https://edfinity.com/) 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 $25 per student for the texts under consideration.

[WeBWorK](https://webwork.maa.org/) 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/USG server, it will be free for students.

Ancillary materials will be created by team members or culled from these resources.

[OpenStax](https://openstax.org/details/books/calculus-volume-1?Instructor%20resources)

[Greg Kelly Math Calculus PowerPoints](https://sites.google.com/site/gkellymath/home/calculus-powerpoints)

[Lumen Learning Lecture Slides](https://courses.lumenlearning.com/boundless-calculus/front-matter/download-lecture-slides/)

Open Course Library [Calculus](http://opencourselibrary.org/math-151-calculus-i/)

These resources will be adapted to fit existing University System of Georgia required topics for each course, as follows:

***MATH* *2200 (Calculus) Topics***

* [Functions](https://openstax.org/books/calculus-volume-1/pages/1-introduction)
* [Limits](https://openstax.org/books/calculus-volume-1/pages/2-introduction)
* [Continuity](https://openstax.org/books/calculus-volume-1/pages/2-4-continuity)
* [The Derivative](https://openstax.org/books/calculus-volume-1/pages/3-introduction)
* [Antidifferentiation](https://openstax.org/books/calculus-volume-1/pages/4-10-antiderivatives)
* [The Definite Integral](https://openstax.org/books/calculus-volume-1/pages/5-2-the-definite-integral)
* [Applications](https://openstax.org/books/calculus-volume-1/pages/4-introduction)

**Plan for the selection, adoption, adaptation, and/or creation of new course materials**

To ensure there is cohesiveness across all types of materials, all PIs will contribute to the creation of the materials, regardless of the topic. In addition, with the process of creating the materials and teaching with the materials, all members of the team will be checking and editing all aspects of the work. All revised or newly created materials will be developed with basic accessibility standards in mind. The materials will include alternative text, accurate captioning and accessible PowerPoint design.

We intend to follow this outline in the creation of materials:

Look at topic list/goals outcome and determine which topics to cover ~2 hrs/chapter

Together the team will discuss topics that are outlined in the chosen no-cost textbook and software and determine which topics are required and optional in the MATH 2200 course (by aligning it to the course goals/topics required by USG and the GGC mathematics discipline).

Homework ~10 hrs/chapter

Once detailed objectives have been identified, Dr. Roberts will create an example homework set for each topic, using questions from Edfinity, the WebWork database, and creating questions as necessary.

Guided Notes and Power Points ~20 hrs/chapter

Ms. DeGeorge will create guided notes and PowerPoint slides based on the homework set Dr. Roberts created as well as content that is available in the open-source textbook. Topics that are not addressed in the e-text will be supplemented from other no-cost resources available. During this phase, Ms. DeGeorge will also be editing and proof-reading the homework so that it aligns with the notes.

Accessibility and Solutions to Notes and Power Points ~15 hrs/chapter

Dr. Pinzon will edit and revise the homework and notes to check that all topics are covered as well as provide solutions/answer keys to the notes and Power Points. In addition, she will make sure the materials are accessible.

Videos ~20 hrs/chapter

Dr. Roberts will use notes and homework to create/collate/edit videos as well as check/revise the homework and notes.

**Plan for redesigning your course**

Dr. Pinzon and Ms. DeGeorge will each teach one section of MATH 2200 in spring 2021 during which they will conduct the initial pilot of the materials. While teaching the courses, we, as a team, will be able to identify any problems or concerns about the ancillary materials. In addition, we will get feedback from students who will be using the materials in their learning of the content. During the spring 2021 semester, Dr. Roberts will be our tech specialist – assisting and helping with the videos as well as any necessary changes in the homework sets. Given that he has experiences with programming, his work will be crucial in making sure the online homework system runs smoothly as Dr. Pinzon and Ms. DeGeorge teach the course.

**Plan for providing open access to the new materials**

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

Students will continue to be able to check out graphing calculators from the Kaufman Library. They can also use the free online graphing calculator Desmos.

­All revised or newly created materials will be developed with basic accessibility standards in mind. The materials will include alternative text, accurate captioning and accessible PowerPoint design.

At the conclusion of the project, the PIs along with the library specialist and design specialist will also make the course materials available.

**4. QUANTITATIVE AND QUALITATIVE MEASURES**

The PIs will utilize questionnaires, such as those described in Jaggers’ (2017) work, and class performance data in order to determine the accomplishment of project goals. In spring 2021, the PIs will obtain IRB approval to administer student questionnaires and possibly conduct limited focus group interviews. Data collection will be conducted during the pilot spring and summer terms and the full department rollout in fall 2021 terms.

The following evaluation plan mirrors and extends the evaluation plan of the ALG Textbook Transformation project of Dr. Amy H Erickson. As stated earlier, the PIs of this project are part of Dr. Erickson’s team. In this proposed project, we would like to continue to evaluate the project along the same lines of inquiry started in the prerequisite courses MATH 1111 (College Algebra) and MATH 1113 (Precalculus) to provide detailed information to the discipline about the effectiveness of using no- and low-cost materials. While we believe using these materials can be extremely beneficial to students in helping them be successful in our courses, we would like to provide quantitative and qualitative measures that support that. In addition, continuing this work into the Calculus sequence can help us determine the different needs and concerns across different courses while also maintaining the cohesiveness.

**GOAL 1: (Student Satisfaction and Engagement)**

**Quantitative Measures, Methods, and Tools**

The PIs will survey the students at the end of each semester to evaluate the effectiveness and engagement of the proposed open source resources, including the online homework system and 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.
* Students experience working with Edfinity/online homework system as compared to MyLabMath.

**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?
* What successes and challenges did you experience using the low-cost online homework system?

**GOAL 2: (Student Success)**

**Quantitative Measures, Methods, and Tools**

The PIs will survey the students at the end of each semester to gain an understanding of students’ perceived success and goals. Understanding students’ idea of what success is and their goals, might help us better understand how providing no-and low-cost materials can help them reach it. 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:

* What is your current grade in the course?
  + Are you currently happy or satisfied with your grade?
* What grade do you hope to have at the end of the course?

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 course. This data will be gathered from faculty teaching the classes.
2. Student grades on a final common assessment in all sections of the course. This data will be gathered from faculty teaching the class.
3. Grade distribution in all sections of the course. 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 similar OER resources, did you find that the topics in these courses prepared you for Calculus? 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 survey the students at the end of each semester to gain an understanding of students’ current behavior around purchasing materials for their courses and the effect it may have on their success. The questionnaire will ask students to rate questions on a scale such as Always, Sometimes, Rarely, Never and will consist of questions focusing on the following main ideas:

* How often students typically purchase course materials for their courses.
* How often students have allowed their MyLabMath access to expire due to cost.
* How students typically shop for their course materials (I.e. directly through the bookstore, third party, online, etc.)
* How much out-of-pocket expense students spend on course materials.

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

1. Percentages of students moving on to the next course in the sequence will be compared to historical data.
2. Grades in the follow-up 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?
* To what extent would the availability of free educational resources impact your decision to enroll in a future course?

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

**5. TIMELINE**

Full implementation will be done in Fall 2021 semester.

**Fall 2020**

October 30, 2020: Kickoff meeting

An initial meeting will be held late-October to develop protocols and a more-detailed schedule of expectations. The team members will use fall 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. The library specialist will work with the team to find other open-source resources that can be adapted to fit the needs of the project. Once OER resources and an online homework system has been chosen, the PIs will create materials that align with content in both systems while also addressing the goals and course outcome goals as determined by USG and GGC. Course materials will follow an agreed accessible template so that all members can create materials that align. 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 that lists projected resources. The design specialist will also help the PIs to develop plans for material templates which meet accessibility guidelines and curation of relevant resources onto Brightspace (D2L) for initial dissemination. Much of this work will be done virtually via shared documents and email. Preliminary material will be selected and prepared by January 10 for small-scale piloting in two sections of MATH 2200 starting January 19, 2021.

**Spring 2021**

The team members will use spring 2021 to test sections of the OER and create and revise the content outlined in the fall, 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 April 15 for more small-scale full implementation in summer. 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 MATH 2200 course will be collected. An evaluation plan and instruments for use in summer and fall will also be developed during this semester.

**Summer 2021**

Full implementation will take place in more pilot sections of MATH 2200. The OER and material will be implemented in 1-2 sections of the course in summer 2021. Team members will meet 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 summer 2021 following the IRB approval obtained in the fall. Data analysis for spring semester will occur during this time.

**Fall 2021**

Full implementation will take place for all sections of MATH 2200 offered in fall 2021. The OER and materials will be given to mathematics faculty for them to use in their courses. Team members will engage with mathematics faculty and encourage input to make any necessary revisions to course materials. More evaluation data, as outlined above, will be collected at the end of fall 2021. All relevant material will be curated onto Brightspace (D2L) and a platform (as determined by the design specialist and all other team members) that can be accessed by any GGC faculty as well as any member of the mathematics community. 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 and those in the mathematics. During this semester, the PIs will create an article to be submitted on the materials and data collected throughout the project.

A final activity for fall 2021 will be the completion of the evaluation plan. The project team will conduct the focus group; collect all in-class, focus group, and faculty evaluations; analyze the data; and prepare the final report. The final report will be submitted on the date designated by ALG.

**6. BUDGET**

Type of Grant: Transformation grant, priorities: departmental scaling and collaborative project with professional support

Amount requested: $15,000

Justification: These funds will cover compensation for the creation of materials amounting to over 470 hours.

**A. PERSONNEL: $15,000**

Funds are requested to cover the compensation and fringe (FICA/SS, FICA Med, Retirement) of Drs. Pinzon, Roberts, and Ms. DeGeorge at $5,000 each.

* Dr. Kathy Pinzon will serve as project manager, taking the lead in compiling and mapping OER resources to course objectives and curating these resources. She will also 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 all topics of the course. A portion of the $5,000 will include registration for the Open Educational Conference ($75 registration fee).
* Dr. Joshua Roberts will lead in the effort to create online homework sets, and 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 all topics of the course. A portion of the $5,000 will include registration for the Open Educational Conference ($75 registration fee).
* Ms. Tonya DeGeorge will assist in evaluation and curation of materials. She will participate in developing and testing course content and assignment materials for all topics of the course. A portion of the $5,000 will include registration for the Open Educational Conference ($75 registration fee).

The Library Specialist team member, Barb Mann, will be assisting the project as a service to the institution, as per institutional guidelines.

The design specialist team member, Chris Robinson, will be assisting the project as a service to the institution, as per institutional guidelines.

**B. TOTAL REQUEST: $ 15,000**

**7. SUSTAINABILITY PLAN**

**The maintenance and updating of course materials**

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 and our design specialist to ensure that the materials are kept up-to-date and organized following established protocols.

**The commitment of the department(s) or institution(s) to continue the use of affordable materials**

MATH 2000 (Calculus I) is a required course for all Mathematics, Chemistry, Biology and Information Technology majors at GGC with MATH 1113 (Precalculus) serving as a prerequisite course. The materials 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 discipline has agreed to move to a low-cost model across our general education courses and is working to develop this for these courses and beyond. We expect this model to be $25 for the homework system and all the other resources will be free and open. The mathematics discipline has committed to adopting the materials created by this project to all sections of MATH 2200 in fall 2021.

**Any possible expansion of the project to more course sections in the future**

As the discipline has committed to a full-scale adoption in fall 2021, all sections of MATH 2200 will use the materials during this semester. In the future, we plan to also continue the transformation of materials for the rest of the courses of MATH 2210 Calculus II and MATH 2220 Calculus III in the sequence. Continuity in the Calculus sequence will be pursued through with free textbooks via future ALG grants. These courses currently use the same expensive MyLabMath materials.

**Future plans for sharing this work with others through presentations, articles, or other scholarly activities**

After the grant is over, we will continue our work with team members Barbara Mann, our library specialist and Chris Robinson, our design specialist. 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 Affordable Materials grant, the team will be able to create a model or template for the conversion of other multi-section, multi-semester courses, in mathematics and other departments, to no- or low-cost materials. Continuing our work from the MATH 1111/MATH 1113 ALG grant shows our commitment to using affordable learning materials in our classes. By providing faculty resources that align with course goals and objectives, we hope the discipline will also continue the path to adopting OER resources in other courses to help our students be successful.

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 and continue the development of materials for the rest of the Calculus sequence.

Not only do we intend to provide our own faculty with materials, as described above, we also intend to discuss and share the results of the study to the greater education community. We intend to present our work at regional and national conferences as well as publish our results to appropriate open educational resources journals, such as the *International Journal of Open Educational Resources* and *Open Learning: The Journal of Open Education, Online and Distance Learning.*

**REFERENCES**

ALG Statistics, Research, and Reports - About / Affordable Learning Georgia. *Affordable Learning Georgia*. <https://www.affordablelearninggeorgia.org/about/reports>

Burke, L. (2019 September 19). *California community colleges implement zero-textbook-cost degree pathways.* Inside Higher Ed. <https://www.insidehighered.com/digital-learning/article/2019/09/19/california-community-colleges-implement-zero-textbook-cost>

Carrns, A. (2016 September 23). *A New Cost at College: Digital Access Codes.* New York Times*.* <https://www.nytimes.com/2016/09/24/your-money/a-new-cost-at-college-digital-access-codes.html>

Clinton, V., & Khan, S. (2019 September 13). *Efficacy of Open Textbook Adoption on Learning Performance and Course Withdrawal Rates: A Meta-Analysis*. SAGE Journals. <https://journals.sagepub.com/doi/full/10.1177/2332858419872212>

Del Valle, G. (2019 March 6). *The high cost of college textbooks, explained.* Vox*.* <https://www.vox.com/the-goods/2019/3/6/18252322/college-textbooks-cost-expensive-pearson-cengage-mcgraw-hill>

Evans, Z. (2014 September 19). *College Students Increasingly Illegally Downloading Textbooks for Free.* Reason.com. <https://reason.com/2014/09/19/college-students-increasingly-illegally/>

Hazelrigg, N. (2019 July 25). *Spending and costs of textbooks continue to decrease, according to surveys.* Inside Higher Ed. <https://www.insidehighered.com/news/2019/07/25/spending-and-costs-textbooks-continue-decrease-according-surveys>

Hilton, J. (2019 August 6). *Open educational resources, student efficacy, and user perceptions: a synthesis of research published between 2015 and 2018.* Educational Technology Research and Development. Springer US. <https://link.springer.com/article/10.1007/s11423-019-09700-4>

Jaggars S. S., Folk, A., & Mullins D. (2018 February 5). *Understanding students’ satisfaction with OERs as course materials.* Performance Measurement and Metrics. Emerald Group Publishing. <https://www.emerald.com/insight/content/doi/10.1108/PMM-12-2017-0059/full/html>.

Nipa, T. J. & Kermanschachi S. (2019 December 11). *Assessment of open educational resources (OER) developed in interactive learning environments.*  Educational and Information Technologies*.* Springer US. <https://link.springer.com/article/10.1007/s10639-019-10081-7>.

Perry, M. (2016 September 1). *Chart of the day: The astronomical rise in college textbook prices vs. consumer prices and recreational books.* American Enterprise Institute*.* <https://www.aei.org/carpe-diem/chart-of-the-day-the-astronomical-rise-in-college-textbook-prices-vs-consumer-prices-and-recreational-books/>

Redden, M. (2011 August 23). *7 in 10 Students Have Skipped Buying a Textbook Because of Its Cost.* The Chronicle of Higher Education. <https://www.chronicle.com/article/7-in-10-Students-Have-Skipped/128785>

Senack, E. (2014). *Fixing the Broken Textbook Market: How Students Respond to High Textbook Costs and Demand Alternatives.* The Student PIRGS. <https://uspirg.org/sites/pirg/files/reports/NATIONAL%20Fixing%20Broken%20Textbooks%20Report1.pdf>

Straumsheim, C. (2015 August 4). *Triaging Textbook Costs.* Inside Higher Ed. <https://www.insidehighered.com/news/2015/08/04/era-400-college-textbook-affordability-initiatives-take-utilitarian-approach>

Trombitas, K. (2012). *Financial Stress: An Everyday Reality for College Students.* <https://www.inceptia.org/PDF/Inceptia_FinancialStress_whitepaper.pdf>

Venegas-Muggli, J. I., & Westermann, W. (2019). View of Effectiveness of OER Use in First-Year Higher Education Students' Mathematical Course Performance. *The International Review of Research in Open and Distributed Learning 20*(2).

<http://www.irrodl.org/index.php/irrodl/article/view/3521/5022> Weisbaum, H. (2014 January 28). *College textbook costs more outrageous than ever.* CNBC. <https://www.cnbc.com/2014/01/28/college-textbook-costs-more-outrageous-than-ever.html>

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**Letter of Support**

**Name and title of the department chair (or other administrator) who provided the Letter of Support.**

Dr. Sonal Dekhane

Interim Dean

School of Science and Technology

**Grants or Business Office Letter of Acknowledgment**

**Name and title of the department chair (or other administrator) who provided the Letter of Acknowledgement.**

Dr. Cathy Hakes

Executive Director

Office of Research, Sponsored Programs, and Accreditation