Fall 2018

Calculus III (FVSU)

Patcharin Marion  
*Fort Valley State University, tragoonsirisakp@fvsu.edu*

Dawit Aberra  
*Fort Valley State University, Aberrad@fvsu.edu*

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Grants Collection

Affordable Learning Georgia Grants Collections are intended to provide faculty with the frameworks to quickly implement or revise the same materials as a Textbook Transformation Grants team, along with the aims and lessons learned from project teams during the implementation process.

Each collection contains the following materials:

- Linked Syllabus
  - The syllabus should provide the framework for both direct implementation of the grant team’s selected and created materials and the adaptation/ transformation of these materials.
- Initial Proposal
  - The initial proposal describes the grant project’s aims in detail.
- Final Report
  - The final report describes the outcomes of the project and any lessons learned.

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Initial Proposal
Application Details

Manage Application: Textbook Transformation Grants: Round Ten

Award Cycle: Round 10
Internal Submission Deadline: Friday, September 29, 2017

Application Title: 333
Application ID: 001881
Submitter First Name: Patcharin
Submitter Last Name: Marion
Submitter Title: Associate Professor of Mathematics
Submitter Email Address: tragoonsirisakp@fvsu.edu
Submitter Phone Number: 478-825-6199
Submitter Campus Role: Proposal Investigator (Primary or additional)

Applicant First Name: Patcharin
Applicant Last Name: Marion
Co-Applicant Name(s): --
Applicant Email Address: tragoonsirisakp@fvsu.edu
Applicant Phone Number: 478-825-6199
Primary Appointment Title: Associate Professor of Mathematics
Institution Name(s): Fort Valley State University
Submission Date: Monday, October 2, 2017

Proposal Title: 333
Proposal Category: No-Cost-to-Students Learning Materials
Are you using an OpenStax textbook?: Yes
Final Semester of Instruction: Fall 2018

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

Dr. Patcharin T. Marion, Associate Professor of Mathematics, Department of Mathematics and Computer Science, Fort Valley State University, tragoonsirisakp@fvsu.edu
List the original course materials for students (including title, whether optional or required, & cost for each item):

Elementary Statistics (MATH 2113): Elementary Statistics with Excel; M. F. Triola; Addison/Wesley 2014. This book is packaged with MyStatLab which is required. The cost at the bookstore to the students is $216.

Calculus III (MATH 2174): Calculus for Scientists & Engineers: Early Transcendental; W. L. Briggs & L. Cochran; Pearson 2010. This book is packaged with MyMathLab which is required. The cost at the bookstore to the students is $326.

Average Number of Students per Course Section: 30

Number of Course Sections Affected by Implementation in Academic Year: 7

Average Number of Course Sections Per Semester:

Statistics: 2

Calculus III: 1

Total Number of Students Affected by Implementation in Academic Year: 210

Requested Amount of Funding: $10,800
Project Goals:

It happens often that students do not have the required textbook right at the beginning of semester. Some students cannot afford the textbooks because they are expensive, or some students need to wait for the financial aid to buy the textbook. The main goal of this project is to save students money on textbooks by replacing the current textbooks with the free OpenStax textbooks. At Fort Valley State University, Calculus I and II courses have been developed recently to incorporate the use of free materials that are delivered on the D2L platform. Students have been very impressed with the new design of these two courses. In Calculus III, we are still using the high-cost textbook and MyMathLab (MML) which is $326, and students have also requested us to do the no-cost material for them. Therefore, we plan to redesign our Calculus III by using the OpenStax Calculus Volume III (by Gilbert Strang and Edwin “Jed” Herman). In Elementary Statistics, students are also still using the high-cost materials. Therefore, we will develop the no-cost material for the Elementary Statistic course as well. We will adopt the OpenStax Introductory Statistics (by Barbara Illowsky and Susan Dean). We also plan to save students money on online homework systems by replacing MML with the free online practice problems in the Brightspace by D2L platform. The project is anticipated to redesign the courses by developing the course content that meets the needs of our students. All the necessary materials will be free for students and included in D2L. With this plan, we expect that the cost savings will have an impact on the students’ learning, and also increase the students’ success.

Statement of Transformation:

We intend to transform our institutional Elementary Statistics and Calculus III courses from high-cost textbooks to no-cost textbooks. In addition, we will create additional course content such as online practice problems and videos. All the students will have full access to these materials.

The primary stakeholders are the students who are reliant on financial aid. Many students have complained in the past that they could not afford the textbook or they had to wait for the financial aid to get book vouchers. Even with the book voucher, students still find the textbook expensive. This project will have a great impact on reducing the financial burden on students. Furthermore, students will be able to access all course materials (including syllabus, textbook, homework problems, etc.) on the first day of class. We expect this plan will help impact the
students’ success in a positive way. Another benefit of this plan is that it will improve the retention rate of the department and institution as well.

For the courses with more than one section, they will be taught more uniformly. This will ensure that all students are being taught the same content and at the same standard. Our faculty will also benefit from the new design. For example, most of the course materials will be uploaded in D2L in advance. This will reduce the amount of time our faculty will spend on preparation.

**Transformation Action Plan:**

The ALG team consists of Dr. Shadreck Chitsonga and Dr. Patcharin T. Marion. Both faculty members are qualified to teach Elementary Statistics and Calculus III. Dr. Chitsonga was instrumental in introducing the course work leading to a concentration of a minor in Statistics at Fort Valley State University. He is also the coordinator for Statistics. Dr. Marion has taught Calculus I, II, and III for several years, and she is the Calculus coordinator for the department.

As an initial step of the Action Plans, we have already selected the OpenStax textbooks, Introductory Statistics and Calculus Volume 3. We plan to use the D2L which comes at no cost to the students in the transformation.

The next step is to redesign the syllabi to be aligned with the OpenStax textbook. After that, we will organize the courses and materials (including outline, note, open-source textbook, video, practice problems, etc.) which will be embedded in the D2L.

Dr. Chitsonga will be responsible for reviewing and redesigning the syllabus and course content for the Elementary Statistics course in the D2L.

Dr. Marion will be responsible for reviewing and redesigning the syllabus and course content for the Calculus III course in the D2L.
**Quantitative & Qualitative Measures:** The quantitative and qualitative data will be collected and analyzed to measure the impact on students’ success and experience. The quantitative data will come from the pre- and post-tests, final examinations, and final grades. Our data will be collected from two groups, one with using free OpenStax materials, and the other from using purchased materials. We will use the pre- and post-test results to compare the differences, if any, between the two groups. For the multiple-section course, one section will serve as pilot course with no-cost materials, and the other section will have the students purchase the textbook and MML. For the single-section course, we will compare the data from the current semester (using free materials) to the past semester (using purchased materials). We will then analyze all the data to see if there are any advantages or benefits for the students in the courses using free materials compared to those using purchased materials. The qualitative data will come from a survey that we will conduct in two groups. At the end of the first semester of using the free materials, we will conduct surveys to see if the feedback from the students in both classes (one in the pilot course using free OpenStax, and the other using purchased materials). For the single-section course, we will compare the conducted surveys from the current semester (using free materials) to the past semester (using purchased materials).

**Timeline:**

November 6, 2017: Both team members will attend the Kickoff Meeting.

November 2017 to December 2017: The course objectives will be matched with the content in the OpenStax textbooks, and the syllabi and course schedules will be modified accordingly.

January 2018 to March 2018: Both team members will get the BrightSpace training as a team. For the single-section courses, the pre-tests from the students who are using the current (purchased) textbook will be administered in this Spring semester.

April 2018 to May 2018: The survey to students concerning the use of the current (purchased) course materials will be collected. For the single-section course, the post-tests from the
students using the current (purchased) textbook will be administered in this Spring semester.

May 2018 to July 2018: The homework problems will be typed and uploaded into the D2L. The creation of all the materials will be completed and uploaded into the D2L.

August 2018 to December 2018: Elementary Statistics and Calculus III courses will be piloted using the new (no-cost) materials. Some adjustments will take place if needed. The pre- and post-tests from the students using the new materials will be administered. The survey to students concerning the use of the new course materials will be collected at the end of this Fall semester.

December 2018: The data from both courses will be analyzed to evaluate the efficiency of the open-source materials.

**Budget:**

$5,000 : Compensation for Dr. Patcharin Marion  
$5,000 : Compensation for Dr. Shadreck Chitsonga  
$800 : Travel and overall project expenses

**Sustainability Plan:**

Elementary Statistics and Calculus are offered each semester throughout the year. The department’s full adoption of these transformed courses will ensure that they are to be reviewed annually for improvement and sustainability. Additional funding will be sought to broaden the free textbook resources to other courses (for example, Introduction to Linear Algebra) in the department.
September 21, 2017

Affordable Learning Textbook Transformation Grant
Review Committee

Dear Committee Members:

Smaller colleges, community colleges, and Historically Black Colleges and Universities are often the vehicles for the growth and development of many first generation minority populations in their pursuit to meet their dreams. Such students need a better way to engage fully with mathematics as essential part of their profession. I am pleased to lend my full support for this proposal for its merits and because I believe Dr. Patcharin Marion and Dr. Shadreck Chitsonga are well qualified to accomplish the goals of the proposal.

Fort Valley State University provides instruction, research and extension services consistent with the mission of the University System of Georgia for all segments of the population to achieve their personal and professional goals. The average enrollment at FVSU has been around 3,500 students with approximately 95% being African Americans. The campus, situated in the city of Fort Valley, spans over 1,375 acres and is the second largest campus in land-area within the University System of Georgia.

The Department of Mathematics and Computer Science offers programs of study leading to the Bachelor of Science degrees, with majors in Mathematics, Computer Science, and Computer Information Systems. Additionally, the department offers minor concentrations in these same areas, as well as statistics and nuclear engineering. In collaboration with the school of Education, the department also offers courses leading to undergraduate and graduate degrees in Education with concentration in Mathematics. The department also participates in several 3+2 dual degree programs, in conjunction with FVSU's Cooperative Development Energy Program (CDEP). Through CDEP dual degree program, students obtain a B.S. degree in Mathematics from FVSU and a second B.S. degree in engineering, geosciences or health physics, from Georgia Tech (GT), the University of Nevada Las Vegas (UNLV), Penn State University (PSU), the University of Texas-Austin (UT-Austin), the University of Texas Pan American (UTPA), and the University of Arkansas (UARK). Achievement gaps in mathematics continue to persist and many students are left behind in their pursuit of a better life because of their financial challenges.

Our Mathematics program, which was ranked top in the nation for producing African-American math graduates by Diverse Magazine (2011, 2014 and 2015), is well prepared to adopt the
transformed courses. We have the smart technology and laboratories available to facilitate student support for the on-line, free text resources. Both Dr. Marion and Dr. Chitsonga have worked on Affordable Learning Grants before.

Dr. Chitsonga was a team member of a funded initiative that resulted in a no-cost, instructional approach to Precalculus. This team saves students enrolled in College Algebra and Precalculus classes in excess of $100,000 per semester in textbook costs. Most recently, Dr. Chitsonga worked with other faculty to produce instructional videos and modules for classroom instruction.

Dr. Marion has a history of successful course transformation initiatives as evidenced by the Calculus I and II modules produced for use in the department. Currently, the modules are being piloted in the calculus I and II classes. Furthermore, students in these calculus classes are using free-online textbooks that have been adopted recently. The overarching goal is to create modules and adopt free-online textbooks for all the three levels of calculus (I, II and III). The multi-section nature of the selected courses guarantees sustainability of the proposed program.

I am excited about the potential financial savings this project would offer our students.

Sincerely yours,

Dawit Aberra, Ph. D.
Chair, Department of Mathematics and Computer Science
Affordable Learning Georgia Textbook Transformation Grants

Round Ten

For Implementations beginning Summer Semester 2017
Running Through Spring Semester 2018

Proposal Form and Narrative

- The proposal form and narrative .docx file is for offline drafting and review. Submitters must use the InfoReady Review online form for proposal submission.

- Note: The only way to submit the proposal is through the online form in Georgia Tech’s InfoReady Review at:
  
  https://gatech.infoready4.com/#competitionDetail/1757803

- If you are copying and pasting into InfoReady Review from this form, first convert the file to **plain text** and copy/paste from the plain text file.
  
  - In Word, go to File > Save As… > and change the file format to “Plain Text (.txt).”
  
  - Copy and paste from the .txt file.
  
  - Be sure to save both copies in case you are asked to resubmit.

- Microsoft Word Document formatting pasted into InfoReady Review will render the reviewer copy unreadable. **If you paste Word-formatted tables into InfoReady Review, you may be asked to resubmit your application if time permits.**

- **Italicized text is provided for your assistance; please do not keep the italicized text in your submitted proposal. Proposals that do not follow the instructions may be returned.**

<table>
<thead>
<tr>
<th>Submitter Name</th>
<th>Patcharin T. Marion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submitter Title</td>
<td>Associate Professor of Mathematics</td>
</tr>
<tr>
<td>Submitter Email</td>
<td><a href="mailto:tragoonsirisakp@fvsu.edu">tragoonsirisakp@fvsu.edu</a></td>
</tr>
<tr>
<td>Submitter Phone</td>
<td>(478) 825-6199</td>
</tr>
<tr>
<td><strong>Phone Number</strong></td>
<td></td>
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<tr>
<td><strong>Submitter Campus Role</strong></td>
<td>Proposal Investigator (Primary or additional)</td>
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<td><strong>Primary Appointment Title</strong></td>
<td>Associate Professor of Mathematics</td>
</tr>
<tr>
<td><strong>Institution Name(s)</strong></td>
<td>Fort Valley State University</td>
</tr>
</tbody>
</table>
| **Team Members** | Dr. Patcharin T. Marion, Associate Professor of Mathematics, Department of Mathematics and Computer Science, Fort Valley State University, tragoonsirisakp@fvsu.edu  
Dr. Shadreck Chitsonga, Associate Professor of Mathematics, Department of Mathematics and Computer Science, Fort Valley State University, chitsongas@fvsu.edu |
| **Sponsor, Title, Department, Institution** | Dr. Dawit Aberra, Department Chair, Department of Mathematics and Computer Science, Fort Valley State University |
| **Proposal Title** | Redesigning Calculus and Statistics courses to incorporate the use of no-cost materials |
| **Course Names, Course Numbers and Semesters Offered** | Elementary Statistics; MATH 2113; Fall, Spring, Summer  
Calculus III; MATH 2174; Fall, Spring or Summer |
<table>
<thead>
<tr>
<th>Final Semester of Instruction</th>
<th>Fall 2018</th>
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<tbody>
<tr>
<td>Average Number of Students Per Course Section</td>
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<tr>
<td>Number of Course Sections Affected by Implementation in Academic Year</td>
<td>7</td>
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<tr>
<td>Total Number of Students Affected by Implementation in Academic Year</td>
<td>210</td>
</tr>
</tbody>
</table>
| Average Number of Course Sections Per Semester | Statistics: 2  
 Calculus III: 1 |
| Award Category (pick one) | ☒ No-or-Low-Cost-to-Students Learning Materials  
 ☐ Specific Core Curriculum Courses |
| Are you planning on using an OpenStax textbook? | ☒ Yes  
 ☐ No |
| List the original course materials for students (including title, whether optional or required, & cost for each item) | Elementary Statistics (MATH 2113): Elementary Statistics with Excel; M. F. Triola; Addison/Wesley 2014. This book is packaged with MyStatLab which is required. The cost at the bookstore to the students is $216.  
 Calculus III (MATH 2174): Calculus for Scientists & Engineers: Early Transcendental; W. L. Briggs & L. Cochran; Pearson 2010. This book is packaged with MyMathLab which is required. The cost at the bookstore to the students is $326. |
<p>| Requested Amount of Funding | $10,800 |</p>
<table>
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<th>MATH 2113: $216 per student</th>
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<tr>
<td><strong>Original Per Student Cost</strong></td>
<td></td>
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<tr>
<td><strong>Post-Proposal Projected Per Student Cost</strong></td>
<td>MATH 2113: $0.00 per student</td>
<td>MATH 2174: $0.00 per student</td>
</tr>
<tr>
<td><strong>Projected Per Student Savings</strong></td>
<td>MATH 2113: $216 per student</td>
<td>MATH 2174: $326 per student</td>
</tr>
<tr>
<td><strong>Projected Total Annual Student Savings</strong></td>
<td>$51,960</td>
<td></td>
</tr>
</tbody>
</table>
1.1 PROJECT GOALS

List the goals you are trying to achieve with the transformation, including goals for student savings, student success, materials creation, and pedagogical transformation.

It happens often that students do not have the required textbook right at the beginning of semester. Some students cannot afford the textbooks because they are expensive, or some students need to wait for the financial aid to buy the textbook. The main goal of this project is to save students money on textbooks by replacing the current textbooks with the free OpenStax textbooks. At Fort Valley State University, Calculus I and II courses have been developed recently to incorporate the use of free materials that are delivered on the D2L platform. Students have been very impressed with the new design of these two courses. In Calculus III, we are still using the high-cost textbook and MyMathLab (MML) which is $326, and students have also requested us to do the no-cost material for them. Therefore, we plan to redesign our Calculus III by using the OpenStax Calculus Volume III (by Gilbert Strang and Edwin “Jed” Herman). In Elementary Statistics, students are also still using the high-cost materials. Therefore, we will develop the no-cost material for the Elementary Statistic course as well. We will adopt the OpenStax Introductory Statistics (by Barbara Illowsky and Susan Dean). We also plan to save students money on online homework systems by replacing MML with the free online practice problems in the Brightspace by D2L platform. The project is anticipated to redesign the courses by developing the course content that meets the needs of our students. All the necessary materials will be free for students and included in D2L. With this plan, we expect that the cost savings will have an impact on the students' learning, and also increase the students' success.
1.2 STATEMENT OF TRANSFORMATION

- Describe the transformation.
- Identify stakeholders affected by the transformation.
- Describe the impact of this transformation on stakeholders and course success.
- Describe the transformative impact on the course, program, department, institutions, access institution, and/or multiple courses.

We intend to transform our institutional Elementary Statistics and Calculus III courses from high-cost textbooks to no-cost textbooks. In addition, we will create additional course content such as online practice problems and videos. All the students will have full access to these materials.

The primary stakeholders are the students who are reliant on financial aid. Many students have complained in the past that they could not afford the textbook or they had to wait for the financial aid to get book vouchers. Even with the book voucher, students still find the textbook expensive. This project will have a great impact on reducing the financial burden on students. Furthermore, students will be able to access all course materials (including syllabus, textbook, homework problems, etc.) on the first day of class. We expect this plan will help impact the students’ success in a positive way. Another benefit of this plan is that it will improve the retention rate of the department and institution as well.

For the courses with more than one section, they will be taught more uniformly. This will ensure that all students are being taught the same content and at the same standard. Our faculty will also benefit from the new design. For example, most of the course materials will be uploaded in D2L in advance. This will reduce the amount of time our faculty will spend on preparation.
1.3 TRANSFORMATION ACTION PLAN

Action plans must address:

- The identification, review, selection, and adoption/adaptation/creation of the new course materials.
- The course and syllabus instructional design/redesign necessary for the transformation.
- The activities expected from each team member and their role(s): subject matter experts, instructional designer, librarian, instructor of record, et al.
- The plan for providing open access to the new materials.

The ALG team consists of Dr. Shadreck Chitsonga and Dr. Patcharin T. Marion. Both faculty members are qualified to teach Elementary Statistics and Calculus III. Dr. Chitsonga was instrumental in introducing the course work leading to a concentration of a minor in Statistics at Fort Valley State University. He is also the coordinator for Statistics. Dr. Marion has taught Calculus I, II, and III for several years, and she is the Calculus coordinator for the department.

As an initial step of the Action Plans, we have already selected the OpenStax textbooks, Introductory Statistics and Calculus Volume 3. We plan to use the D2L which comes at no cost to the students in the transformation.

The next step is to redesign the syllabi to be aligned with the OpenStax textbook. After that, we will organize the courses and materials (including outline, note, open-source textbook, video, practice problems, etc.) which will be embedded in the D2L.

Dr. Chitsonga will be responsible for reviewing and redesigning the syllabus and course content for the Elementary Statistics course in the D2L.
Dr. Marion will be responsible for reviewing and redesigning the syllabus and course content for the Calculus III course in the D2L.
1.4 QUANTITATIVE AND QUALITATIVE MEASURES

- The quantitative and qualitative measures of impact on student success and experience. The quantitative and qualitative data collected will be utilized in your final report as well as within ALG program communications.
- It is important to identify how the data is to be analyzed for each data source. In specific, the action plan must address the project’s quantitative impact on student success (items such as Learning Objective success, Drop, Fail, Withdraw (DFW) delta rate, and any other critical factors) to measure impact on student experience.
- Qualitative measures can include student feedback through surveys, interviews, focus groups, or other means.

The quantitative and qualitative data will be collected and analyzed to measure the impact on students’ success and experience.

The quantitative data will come from the pre- and post-tests, final examinations, and final grades. Our data will be collected from two groups, one with using free OpenStax materials, and the other from using purchased materials. We will use the pre- and post-test results to compare the differences, if any, between the two groups. For the multiple-section course, one section will serve as pilot course with no-cost materials, and the other section will have the students purchase the textbook and MML. For the single-section course, we will compare the data from the current semester (using free materials) to the past semester (using purchased materials). We will then analyze all the data to see if there are any advantages or benefits for the students in the courses using free materials compared to those using purchased materials.

The qualitative data will come from a survey that we will conduct in two groups. At the end of the first semester of using the free materials, we will conduct surveys to see if the feedback from the students in both classes (one in the pilot course using free OpenStax, and the other using purchased materials). For the single-section course, we will compare the conducted surveys from the current semester (using free materials) to the past semester (using purchased materials).
1.5 Timeline

This is a timeline of milestone dates for your transformation project through the end of the first semester the transformed course(s) is/are offered to students. Your interim reports will utilize this timeline to indicate if the project is on schedule.

When submitting this timeline in InfoReady Review, be sure to use the Paste from Word button in order to correctly paste a table from Word. Otherwise, the document will be unreadable to reviewers.

November 6, 2017: Both team members will attend the Kickoff Meeting.

November 2017 to December 2017: The course objectives will be matched with the content in the OpenStax textbooks, and the syllabi and course schedules will be modified accordingly.

January 2018 to March 2018: Both team members will get the BrightSpace training as a team. For the single-section courses, the pre-tests from the students who are using the current (purchased) textbook will be administered in this Spring semester.

April 2018 to May 2018: The survey to students concerning the use of the current (purchased) course materials will be collected. For the single-section course, the post-tests from the students using the current (purchased) textbook will be administered in this Spring semester.

May 2018 to July 2018: The homework problems will be typed and uploaded into the D2L. The creation of all the materials will be completed and uploaded into the D2L.

August 2018 to December 2018: Elementary Statistics and Calculus III courses will be piloted using the new (no-cost) materials. Some adjustments will take place if needed. The pre- and post-tests from the students using the new materials will be administered. The survey to students concerning the use of the new course materials will be collected at the end of this Fall semester.

December 2018: The data from both courses will be analyzed to evaluate the efficiency of the open-source materials.
1.6 BUDGET

Include Personnel & Projected Expenses as appropriate for the category.

Proposals must involve teams of at least teams of 2 or more of any of the following: faculty, faculty librarians, instructional designers, subject matter experts, editors, graphic designers, or others as needed. It is required to include the $800 for overall project expenses and travel in this section.

Two levels of funding are available based on the scale of the project proposed:

Standard-Scale Transformation: Textbook transformation projects within one or more courses or sections with under 500 students enrolled on average per academic year total.

$10,800 maximum award
$5,000 maximum per team member
$800 for travel and expenses

Large-Scale Transformation: Textbook transformation projects within one or more courses or sections or department-wide adoptions with 500 or more students enrolled on average per academic year total.

$30,000 maximum award
$5,000 maximum per team member
$800 for travel and expenses

Funding is not a direct stipend to the team members, but rather goes to the institution to cover the team member's time (salary/release time/overload/replacement coverage), project expenses including related department needs, and travel expenses (up to $800 is specifically designated for at least two team members to attend the required in-person kickoff meeting).

The proposing team must coordinate as necessary with their departments and institutional sponsors to determine how to handle the distribution, including amounts, release time/overload/salary/replacement as well as semester(s). This provides the maximum flexibility to the institution and the team in terms of how many people and what types of skills are needed, amount of compensation vs. replacement of teaching load, and timing in terms of semesters of preparatory work vs. semesters of adoption.

$5,000 : Compensation for Dr. Patcharin Marion
$5,000 : Compensation for Dr. Shadreck Chitsonga
$800 : Travel and overall project expenses
1.7 SUSTAINABILITY PLAN

What is your plan for offering the course in the future, including maintenance and updating of course materials?

Elementary Statistics and Calculus are offered each semester throughout the year. The department's full adoption of these transformed courses will ensure that they are to be reviewed annually for improvement and sustainability. Additional funding will be sought to broaden the free textbook resources to other courses (for example, Introduction to Linear Algebra) in the department.
1.8 REFERENCES & ATTACHMENTS

A letter of support must be provided from the sponsoring area (unit, office, department, school, library, campus office of the Vice President for Academic Affairs, etc.) that will be responsible for receipt and distribution of funding. Letters must reference sustainability. In the case of multi-institutional affiliations, all participants' institutions/departments must provide a letter of support.
Course: MATH 2174 – Calculus III
Section: 1
Schedule: MTWR => 1:00 pm – 1:50 pm
Location: CTM 202
Instructor: Dr. Patcharin Tragoonsirisak Marion  
E-mail: tragoonsirisakp@fvsu.edu
Office: CTM 216  
Phone #: 478-825-6199
Office Hours: Monday => 10:00 am – 12:00 pm; 2:00 pm – 3:00 pm  
Tuesday => 10:00 am – 12:00 pm  
Wednesday => 10:00 am – 12:00 pm; 2:00 pm – 3:00 pm  
Thursday => 10:00 am – 12:00 pm  
or by appointment

Course Description:
The concepts of limit, derivative, and integral are applied to vector-valued functions and functions of several variables. Students apply vector calculus to solve problems in physics.

Prerequisite: MATH 2164 – Calculus II


Additional information: 
"https://fvsu.view.usg.edu" for doing quizzes and downloading documents (including the syllabus and solution keys).

Departmental Major Area Learning Outcomes:
This course addresses the following major area learning outcomes:

I. Students will apply the concept of function together with the traditional computational techniques to solve real world problems (Course Learning Outcomes II - Objective 8, III - Objective 19, and IV- Objectives 1, 2, 4, and 5)

V. Students will use graphing calculators and computers to perform numerical and symbolic computations, visualize data and mathematical objects, and solve mathematics problems. (Technology Assignment - Course Learning Outcome III - Objectives 19 and 20)

Sophomore-Junior Diagnostic Exam:
Mathematics majors enrolled in this course will take part I of the diagnostic exam. This exam includes items on topics covered in MATH 1113 (Precalculus), MATH 1154 (Calculus I), and MATH 2164 (Calculus II).

Course Learning Outcomes:
I. Students will investigate analytical properties of curves given by parametric equations. They will explore polar coordinates and properties of polar graphs.

Objectives:
1. Sketch the graph of a curve given by a set of parametric equations
2. Find a set of parametric equations to represent a curve
3. Find the slope of a curve represented by a set of parametric equations
4. Find the arc length of a curve given by a set of parametric equations
5. Find the area of a surface of revolution given in parametric form
6. Convert between rectangular and polar forms
7. Sketch the graph of an equation given in polar form
8. Find the area of a region bounded by a polar graph
9. Find the arc length of a polar graph
10. Find the area of a surface of revolution given in polar form

II. Students will perform operations with vectors and investigate the geometry of space.
   Objectives:
   1. Write vectors in component form and as linear combinations of standard unit vectors
   2. Perform vector operations, and interpret the results geometrically
   3. Compute dot product of vectors in 2-space and 3-space
   4. Apply the properties of dot product
   5. Find the direction cosines of a vector in space
   6. Find the projection of a vector onto another vector
   7. Find the cross product of two vectors in 3-space
   8. Apply the properties of cross product
   9. Find and apply the triple scalar product of three vectors in space
   10. Write parametric equations and symmetric equations of lines
   11. Write equation of a plane in standard and in general form
   12. Find the measure of the angle between two planes
   13. Find the distance between a point and a plane
   14. Find the distance between a point and a line in space
   15. Recognize and write equations for cylindrical surfaces, quadric surfaces, and surfaces of revolution
   16. Convert between rectangular, cylindrical, and spherical coordinates
   17. Write equations of surfaces in space using cylindrical and spherical coordinates

III. Students will differentiate and integrate vector-valued functions. They will apply vector valued functions to real world problems.
   Objectives:
   1. Sketch space curves given by vector-valued functions
   2. Find limits of vector valued functions
   3. Determine whether a given vector-valued function is continuous at a give point or on a given set
   4. Find the derivative of a given vector-valued function
   5. Apply the properties of the derivative of vector-valued functions
   6. Find the definite integral and indefinite integral of a vector-valued function
   7. Find the velocity, acceleration, and speed of a vector-valued function
   8. Use a vector-valued function to analyze projectile motion
   9. Find the unit tangent vector and the unit normal vector at a point on a space curve
   10. Find the tangential and normal components of acceleration
   11. Find the arc length of a space curve, and use the arc length parameter to describe a curve at a point on the curve
   12. Find the curvature of a curve at a point on the curve

IV. Students will apply differential calculus to functions of several variables. They will solve optimization problems involving functions of several variables.
   Objectives:
   1. Find and sketch the domain of a function of two (or three) variables
   2. Sketch the graph of a function of two variables
   3. Sketch level curves of a function of two variables, and sketch level surfaces of a function of three variables
   4. Find limit of a function of two (or three) variables
   5. Determine whether a function of two (or three) variables is continuous at a point or on a set
   6. Find partial derivatives of a function of two or three variables
   7. Find higher order partial derivatives of a function of two or three variables
   8. Find the total differential of a given function of two or three variables
   9. Determine whether a function of two (or three) variables is differentiable at a point or on a set
   10. Apply differentials of functions of two or three variables
   11. Apply the Chain Rule
   12. Find partial derivatives implicitly
   13. Find the directional derivatives of a function of two (or three) variables
   14. Find the gradient of a function of two (or three) variables
   15. Find the direction of maximum decrease and the direction of maximum increase of a function of two (or three) variables, and find the maximum and minimum values of the directional derivative
   16. Find equations of tangent planes and normal lines to a surface
   17. Find the absolute and relative extrema of a function of two variables
18. Apply the Second Partials Test
19. Solve optimization problems involving functions of several variables
20. Use Lagrange multipliers to solve constrained optimization problems

V. Students will evaluate iterated integrals. They will use multiple integrals to find areas of plane regions, volumes of solid regions, and areas of surfaces.
   Objectives:
   1. Evaluate an iterated integral, and use an iterated integral to find the area of a plane region
   2. Evaluate and apply properties of double integrals; use double integrals to find the volume of a given solid region
   3. Evaluate double integrals using polar coordinates
   4. Use double integral to find the area of a surface
   5. Evaluate triple integrals, and use them to find volumes of solid regions
   6. Write and evaluate triple integrals in cylindrical and spherical coordinates

VI. Students will study the calculus of vector fields.
   Objectives:
   1. Find the curl and the divergence of a vector field
   2. Determine whether a vector field is conservative
   3. Write and evaluate line integrals of real valued functions and vector fields along piecewise smooth curves
   4. Apply the Fundamental Theorem of Line Integrals
   5. Apply Green’s Theorem to evaluate a line integral
   6. Evaluate surface integrals
   7. Apply the Divergence Theorem
   8. Apply Stokes’s Theorem

Required Content:

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<td>6</td>
<td>1, 2, 3, 4, 5, 6, 7, 8</td>
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Grading Standards and Criteria:

Final averages will be computed using the following scales:
- Common Final Exam: 20%
- Midterm Exam: 15%
- Test Average: 45%
- Quiz (in D2L) Average: 20%

Grades will be assigned using the point spread indicated below:
A: 100 – 90       B: 89 – 80       C: 79 – 70       D: 69 – 60       F: Below 60

Institutional and Course Policies for students:

- You are expected to bring the textbook and a calculator to class, and to be attentive and quiet. During class, I encourage you to ask me questions about the lecture, but not your classmate.
- Students are expected to attend punctually all classes. According to University policy, you are allowed 3 unexcused absences. After the three absences, 1% of your final grade will be deducted for each class you miss. Without a good reason, leaving a class before dismissal will be counted as a
late arrival. Every two late arrivals will be counted as one absence. If an absence is necessary, you are responsible for the material covered on that day.

- Any proof for an excuse (including any missing assignments) should be submitted as soon as possible. Definitely, there is no excuse or late assignments will be accepted after the final examination.
- During the test or exam, do not wear a cap/sunglass, and do not use any electronic device (except that being approved). Without any medical reason, you can leave the classroom only after having turned in the test or exam paper; otherwise, one point will be deducted for each minute being away.
- Cell phones, beepers, and anything that makes noise should be turned off during class.
- Anyone caught cheating will be given an F for the course, and will be dealt with to the full extent of Fort Valley State University regulations.

**DISABILITY**

FVSU is committed to the full inclusion of individuals with disabilities. To that end, the policies and procedures of FVSU ensure that a person with a documented disability is not, on the basis of that disability, denied full and equal access to academic programs, nor excluded from participation in co-curricular activities, or otherwise subjected to discrimination in such programs and activities. The policies for individuals with disabilities at FVSU are designed to ensure full compliance with all pertinent federal and state legislation, specifically to include Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990. If a student requires disability accommodations, he/she must register with the Office of Disability Services. To register online please visit: http://www.fvsu.edu/disability-services/. You may also call (478) 822-1072, or visit the Royal C. Peabody Bldg. Room 125.

**IN Voluntary Withdrawal Policy**

If after the mid-semester period, the instructor verifies that a student has accumulated the following number of unexcused absences from the class, the student is subject to involuntary withdrawal from the class and will receive a final course grade of “WF.”

- The student is absent 20 or more days for a class (including labs) that meet 4 days per week.
- The student is absent 15 or more days for a class that meets 3 days per week.
- The student is absent 10 or more days for a class meets 2 days per week.
- The student is absent 6 or more days for a class meets 1 day per week.

**FVSU’s current policies and practices regarding plagiarism and academic dishonesty: Student Academic Dishonesty.** Expulsion or suspension from the University or any lesser sanction may be imposed for the commission of offenses involving cheating or defraud on examinations. Examples of such offenses include giving assistance not authorized by the instructor in the preparation of an essay, laboratory report, examination or other assignment included in an academic course; taking or attempting to take, steal, or otherwise procure in an unauthorized manner, any material pertaining to the conduct of a class, including but not limited to examinations, laboratory experiments, and roll books; and plagiarizing.

**Plagiarism.** The appropriation of someone else’s ideas, passages arguments, interpretation of events or factual information, in either hard copy or electronically, demonstrates a lack of integrity and is unacceptable at Fort Valley State University. Other examples of plagiarism include submitting someone else’s work/assignment as one’s own, submitting purchased papers as one’s own, and submitting papers from the Internet as one’s own. Students who are guilty of plagiarism are subject to disciplinary action. Acts of plagiarism must be reported to the Department Head, Dean, Vice President for Academic Affairs, and the Vice President for Student Affairs for appropriate action. (2006–2008 Fort Valley State University Undergraduate Catalog, 71-72.)

**References:**


The above schedule and procedures are subject to change in the event of extenuating circumstances.
Final Report
Affordable Learning Georgia Textbook Transformation Grants

Final Report

To submit your Final Report, go to the Final Report submission page on the ALG website: http://affordablelearninggeorgia.org/site/final_report_submission

Final report submission requires four files:

- This completed narrative document
- Syllabus or syllabi
  - (if multiple files, compress into one .zip folder)
- Qualitative/Quantitative Measures data files
  - (if multiple files, compress into one .zip folder)
- Photo of your team or a class of your students w/ at least one team member, minimum resolution 800x600px
  - (nearly all smartphones take photos larger than this size by default)

Follow the instructions on the webpage for uploading your documents. Based on receipt of this report, ALG will process the final payment for your grant. ALG will follow up in the future with post-project grantee surveys and may also request your participation in a publication, presentation, or other event.

General Information

Date: 12/19/2018

Grant Round: 10

Grant Number: 333

Institution Name(s): Fort Valley State University

Project Lead: Dr. Patcharin Tragoonsirisak Marion

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

  Dr. Patcharin T. Marion; Associate Professor; Mathematics and Computer Science; tragoonsirisakp@fvsu.edu
  Dr. Dawit Aberra; Professor; Mathematics and Computer Science; aberrad@fvsu.edu

Course Name(s) and Course Numbers:

  Calculus III (MATH 2174)
  Elementary Statistics (MATH 2113)
Semester Project Began: Fall 2017

Final Semester of Implementation: Fall 2018

Total Number of Students Affected During Project: 139

1. Narrative
   
   A. Describe the key outcomes, whether positive, negative, or interesting, of your project. Include:
      
      • Summary of your transformation experience, including challenges and accomplishments
      • Transformative impacts on your instruction
      • Transformative impacts on your students and their performance

   B. Describe lessons learned, including any things you would do differently next time.

   In this project, we proposed to develop the no-cost materials for Calculus III (created by PI or Dr. Patcharin T. Marion) and Elementary Statistics (created by Dr. Shadreck Chitsonga). Dr. Chitsonga who was supposed to teach and pilot the Elementary Statistics course in Fall 2018 resigned from Fort Valley State University in August 2018. That was the big challenge in this project because the free-material project for the Elementary Statistics was under the construction and not ready to be used by the August 2018. Dr. Dawit Aberra who is the department head of the Department of Mathematics and Computer Science at Fort Valley State University accepted to teach the course and joined us in the second half of the project. Dr. Aberra could not use and pilot the project with the OpenStax textbook in Fall 2018. However, he continued the project from Dr. Chitsonga and the course is now being ready to use in Spring 2019 onward.

   About the free-material project for Calculus III, everything went well. In Fall 2018, we used the OpenStax textbook, and piloted the free-material in D2L. The students were happy with the course. They could start the homework or quiz assignment on the first day of semester. They could view and access the textbook since the first day. Since this course is in the higher level, the class size is small but the students pay more attention.

   Overall, the projects were implemented successfully. Both courses are now being ready to be used in the future. However, the data report in the following sections will be based on the Calculus course only.
2. Quotes

- Provide three quotes from students evaluating their experience with the no-cost learning materials.

“I like the free materials because of the fact that it is free and I can download the pdf file on my computer and on my phone. Getting an actual book would be extra pay for the paper and pdf and usually the book is too heavy to carry around.”

“I thought the course was great, the only thing I believe could have made it better was mymathlab. Mymathlab makes studying for tests easier when using the example feature on homework problems and also provides another avenue for figuring out all the different solutions to a problem. Overall I really enjoyed the course and learned a lot.”

“the information provided on d2l was very helpful. The online videos helped me understand some of the more difficult concepts. The online text provided was visible and came in hand when learning new material. Quizzes for the course were challenging but reasonable considering the amount of attempts given. Overall I would highly recommend this for future courses. Thank you”

3. Quantitative and Qualitative Measures

3a. Uniform Measurements Questions

The following are uniform questions asked to all grant teams. Please answer these to the best of your knowledge.

Student Opinion of Materials

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

Total number of students affected in this project: 10

- Positive: 89% of 9 number of respondents
- Neutral: % of number of respondents
- Negative: 11% of 9 number of respondents
Student Learning Outcomes and Grades

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

*Student outcomes should be described in detail in Section 3b.*

Choose One:
- **X** Positive: Higher performance outcomes measured over previous semester(s)
- ____ Neutral: Same performance outcomes over previous semester(s)
- ____ Negative: Lower performance outcomes over previous semester(s)

Student Drop/Fail/Withdraw (DFW) Rates

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

*Drop/Fail/Withdraw Rate: Depending on what you and your institution can measure, this may also be known as a drop/failure rate or a withdraw/failure rate.*

___10__% of students, out of a total _10____ students affected, dropped/failed/withdrew from the course in the final semester of implementation.

Choose One:
- ____ Positive: This is a lower percentage of students with D/F/W than previous semester(s)
- ___ Neutral: This is the same percentage of students with D/F/W than previous semester(s)
- **X** Negative: This is a higher percentage of students with D/F/W than previous semester(s)

*Note to the result: Calculus III is a course in the higher level. In general, students pay attention and work hard. Unfortunately, one student in the Fall 2018 (after implementation) missed many classes and attended only 60% of all the class time.*

3b. Measures Narrative

In this section, summarize the supporting impact data that you are submitting, including all quantitative and qualitative measures of impact on student success and experience. Include all measures as described in your proposal, along with any measures developed after the proposal submission.
[When submitting your final report, as noted above, you will also need to provide the separate file (or .zip with multiple files) of supporting data on the impact of your Textbook Transformation, such as surveys, analyzed data collected, etc.]

- Include measures such as:
  - Drop, fail, withdraw (DFW) delta rates
  - Course retention and completion rates
  - Average GPA
  - Pre-and post-transformation DFW comparison
  - Student success in learning objectives
  - Surveys, interviews, and other qualitative measures

- Indicate any co-factors that might have influenced the outcomes.

<table>
<thead>
<tr>
<th>Grade distribution after implementation (Fall 2018)</th>
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<tbody>
<tr>
<td>A</td>
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<td>40%</td>
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<table>
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<th>Grade distribution before implementation (Fall 2017)</th>
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<tr>
<td>A</td>
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The pre- and post-tests (with the same question) from the students using the free material and purchased material were administered. With the score out of 10 points, the students using the free material were doing better in the post test with the average 4.375 points (administered in Fall 2018), and the students using the purchased material were doing better in the post test with the average 3.5 points (administered in Fall 2017).

According to the survey, most students agree that the cost of the textbook effect their success in the class (please see the excel file for more details).

4. Sustainability Plan

- Describe how your project team or department will offer the materials in the course(s) in the future, including the maintenance and updating of course materials.

We will have the course template ready in the D2L. In the future, we will copy the course material from the template to the course being offered. When the change is needed, we will make the change in the course template.
5. Future Plans

- Describe any impacts or influences this project has had on your thinking about or selection of learning materials in this and other courses that you will teach in the future.
- Describe any planned or actual papers, presentations, publications, or other professional activities that you expect to produce that reflect your work on this project.

We plan to develop more free-textbook resources for more courses (for example, Introduction to Linear Algebra).

The data and feedback from this project will be presented in a paper.

6. Description of Photograph

- On the Final Report Submission page, you will be submitting a photo. In this document, list the names of the people shown in this separately uploaded photograph, along with their roles.

From left to right, Dr. Dawit Aberra (team member; developing free-material for Elementary Statistics; department chair) and Dr. Patcharin T. Marion (project leader; developing free-material for Calculus III; calculus coordinator).