

Spring 2016

College Algebra (Fort Valley State University)

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Grants Collection

Fort Valley State University



UNIVERSITY SYSTEM
OF GEORGIA

Josephine Davis, Bhavana Burell, Samuel Cartwright,
Shadreck Chitsonga, Ian Toppin, James Scott

College Algebra





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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Syllabus

COLLEGE ALGEBRA PACING GUIDE

<i>DATES</i>	TOPIC	Textbook Reading Selections and Videos to Study
WEEK 1	Pre-Assessment Graphing Basics Linear Equations Rational Equations	Blitzer's Algebra and Trigonometry (5e) -Section 1.1: Pages 93-101; Section 1.2: Pages 105 – 110;; https://www.youtube.com/watch?v=BaQXFstxCMo (Forms of Linear Equations) https://www.khanacademy.org/math/algebra-basics/core-algebra-graphing-lines-slope/core-algebra-graphing-intercepts/v/x-and-y-intercepts https://www.youtube.com/watch?v=YB1XuQ1Pc5s (Word Problems)
WEEK 2	Linear Functions Slope TEST 1	Blitzer's Algebra and Trigonometry (5e) - Section 2.3, Pages 244-252; Section 2.4 , Pages 259-256;View the Khan Academy Video https://www.khanacademy.org/math/algebra-basics/core-algebra-graphing-lines-slope/core-algebra-slope https://www.khanacademy.org/math/algebra-basics/core-algebra-graphing-lines-slope/core-algebra-slope/v/slope-and-rate-of-change
WEEK 3	Linear Inequalities Absolute Value Inequalities Graphing Absolute Value Functions	Blitzer's Algebra and Trigonometry (5e) - Section 1.7: Pages 182 -191, View the Khan Academy Video https://www.khanacademy.org/math/algebra/linear_inequalities/inequalities/v/solving-inequalities https://www.khanacademy.org/math/algebra/linear_inequalities/compound_absolute_value_inequali/v/compound-inequalities Blitzer's Algebra and Trigonometry (5e) - Section 1.6., Pages176-177; Handout 4.1 Graphing Absolute Value Functions; Section 1.7: Pages 192- 195.View the Khan Academy Video https://www.khanacademy.org/math/algebra/linear_inequalities/compound_absolute_value_inequali/v/absolute-value-inequalities-example-1

COLLEGE ALGEBRA PACING GUIDE

WEEK 4	Combining Functions Composition of Functions Inverse Functions TEST 2	<p>Blitzer's Algebra and Trigonometry (5e) - Section 2.6 , Pages 286 - 297 and 2.7, Pages 300 – 308.. View the Khan Academy Videos and other related videos below:</p> <ul style="list-style-type: none"> • https://www.youtube.com/watch?v=n34dqyVCXs4 • https://www.youtube.com/watch?v=u9v_bakOicU • https://www.youtube.com/watch?v=tQ01R4j8MSQ • https://www.youtube.com/watch?v=3ggdZjDXpis • https://www.youtube.com/watch?v=n34dqyVCXs4 • https://www.youtube.com/watch?v=nSmFzOpxhbY • https://www.youtube.com/watch?v=q739Wcf0ZUg • https://www.youtube.com/watch?v=q739Wcf0ZUg
WEEK 5	Solving Word Problems – Models and Applications Quadratic Functions MID-TERM	<p>Blitzer's Algebra and Trigonometry (5e) - Section 1.3 , Pages 132 -136; Section 3.1, Pages, 330 – 342 https://www.youtube.com/watch?v=NBdtKR3btvs</p> <ul style="list-style-type: none"> • https://www.youtube.com/watch?v=lEkex7L-bc8 • https://www.youtube.com/watch?v=r2v90BDEfXY <p>• View the following Khan Academy videos – link has been provided below https://www.youtube.com/watch?feature=player_detailpage&v=7QMoNY6FzvM https://www.youtube.com/watch?feature=player_embedded&v=i7idZfS8t8w https://www.youtube.com/watch?feature=player_embedded&v=1Pva-Iv43Nc</p>
WEEK 6	Complex Numbers	<p>Blitzer's Algebra and Trigonometry (5e) - Section 1.4, Pages 137 – 141.</p> <p>View the related videos below:</p> <ul style="list-style-type: none"> • https://www.youtube.com/watch?v=9Fm8aUyf1Yo • https://www.youtube.com/watch?v=-CmwjC_1mQA • https://www.youtube.com/watch?v=KhdZvfH6fGg <p>https://www.youtube.com/watch?v=GH2fzLCCdKc</p>

COLLEGE ALGEBRA PACING GUIDE

WEEK 7	<p>Transformations of Functions</p> <p>Polynomial Functions and Models</p> <p style="text-align: center;">TEST 3</p>	<p>Blitzer's <u>Algebra and Trigonometry</u> (5e), Section 2.5, Pages 270-281.</p> <ul style="list-style-type: none"> • View the following Khan Academy videos – link has been provided below https://www.youtube.com/watch?feature=player_embedded&v=5oQgzup9nx4 https://www.youtube.com/watch?feature=player_embedded&v=5oQgzup9nx4 https://www.youtube.com/watch?feature=player_embedded&v=5oQgzup9nx4 <p>Blitzer's <u>Algebra and Trigonometry</u> (5e), Section 3.2 Pages 347-359</p> <ul style="list-style-type: none"> • View the following Khan Academy videos – link has been provided below https://www.youtube.com/watch?feature=player_detailpage&v=tZKzaF28sOk https://www.youtube.com/watch?feature=player_embedded&v=4OPINzI4dWc
WEEK 8	<p>Zeros of Polynomial Functions</p>	<p>Blitzer's <u>Algebra and Trigonometry</u> (5e), Section 3.4 Pages 376-386.</p> <ul style="list-style-type: none"> • View the following Khan Academy videos – link has been provided below https://www.youtube.com/watch?feature=player_embedded&v=YMyv9-9VXw4 https://www.youtube.com/watch?v=rP-_zFngio&feature=player_embedded https://www.youtube.com/watch?feature=player_embedded&v=Jx4amKfIoP4 https://www.youtube.com/watch?feature=player_embedded&v=5YAmwfT3Esc
WEEK 9	<p>Rational Functions and Models</p>	<p>Blitzer's <u>Algebra and Trigonometry</u> (5e), Section 3.5 Pages 391-405.</p> <ul style="list-style-type: none"> • View the following Khan Academy videos – link has been provided below https://www.youtube.com/watch?v=_qEOZNPce60&feature=player_embedded https://www.youtube.com/watch?feature=player_embedded&v=0cPptjKTR7M
WEEK 10	<p>Rational Equations</p> <p style="text-align: center;">TEST 4</p>	<p>Blitzer's <u>Algebra and Trigonometry</u> (5e) , Section 1.2, Pages 111-117.</p> <ul style="list-style-type: none"> • View the following Khan Academy videos – link has been provided below https://www.youtube.com/watch?feature=player_embedded&v=5wUJLMWZ5Fw https://www.youtube.com/watch?feature=player_embedded&v=6egglZyXgK8 https://www.youtube.com/watch?feature=player_embedded&v=ZWTZm6Aveqg

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WEEK 11	Variations Problem Solving Using Variations	<p>Blitzer's <u>Algebra and Trigonometry</u> (5e) Section 3.7, Pages 423-430.</p> <ul style="list-style-type: none"> View the following Khan Academy videos – link has been provided below https://www.youtube.com/watch?feature=player_embedded&v=is07Wg_0DiY https://www.youtube.com/watch?feature=player_embedded&v=92U67CUy9Gc https://www.youtube.com/watch?feature=player_embedded&v=92U67CUy9Gc <p>Modeling Using Direct variation https://www.youtube.com/watch?v=9Giu9tk6H6I https://www.youtube.com/watch?v=WGqmAmzUODM</p> <p>Modeling Using Inverse variation https://www.youtube.com/watch?v=awp2vxqd-l4</p>
WEEK 12	Polynomial and Rational Inequalities	<p>Blitzer's <u>Algebra and Trigonometry</u> (5e); Section 3.6: Pages 410-415 and 418-420. View Khan video:</p> <p>https://www.khanacademy.org/math/algebra2/advanced-equations-and-inequalities/quadratic-inequalities/v/quadratic-inequalities-visual-explanation</p>
WEEK 13	Solving Other Types of Equations	<p>Blitzer's <u>Algebra and Trigonometry</u> (5e); Section 1.6, Pages 167-178.</p> <ul style="list-style-type: none"> Watch Khan Videos <p>https://www.khanacademy.org/math/algebra2/radical-equations-and-functions/solving-square-root-equations/v/extraneous-solutions-to-radical-equations</p> <p>https://www.khanacademy.org/math/algebra2/polynomial-functions/factoring-polynomials-quadratic-forms-alg2/v/factor-by-grouping-and-factoring-completely</p> <p>https://www.youtube.com/watch?v=Mzh_o2KYasA</p>

COLLEGE ALGEBRA PACING GUIDE

WEEK 14	Exponential and Logarithmic Functions	<p style="text-align: center;">Blitzer's <u>Algebra and Trigonometry</u> (5e); Section 4.1, Pages 442-451</p> <p>https://www.khanacademy.org/math/algebra/introduction-to-exponential-functions/exponential-growth-and-decay/v/exponential-growth-functions https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/graphs-of-logarithmic-functions/v/comparing-exponential-logarithmic-functions</p>
WEEK 15	<p>Properties of Logarithms</p> <p>Solving Exponential and Logarithmic Equations</p> <p>FINAL EXAM</p>	<p style="text-align: center;">Blitzer's <u>Algebra and Trigonometry</u> (5e); Section 4.3, Pages 469-476</p> <ul style="list-style-type: none"> • Watch Khan Videos <p>https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/properties-of-logarithms/v/introduction-to-logarithm-properties https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/properties-of-logarithms/v/introduction-to-logarithm-properties-part-2</p> <ul style="list-style-type: none"> • Read Section 4.4, , Pages 479-489 • Watch Khan Videos <p>https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/solving-exponential-equations-with-logarithms/v/exponential-equation https://www.khanacademy.org/math/algebra2/exponential-and-logarithmic-functions/solving-exponential-equations-with-logarithms/v/solve-exponentials</p>

Initial Proposal

Affordable Learning Georgia Textbook Transformation Grants Proposal Form

Institution Name(s)	Fort Valley State University				
Team Members (Name, Title, Department, Institutions if different, and email address for each)	Dr. Josephine D. Davis, Professor, Dept. Math& Comp. Sci. davisj@fvsu.edu Mrs. Bhavana Burell, Lecturer, burellb@fvsu.edu Dr. Samuel Cartwright, Assistant Prof., Dept. Math, cartwris@fvsu.edu Dr. Shadreck Chitsonga, Assistant. Prof., Dept. Math , chitsongas@fvsu.edu Dr. Ian Toppin, Director, Center for Teaching & Learning, toppini@fvsu.edu Mr. James Scott, Library Tech/Digital Support Specialist, scottj@fvsu.edu				
Sponsor, Title, Department, Institution	Dr. Dawit Aberra, Chair, Department of Mathematics and Computer Sciences, Fort Valley State University.				
Course Names, Course Numbers and Semesters Offered (Summer 2015, Fall 2015, or Spring 2016)	MATH 1113 Pre-Calculus Spring 2016 MATH 1111 College Algebra – Spring 2016				
Average Number of Students Per Course Section	25	Number of Course Sections Affected by Implementation in Academic Year 2016	College Algebra – 20 Pre-Calculus - 10	Total Number of Students Affected by Implementation in Academic Year 2016	MATH 1113 – 500 MATH 1111 – 250 TOTAL 750
Award Category (pick one)	<input checked="" type="checkbox"/> No-Cost-to-Students Learning Materials <input type="checkbox"/> OpenStax Textbooks <input type="checkbox"/> Course Pack Pilots <input type="checkbox"/> Transformations-at-Scale				
List the original course materials for students (including title, whether optional or required, & cost for each item)	Required: <i>College Algebra and Trigonometry</i> by G. Rockswold, Pearson Publisher And MyMathLab(MML)		\$ 175 \$ 120.00(when students only purchase MML separately) Total Cost \$ 175		
Plan for Hosting Materials	<input type="checkbox"/> OpenStax CNX <input checked="" type="checkbox"/> D2L <input checked="" type="checkbox"/> LibGuides <input type="checkbox"/> Other _____				
Projected Per Student Cost	\$ 175.00	Projected Per Student Savings (%)	100%		

1. PROJECT GOALS

1. To develop and adopt for use, no-cost textbooks, LibGuides, and related learning resources for pre-calculus and college algebra students at Fort Valley State University.
2. To improve students' mastery of pre-calculus and college algebra content by:
 - 2a. infusing critical thinking concepts into these on-line text resources;
 - 2b. producing videos (Video-Lecture Capture (VLC)) to provide multiple opportunities for students to master traditionally challenging topics; and
 - 2c. identifying other free, online tutorial and laboratory resources to engage students in a deeper understanding of the topics and concepts covered in these courses.
3. To provide professional development opportunities for faculty to adopt innovative pedagogies (such as the "Flipped" Classroom approach) for maximizing student learning in using these integrated technologies.

1.1 STATEMENT OF TRANSFORMATION

The Need: More than 88% of FVSU students are on financial aid. Because of limited finances, far too many students are either delayed in purchasing their pre-calculus and college algebra textbooks or, ultimately, not able to afford the purchases. These courses also have a required MyMathLab (MML) component. There is a noticeable increase in student absentee rates once the 17-day, free, MML trial period ends. Because many students are not immediately able to purchase the required MML access codes, achievement and retention rates are adversely impacted.

The Stakeholders: As the primary stakeholders, students will benefit most significantly from having ready access to no-cost, high quality text resources. Higher pass rates and student retention rates meet the university's cost-effectiveness goals. Therefore, the university stands to benefit from budget increases that are linked to higher student retention and graduation rates. Faculty, staff, parents, community and, ultimately, national stakeholders will benefit from the production of increased number of minority graduates, particularly in STEM careers.

The Transformative Impact: With access to no-cost, online resources, and focused instructional videos, student achievement and cost-savings will be sizeable. Ready access to curricular resources will enhance students' self-confidence, self-image and attitudes towards learning (Harley et al., 2003). Equipped with the proper resources, all students in the classroom will be on a level field, prepared to engage the mathematics course content in greater depth. The proposed Video Lesson Captures (VLC) will feature FVSU faculty teaching traditionally challenging topics. Flipped classroom pedagogy will be used (Bergmann, et al., 2012). Students will be able to replay these videos as often as needed outside the classroom, freeing the faculty to cover the range of prescribed content for these courses. In short, the free and open access to multimedia learning resources will transform the students' intellectual experiences in these courses from a dominant, skills-based approach to a more engaging quantitative reasoning program of study (Zupanic et al., 2002). The mathematics degree program and STEM disciplines on campus will benefit substantially in that college algebra and pre-calculus will no longer be dubbed "gatekeeping courses" to STEM careers.

1.2 TRANSFORMATION ACTION PLAN

Adoption of Course Materials: Project faculty will review for adoption the free, on-line resources and align them with departmental goals and objectives for precalculus and college algebra. Among the open-sourced materials to be reviewed are: Khan Academy tutorials; free resources from Affordable Learning Georgia; content from stitzzeager.com/; openstaxcollege.org; and collegeopentextbook.org and laboratory exercises from the West Texas A & M virtual math laboratory. Critical Thinking Modules previously developed by the faculty will be converted to digital notes and uploaded into D2L and the library tech specialist will develop libguides supportive of topics identified by the faculty. The department will review and adopt these well-designed, multimedia courses that will be structured to enhance student learning and access (Mayer, 2001).

Course and Syllabus Redesign: Syllabi will be revised to integrate the use of free library resources and free text support. Appropriate references and links to online resources will be identified according to the outlined topics and objectives of each course. There will be links to the library libguides and other free resources placed on reserve in the library. A checklist for navigating multimedia components of the course will be added.

Activities of Team Members: **Subject matter experts**, Professors Davis, Cartwright, Burell, and Chitsonga will review online course resources, develop the course content, infuse the Critical Thinking Modules into the content and prepare the video lectures. **The Librarian** will assist in creating libguides for courses and uploading videos and digital course content into D2L. **The Director of the Center for Teaching and Learning** will assist with the Video Lecture Capture process, ensure that the courses adhere to “Quality Matters” criteria and conduct the professional development of faculty with a focus on student learning (Barker, 2003). **The Departmental Chair** will ensure the full implementation and adoption of the transformed courses by departmental faculty.

Open Access Plan: All students who are officially enrolled in college algebra and precalculus courses will automatically have access to these free resources that will be offered via D2L. This access to the transformed courses will be immediate.

1.3 QUANTITATIVE AND QUALITATIVE MEASURES

Quantitative Data – The percentage of students evidencing gains from the pre-to the post tests, on the General Education Outcomes assessments and on the common final examinations (proficiency levels of 70% or better), and the percentage scoring above the norm on the Collegiate Assessment of Academic Proficiency (CAAP) in Critical Thinking and in Mathematics will provide evidence of success. The common final examination will be used to measure students’ mastery of the course content. Course grades will provide indirect measures of achievement. An annualized 15% or better decrease in end-of-course grades at the DWF rate will be used as an indicator of this project’s success. The noted 10 (2) percentage points increase in the college algebra (pre-calculus) ABC rates from 2011 to 2012 and beyond (Fig.1) is aligned with the critical thinking transformation of these courses. Analytics from the Video Lecture Capture will be correlated with student achievement in the interest to boost success especially in pre-calculus where students experience more rigorous and complex content.

Qualitative Data – Student surveys will be conducted using Survey Monkey and clickers to ascertain how the interaction with the on-line, technology resources is affecting their learning. Focused group discussions with randomly selected students from these transformed courses will be conducted by the Director of the QEP to determine how well the free resources are being use and students’ perceptions of their value.

Figure 1 Academic Year	ABC Rates		DWF Rates	
	N (%)	N (%)	N (%)	N (%)
	Coll. Alg.	Precalulus	Coll. Alg.	Precalculus
Fall 2010 – Spring 2011	348 (48%)	218 (57%)	370 (52%)	167 (43%)
Fall 2011 – Spring 2012	302 (58%)	172 (59%)	216 (42%)	122 (41%)
Fall 2012 – Spring 2013	272 (57%)	152 (57%)	206 (43%)	117 (43%)

1.4 TIMELINE

Summer 2015 Evaluation and selection of on-line textbook and supportive resources consistent with the required goals and objectives for the course. Syllabus revision begins and content is uploaded into D2L.

Fall 2015 – Faculty development workshops on topics such as “Flipped Classroom Approach,” using the transformed course resources. Finalize content and resources in. Pilot a sample lesson. Field test the surveys.

Spring 2016 – Full implementation of the transformed courses. Collect and analyze the data.

1.5 BUDGET

<i>Item</i>	<i>Unit Cost</i>	<i>N</i>	<i>Total</i>
Faculty salary and released time for course production	\$ 5,000	4	\$ 20,000
Clerical Support @ \$ 7/hr for 80 days (4hrs ea.)	\$ 7.00	320	\$ 2,240
Travel	\$ 400	2	\$ 800
Graphic Designer	\$ 1,320	1	\$ 1,320
Faculty Workshops and conferences	\$ 140	1	\$ 140
Video Lecture Capture System	\$ 3,000	1	\$ 3,000
Supplies	\$ 500	3	\$ 1,500
TOTAL			\$ 29,000

1.6 SUSTAINABILITY PLAN

College algebra and pre-calculus are offered each semester. The department’s full adoption of these transformed courses will ensure that they are reviewed annually for improvement and sustainability. Additional funding will be sought to broaden the free text resources to the calculus series and to statistics courses.

1.7 REFERENCES & ATTACHMENTS

References

Barker, A. (2003). Faculty development for teaching online: Educational and technological issues. *The Journal of Continuing Education in Nursing*, 34(6), 273-278.

Faculty development programs are essential for cultivating faculty competency to teach on-line courses. Such programs should focus on issues of quality and student learning. All development activities should be grounded in sound educational theory and principles with a priority focus on student learning and a secondary emphasis on technology usage.

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. Eugene, OR: International Society for Technology in Education.

The flipped classroom allows students to engage collaboratively and cooperatively in the teaching/learning process. Students have open and frequent access, beyond the classroom, to instructional resources that broaden their understanding and prepare them for in-class instruction. This model places students more actively in the learning process giving them diverse, hands-on experiences that are designed to increase their communications with other students. The priority feature of this model is the shift from students simply covering the classroom materials to mastering it.

Browne, E. (2005). Structural and pedagogic changes in further and higher education: A case study approach. *Journal of Further and Higher Education*, 29(1), 49-59.

This study examines the role of learning technologies in developing faculty's use of structure and innovative pedagogies. Learning more about the parameters, interests and issues impacting the technology-centered environment, faculty members are more readily able to transition away from a heavy reliance on traditional teaching methods.

Griffin, D. K., Mitchell, D., & Thompson, S. J. (2009). Podcasting by synchronizing PowerPoint and voice: What are the pedagogical benefits? *Computers & Education*, 53, 532-539.

Students used podcasts-lectures in their private study space. While many students benefit from notes taken in class, podcast lectures serve as reinforcing tools that enhance their learning.

Harley, D., Henke, J., Lawrence, S., McMartin, F., Maher, M., Gawlik, M., et al. (2003, March). *Costs, culture, and complexity: An analysis of technology enhancements in a large lecture course at UC Berkeley*. University of California Berkeley: Center for Studies in Higher Education Retrieved from: <http://escholarship.org/uc/item/68d9t1rm>

Using educational and technological resources provide cost-effective options for students, particularly considering projected enrollment growth. The quality of pedagogy and the economic impact of using on-line teaching materials will result in significant restructuring of staff time in laboratories and lectures, as well as increase the use of instructional facilities by

more students. Access to good technological resources enhances students' performance and/or attitudes.

Mayer, R. E. (2001). *Multimedia learning*. New York: Cambridge University Press.

Well-designed and implemented multimedia instruction can significantly enhance student learning.

Mayes, J. T. & Fowler, C. J. (1999). Learning technology and usability: A framework for understanding courseware. *Interacting with Computers, 11*, 485–497.

Learning goals, activities, assessments, and learner characteristics should be aligned with and adapted to the course content. Student feedback should drive the learning model. Factors such as: the presentation of design- whether audio or visual; the ease of navigation of the technology; and user accessibility and usability should accommodate students with different learning backgrounds.

Zupancic, B., & Horz, H. (2002). Lecture recording and its use in a traditional university course. *Proceedings of the 7th Annual Conference on Innovation and Technology in Computer Science Education*. New York: ACM Retrieved.

Live lecture recordings provide audio and video with slides over the web is very popular. The Authoring on the Fly system (AOF), which has been used in many different courses over the past years, allows us to automatically produce a multimedia document with an HTML overview. It was found that lecture recordings are a good supplement to course instruction, but should not replace it.

Support Letters (Attached)



Fort Valley State University

A State and Land-Grant University
University System of Georgia

Department of Mathematics and Computer Science

1005 State University Drive · Fort Valley, GA 31030-4313

December 4, 2014

Affordable Learning Textbook Transformation Grant Review Committee

Dear Committee Members:

Smaller colleges, community colleges, and Historically Black Colleges and Universities are often the primary vehicles for the professional growth and development of many first generation minority populations. Central to their educational advancement is the development of mathematical competency, given the intellectual, critical thinking and quantitative reasoning skills exacted of 21st Century careers. It is, therefore, important for faculty in departments of mathematics to identify and implement better ways of engaging these students in the content depth of mathematics. Such proficiency is an essential part of their professional growth and development. I am, therefore, pleased to lend my full support of this proposal to transform our department's college algebra and pre-calculus courses so that more deserving, but financially challenged students will be able to realize their educational aspirations. This proposal has significant intellectual merits owing to its innovative plan of action, the diverse academic team of professionals who will be engaged in its implementation, and the proven competency of the mathematics team, led by Professor Josephine D. Davis, to accomplish the project goals as stated.

Dr. Davis and her team successfully transformed our pre-calculus course by developing and infusing critical thinking modules pursuant to the university's Quality Enhancement Plan (QEP) for SACS accreditation. Students have subsequently shown significant gains on the Collegiate Assessment of Academic Proficiency (CAAP) in Critical Thinking and in course pass rates. This level of content expertise, access to the department's smart technology classrooms and campus computer laboratories will facilitate students' access to the on-line, free text resources. That the department approves the adoption of this project guarantees sustainability of the proposed initiative. I am excited about the potential financial savings this project will offer our students and the potential it holds for increasing the number of STEM majors.

The Fort Valley State University's Mathematics Degree Program was recently ranked by *Diverse Magazine* (2014 and 2011) as top in the nation for producing high numbers of African-American graduates. We believe that our productivity would be even more competitive were we able to offer free, on-line text resources to the number of entering freshmen, aspiring STEM majors, who are unable to pass college algebra and pre-calculus courses due to the lack of resources to purchase their textbooks and MyMathLab codes. This project answers our needs for change.

Sincerely yours,

Dawit Aberra, Ph. D.

Chair, Department of Mathematics and Computer Science



Fort Valley State University
Center for Teaching & Learning (CTL)
303 Hunt Memorial Library

Dear Dr. Davis,

I applaud your efforts and those of your colleagues in the Math Department in submitting a proposal for the Textbook Transformation Category-4 Grant, sponsored by the Affordable Learning Georgia (ALG) office of the University System of Georgia (USG). As the ALG campus champion for FVSU, and having worked with you for a few years now, I am aware of your efforts to implement strategies to make learning more affordable for our students without compromising the quality of instruction they receive. You have been responding to the struggles of our students to keep up with rising cost of class materials while financial resources continued to be severely limited. Therefore, this grant will provide added resources for you to advance what has already been a passion.

As Director for the Center for Teaching and Learning (CTL), I pledge our support in any way we can. We will provide ongoing training in effective pedagogies relating to implementing contextual learning strategies in order to make instruction relevant and interesting to students. We believe that students demonstrate greater interest in courses when they value them as having present or future relevance to their lives. The CTL will also provide training in effective strategies for implementing a Video Lecture Capture (VLC) System in the classroom, and for extracting data from the VLC, which would provide information about its effectiveness in impacting student performance.

We hope your proposal will result in a successfully funded project, and we look forward to working with you to implement those things which will lead to greater student success.

Sincerely,

Ian Toppin, Ed.D.
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Fort Valley State University

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December 5, 2014

**Affordable Learning Transformation Textbook Grant
Grant Review Committee**

Dear Committee Members:

The implementation of the open electronic resources to reduce textbook and other cost benefits to students is a laudable undertaking. This USG initiative to reduce the cost of education across the system will allow for adoption of text books with ease.

The Hunt Library supports this proposal to provide free online course resources and textbooks, being offered by the Department of Mathematics and Computer Sciences. Mr. James Scott, the Library Technology and Digital Support Specialist, will be assisting with this project to support and facilitate the attainment of the following stated goals:

“ 2b. Producing and using videos (Video-Lecture Capture (VLC)) to provide multiple opportunities for students to master traditionally challenging topics within these courses and

2c. Identifying other on-line tutorial and support resources to engage students in a deeper understanding of the topics and concepts covered in these courses.”

The library has received topics of interest from the mathematics faculty for which students need a broader range of resources to advance their understanding and mastery. The college algebra and pre-calculus courses will have online course environments in D2L. Mr. Scott and staff will assist faculty to identify digital math course content from the textbook publishers and other resources and uploading them into D2L.

The library will also work collaboratively with personnel from the Center for Faculty Development who will use the Video Lecture Capture System to produce faculty videos.

We believe that this proposal will make a significant impact in providing students access to a successful learning experience in mathematics.

If you have any questions or need further clarification, please let me know. I can be reached at 478-825-6342 or by email at mahitabf@fvsu.edu.

Sincerely,

Frank Mahitab
Director of Library Services

Final Report

Affordable Learning Georgia Textbook Transformation Grants

Final Report

FORT VALLEY STATE UNIVERSITY

Dr. Josephine D. Davis, Principal Investigator

Date: May 20, 2016

Grant Number: 113

Institution Name: Fort Valley State University

Team Members:

- 1) Dr. Samuel Cartwright, Assistant Professor, Department of Mathematics and Computer Science, cartwris@fvsu.edu
- 2) Dr. Shadreck Chitsonga, Assistant Professor, Department of Mathematics and Computer Science, chitsongas@fvsu.edu
- 3) Mrs. Bhavana Burell, Senior Lecturer, Department of Mathematics and Computer Science, burellb@fvsu.edu
- 4) Dr. Ian Toppin, Director, QEP and Faculty Development, toppini@fvsu.edu

Project Lead: Dr. Josephine D. Davis, Professor, Department of Mathematics and Computer Science, davisj@fvsu.edu

Course Names and Course Numbers: College Algebra, MATH 1111 AND Precalculus, MATH 1113

Semester Project Began: Summer, 2015

Semester of Implementation: Spring, 2016

Average Number of Students Per Course Section: 20.5 in MATH 1111 and 25 in MATH 1113

Number of Course Sections Affected by Implementation: 8 Course Sections

Total Number of Students Affected by Implementation: 173 Students Affected

Total Cost Savings of the Transformation Project to Students: \$ 65, 913

1. Narrative

A. Describe the key outcomes, whether positive, negative, or interesting, of your project.

Include:

- **Summary of the FVSU transformation experience, including challenges and accomplishments**

The Affordable Learning transformation experience at FVSU involved a complete redesign of two courses, college algebra and precalculus. Not only were a low-cost textbook and a new student support system utilized, but the content of these courses was redesigned so as to require, for future enrolled students, that college algebra will be a pre-requisite for precalculus. The Mathematics Faculty voted to support this re-alignment of content and course restructuring to bring the credit hour requirement for precalculus more in line with other institutions within the University System of Georgia, from 4- to a 3-hour credit precalculus course requirement.

The FVSU Affordable Learning Project Development Team met once every two weeks during the 2015 Summer Semester and twice monthly during the 2015 Fall Semester to develop and coordinate the curricular redesign and technology integration components of the project. Free course resources on the web were reviewed for adoption and the advantages and disadvantages of three classroom management systems were examined. These systems were needed to provide tutorial, homework and testing support. The team examined MyMathLab, WebWorks and WebAssign. After training for WebAssign was completed and after negotiations with MyMathLab representatives failed to result in lowered costs to students, our project team decided to adopt the WebAssign software system. We soon encountered a challenge. We discovered that substantial faculty effort was required with this system to develop sets of problems, quizzes and tests appropriate to the topics covered in the two proposed courses. By the time the team learned that this level of content development was required to use WebAssign, there was not enough time to perform the work by the proposed Spring, 2016 Semester of implementation.

Then, after examining the Open Stax Precalculus Textbook with which WebAssign would be used, the faculty agreed that the quality of the content and the exercise sets in this textbook was not appropriate to our needs. MyMathLab was already being used in the department; everyone was familiar with this course management system. Therefore, we negotiated again with our Pearson Book Company representative to lower the cost for MyMathLab. The Pearson representative introduced us to MathXL, an inexpensive version of MyMathLab System having comparable features. Therefore, we were able to meet our no-cost obligation by using the laboratory fee that students were already required to pay for these courses. This arrangement was approved by the Fort Valley State University administration and has proved highly successful in terms of implementation. We worked diligently with the information technology personnel to be prepared to launch the courses by the target date. By the start of the Spring 2016 Semester, all faculty members who had been assigned to teach college algebra and precalculus had been trained in the use of MATH XL. They were

knowledgeable of the redesigned curriculum and aware of the need to rely solely on online resources to teach these courses. These redesigned courses fully utilized appropriate open resources.

- Transformative impacts on your instruction

The major impact that this grant had on instruction was rendering the classroom a more dynamic place. Faculty members used open resources more often than in previous semesters to highlight instruction. Additionally, a greater responsibility was placed on the learner to be more accountable for preparing for class in advance. These instructors found it useful to be more innovative with their pedagogy. The e-book facilitated more readily the use of the “Flipped” Classroom instructional strategy.

- Transformative impacts on your students and their performance

Overall, it was noted that students were more attentive in class since technology enabled everyone in the class to have immediate access to the e-textbook. A greater responsibility was placed on students to read the course content online in preparation for their online homework assignments. Students were also tasked to read the course content prior to coming to class and be prepared to engage in class discussions. This approach resulted in students engaging more deeply into the course content by asking questions and using appropriate math language. Students also took advantage of the videos embedded in the lessons.

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

The major lesson learned was that students are using computer aids to enable them to solve homework problems to the extent that the aids are becoming a “crutch.” For this reason, it appears that the transference of knowledge to novel situations is not occurring. This lack of grasping the material at a level to promote transfer of knowledge evidences itself in the large gap between the homework grades and the quiz grades online. As faculty, we have discussed the possibility of gradually restricting the aids that students can use in completing their homework online to ensure that at some point, they are capable of performing more tasks independently. Based on the item analysis of objectives not mastered, more emphasis will be placed on the use of graphs to render the concepts more meaningful. Also, more time will be spent enabling today’s learners to improve their memory skills. Students are increasingly not able to remember formulas as was past tradition. With the advent of the cell phone, students are more prone to look up needed information rather than rely on their memory. Little information is being stored for later retrieval purposes.

In terms of the no-cost resources used, the faculty is extremely pleased with all of the educational resources that were adopted for use.

2. Quotes

These are sample student responses to using the “free” resources:

- *“I think it’s great that we don’t have to pay considering that we have other books to buy. I wouldn’t like carrying a book to class everyday also – purchasing a book does not mean the student will learn more.”*
- *“The free book gave us very easy access to materials instead of our having to wait for financial aid refunds to buy our textbook - then we are so far behind in the class.”*
- *“I felt as if I could focus on my studies more without having to worry about money. This way, no one can use the excuse that they don’t have a textbook or they have to wait until their refunds drop to buy a book.”*
- *“I enjoy the free-cost, but prefer the ease of using a physical textbook.”*

3. Quantitative and Qualitative Measures

3a. Overall Measurements

Student Opinion of Materials

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

Total number of students affected in this project: 173

- Positive: 82 % of 146 number of respondents
- Neutral: 0 % of 146 number of respondents
- Negative: 18 % of 146 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?

The outcomes were positive in terms of students’ attitudes towards learning, but negative in terms of their performance rates. The limiting factor is that more students who are course repeaters are enrolled in these courses in the Spring semester than in the Fall.

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

Choose One:

- 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? Slightly negative.

Drop/Fail/Withdraw Rate:

55 % of students, out of a total 173 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)
- Negative: This is a higher percentage of students with D/F/W than previous semester(s) (That rate was 40%)

3b. 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. **Quantitative data used in this study consisted of the Pre-and Post-surveys that were administered to students. Students were also given common final examinations that were analyzed using item analyses. T-tests of the means were analyzed based on Fall 2015 and Spring 2016 grades. The average GPA was calculated and the pre- and post DFW comparisons were completed.***
 - *Include measures such as: Drop, fail, withdraw (DFW) delta rates (Pre- and Post)*

Course	Total Fall '15 DWF	Percent Fall '15 DWF	Total Spring '16 DWF	Percent Spring '16 DWF
COLLEGE ALGEBRA	68	N: 154 44%	64	N: 123 52%
PRECALCULUS	38	N: 109 35%	31	N:50 62%
Overall Impact	106	N: 263 40%	95	N:173 55%

- Course retention and completion rates

With regards to the course completion rates, in the 2015 Fall Semester, 243 of 263 enrolled students completed the course at a rate of 92%. During the Spring 2016 Semester, 146 of 173 enrolled students completed the course for a course completion rate of 84%.

- Average GPA

The average GPA in College Algebra was 1.8 and in Precalculus it was 1.6.

- *Surveys, interviews, and other qualitative measures (See Attached)*

- *Indicate any co-factors that might have influenced the outcomes for better or worse.*

The 15 percentage point difference in the fall to spring DWF rates is worth noting. Further analysis of the pre-test showed that 96% of enrolled students scored below the 70% proficiency threshold. This performance level showed that the students were underprepared for these courses. Generally, in the spring semester these courses enroll a large number of students who are repeaters. The high dropout rates are also reflective of poor attendance.

The majority of those students with WFs amassed more than 15 days of unexcused absences. The low overall GPAs for students in these courses are indicative again of the distance that students had to advance to meet the course expectations in a 15 week semester. When asked what improvements could be made in the course, a common student response was to limit the number of homework exercises required. One student indicated feeling “overwhelmed.” Again, these expressions basically highlight students’ general need for more developmental mathematics in order to be prepared for the rigor of these courses. We are continuing this study by examining the SAT Math scores of our Spring 2016 enrollees to better understand the students’ preparedness for college-level mathematics courses.

An interesting contrast to these performance outcomes are the pre-and post-survey data that showed high student excitement and interest in having and using the free course resources. Students indicated that the use of free materials motivated them to want to learn and enabled them to have a more positive attitude towards the course. However, their achievement data reflect the opposite – high failure rates.

- *When submitting your final report, as noted above, you will also need to provide the separate file of supporting data on the impact of your Textbook Transformation (surveys, analyzed data collected, etc.)*

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.*

Future plans include the continuation of the model that has been implemented this Spring 2016 Semester. In fact, plans are underway to incorporate MATHXL into Bright Space to make it easier for students to access the system. Also, this integration will enable faculty to have their grades in a single file. Plans are also underway to transform the Calculus I course in a similar manner. Course materials will be maintained by members of this development team. We will meet monthly throughout the semester to compare notes and to make proper revisions as needed. Too, the team will work during the opening week of school to update the website containing open resources.

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.*

We will continue with this transformed course in subsequent semesters. The project team has been positively impressed with the ease in which the MathXL system has been integrated into the portal here at FVSU. We have had formidable support from the Pearson Team in terms of training us on the use of the system and explaining the details of the data that the system collects on students' performances. As stated above, the next course to be transformed is Calculus I.

- *Describe any planned or actual papers, presentations, publications, or other professional activities that you expect to produce that reflect your work on this project.*
- **Two papers are being prepared for publication in refereed journals. We assisted Dr. Toppin with the two presentations that he made for Affordable Learning. Two of us have received undergraduate research funding to mentor students through a research project for this summer. This funding requires the student researchers to make presentations at Research Day, 2017. This local program is sponsored by the Office of Undergraduate Research at Fort Valley State University.**

6. Description of Photograph

- *List the names of the people in the separately uploaded photograph and their roles.*
- *Left to Right:*

Dr. Josephine Davis, Professor, Subject matter expert

Mrs. Bhavana Burell, Senior Lecturer, Subject matter expert

Dr. Samuel Cartwright, Subject matter expert

Dr. Shadreck Chitsonga, Subject matter expert

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