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Application Summary

Competition Details

Competition Title:	Textbook Transformation Grants, Round Thirteen (Spring 2019-Spring 2020)
Category:	University System of Georgia
Award Cycle:	Round 13
Submission Deadline:	01/14/2019 at 11:59 PM

Application Information

Submitted By:	Rosa Williams
Application ID:	2864
Application Title:	413
Date Submitted:	01/15/2019 at 7:33 AM

Personal Details

Institution Name(s):	Columbus State University
Applicant First Name:	Rosa
Applicant Last Name:	Williams
Applicant Email Address:	williams_rosa@columbusstate.edu
Applicant Phone Number:	706-649-1474
Primary Appointment Title:	Professor of Astronomy
Submitter First Name:	Rosa
Submitter Last Name:	Williams
Submitter Email Address:	williams_rosa@columbusstate.edu
Submitter Phone Number:	706-649-1474
Submitter Title:	Professor of Astronomy

Application Details

Proposal Title

413

Final Semester of Project

Fall 2019

Requested Amount of Funding

10,800

Type of Grant

Specific Core Curriculum Courses

Course Title(s)

Descriptive Astronomy 1: The Solar System

Course Number(s)

ASTR 1105

Team Member 1 Name

Rosa Williams

Team Member 1 Email

williams_rosa@columbusstate.edu

Team Member 2 Name

Kimberly Shaw

Team Member 2 Email

Shaw_kimberly@columbusstate.edu

Team Member 3 Name

Team Member 3 Email

Team Member 4 Name

Team Member 4 Email

Additional Team Members (Name and email address for each)

Sponsor Name

Clinton Barineau

Sponsor Title

Professor and Chair

Sponsor Department

Earth and Space Sciences

Original Required Commercial Materials (title, author, price)

Required textbook: "*The Cosmic Perspective*" by Bennett, Donahue, Schneider & Voit.
Price is \$117 for Solar System edition, \$190 for full edition of Cosmic Perspective textbook. Homework is handled through CougarView Desire2Learn.

Average Number of Students per Course Section Affected by Project in One Academic Year

41 per section of ASTR 1105

Average Number of Sections Affected by Project in One Academic Year

2 sections of ASTR 1105 (1 Fall, 1 Summer semester)

Total Number of Students Affected by Project in One Academic Year

82 students per academic year

Average Number of Students Affected per Summer Semester

41

Average Number of Students Affected per Fall Semester

41

Average Number of Students Affected per Spring Semester

0

Original Total Cost per Student

\$117 for Solar System edition, \$190 for full edition of Cosmic Perspective textbook

Post-Project Cost per Student

No cost to students

Post-Project Savings per Student

Approximately \$154 per student

Projected Total Annual Student Savings per Academic Year

\$12,628

Using OpenStax Textbook?

Yes

Project Goals

Our goals for this project are centered around the two principles of (a) converting the class to use the OpenStax free textbook, and (b) leveraging this and other freely available materials to facilitate active learning in and out of the classroom. Specifically, we intend:

- To adopt relevant sections of the OpenStax Astronomy textbook (instead of the current commercial textbook) for students to prepare for class and to supplement in-class discussion and activities.
- To revise assignments available through the freely available CougarView (D2L) system to apply directly to the OpenStax Astronomy textbook, including pre-class quizzes to encourage students to come prepared to lecture.
- To make available various free supplementary materials that will allow students to practice concepts covered in class.
- To revise the classroom approach for this astronomy course, reducing the amount of time spent on in-class lecture in favor of active-learning strategies such as group activities and in-class problem-solving tutorials.
- Through this combination of freely available resources and active-learning strategies, to both better promote scientific thinking (an Area D outcome) and improve RPG for this class.

Statement of Transformation

The Department of Earth and Space Sciences at Columbus State University offers two core curriculum classes in “Descriptive Astronomy”, one for the Astronomy of the Solar System and a second for Astronomy of Stars, Galaxies and Cosmology. Both of these are listed among the “Specific Core Curriculum Courses” (as Astronomy of the Solar System and Stellar and Galactic Astronomy) which have not previously had Textbook Transformation Grants (RFP 13, section 3.2.2). In this proposal, we focus on the first of these core classes: ASTR 1105, “Descriptive Astronomy: The Solar System.” If successful, this may provide a basis for similarly converting the second course in the future.

These courses are taught in a regular rotation by faculty member Williams. An additional section of ASTR 1105 is offered by faculty member Cruzen as part of a yearly summer travel study experience, but this only includes a few students per year. Faculty member Puckett offers additional sections of ASTR 1105 as teaching schedules permit, primarily in the summer. Thus, the courses taught by Williams make up the bulk of the core Astronomy offerings at CSU.

The Astronomy courses are currently based around the textbook “The Cosmic Perspective” by Bennett et al. This text has proven costly for students, with single-semester digital rentals at about \$60 and print purchases ranging from \$117-\$190 (Pearson website¹). A survey by Shaw of ASTR 1105 students in Fall 2018 showed that one-third of the respondents never obtained a copy of the class textbook. Students with the textbook were often unable to purchase it until the second week of class or later. The same survey showed that four-fifths of students did NOT read the assigned textbook sections before class meetings. These data encapsulate the concern that textbook costs and lack of easy accessibility are having serious impacts on student preparation, and that curriculum revisions that incentivize use of these materials are needed.

Williams has already implemented the use of the online CougarView Desire2Learn system, available to all USG students, for reading quizzes and homework assignments. In addition, Williams has regular access to a classroom for which a set of clickers is available at no cost to students. The primary remaining cost hurdle for students, therefore, is the textbook itself. A related concern is student under-utilization of the textbook once obtained. Both of these issues will be addressed in this course transformation.

The revision of the Solar System Astronomy course necessarily involves substantial alterations to lectures and assignments, in order to ensure consistent topic development and terminology with the OpenStax Astronomy textbook. It therefore provides an excellent opportunity to redevelop the classroom content as well, in accordance with the principles of active learning and engagement that are supported by pedagogical research. Shaw has made extensive study of best-practices and effective strategies for teaching science, particularly in the area of physics, and is attending the American Association of Physics Teachers Winter meeting this January, enabling her to update her knowledge on current research in this area. Thus, she will help Williams design classes that promote better learning, as well as in designing metrics to determine the impact of the redesigned course delivery.

Thus, we (Williams and Shaw) propose to shift to an OpenStax Astronomy textbook, and develop improved incentives (e.g. pre-class online reading quizzes) for students to make use of this resource. We will supplement the textbook with free online astronomical visualization resources, such as the University of Nebraska-Lincoln “ClassAction” modules (<http://astro.unl.edu/classaction/>). We will rewrite the Desire2Learn assignments to better assess whether students are understanding and applying the concepts covered in the redesigned course. We will redesign classes to take up less time with lecture, and incorporate more active-learning group activities and tutorials. This will include creating new activities which can be shared with other instructors.

¹ <http://www.mypearsonstore.com/bookstore/cosmic-perspective-0134059069>

Transformation Action Plan

Williams will develop a new schedule of topics and concepts to be covered, following the overall structure of the OpenStax Astronomy textbook (chapters 1-15, possibly sections from chapters 21 and 30). She will list reading assignments based on that schedule, and develop multiple-choice “reading quizzes” online to incentivize students to read ahead of classes.

Williams will adapt current Desire2Learn homework assignments to the new topic order and material covered. She will revise class lectures likewise, and break them up into “mini-lecture” segments that allow greatly expanded time for active learning activities.

Shaw will advise Williams on the development of new active learning activities, and on effective means of structuring classes to include these activities. New activities developed will be shared via GALILEO and internally to the department on a shared Google Drive.

Williams and Shaw will jointly develop metrics to measure success of the various innovations, including a variant on the Astronomy Diagnostic Test and a student satisfaction survey.

Shaw will observe this class three times during the Fall semester (either in person, or will watch a video recording of the class meeting) in order to aid Williams in adapting her pedagogical style to these new course activities and any classroom management challenges that arise, allowing mid-semester adjustments to be made more effective when needed.

Quantitative & Qualitative Measures

Williams and Shaw will measure the success of the textbook transformation and associated course redevelopment through the following assessments:

- Student satisfaction survey
- Pre- and post-testing using a variant on the Astronomy Diagnostic Test
- Student completion of and performance on “reading quizzes”
- Exam and final exam scores compared to previous years
- DFW rates for the class
- Instructor reflection after each exam, and after the semester ends, providing a qualitative snapshot of the instructor perception of the effectiveness of changes made.

Timeline

Spring semester 2019

- Williams will plan out the new schedule of topics and assigned readings.
- Shaw and Williams will discuss what lectures or lecture segments can best be replaced by active learning activities, and what sorts of activities are best fitted to cover the various topics (e.g. mathematical problem-solving; lecture-tutorials; group work; etc.)

Summer semester: May

- Williams will create new “reading quizzes” on Desire2Learn in accordance with the schedule.
- Williams, advised by Shaw, will lay out a plan of lecture segments and activities for the course of the semester.
- Williams will revise or write new questions for clicker-response to be delivered during lecture segments, to assess student understanding of the topic and increase student participation during these segments.

Summer semester: June

- Williams will create or revise the class presentation slides for the lecture segments according to the plan developed in May.
- Williams and Shaw will jointly review existing exercises (e.g. “Lecture-Tutorials for Astronomy, 3rd ed., Prather et al.) and determine what new activities would best promote student learning.
- Shaw and Williams will jointly develop assessments to determine success metrics.

Summer semester: July

- Williams will complete slides for lecture segments.
- Williams, advised by Shaw, will rewrite homework assignments on Desire2Learn to evaluate student understanding of the topics periodically during the semester.
- Williams, advised by Shaw, will develop new lecture-tutorials and other activities to promote engagement in the classroom.

Fall semester 2019

- Implement new textbook (OpenStax) with new class structure and activities, with reading quizzes and assignments prepared on Desire2Learn.
- Observation (via video or in person) of three course meetings over the semester to make any needed adjustments during the semester to provide better effectiveness for student learning.
- Williams will write short (one paragraph) reflections on effectiveness of changes after grading each exam. Reflections will provide additional data “snapshots” to base later adaptation on.

January 2020

- Review assessment data from Fall 2019 to determine which strategies were effective, and which require improvement.

Budget

- \$800 travel funding
- \$5000 stipend for Williams
- \$5000 stipend for Shaw

Sustainability Plan

Newly developed course materials such as activities will be uploaded to GALILEO and also to a shared Google Drive for use within the Department.

Desire2Learn questions and assessments will be made available to other astronomy instructors at (or beyond) CSU upon request.

Williams will continue to use the revised version of the course, updated and improved as indicated by the success metrics, in the Fall semesters.

Williams and Shaw plan to expand the use of OpenStax Astronomy and active learning strategies, first explored for ASTR 1105, to the second astronomy course, ASTR 1106: Descriptive Astronomy 2: Stars and Galaxies.

Acknowledgment

Grant Acceptance

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



January 9th, 2019

To: Textbook Transformation Grant Screening Committee

From: Clinton I. Barineau, PhD.
Department of Earth and Space Sciences
Columbus State University
Columbus, GA 31907

Re: Letter of Support – Grant Application – Williams and Shaw

I would like to express my support for the Affordable Learning Georgia Textbook Transformation Grant proposal, *Transforming Solar System Astronomy courses using OER and Active Learning Techniques*, submitted by Dr. Rosa Williams and Dr. Kimberly Shaw. Professor of Astronomy, Dr. Williams is the primary instructor in our introductory astronomy (ASTR) courses in the Department of Earth and Space Sciences at Columbus State University, where she has taught for more than a decade. Her project team member, Professor of Physics, Dr. Kimberly Shaw, has also taught in our program for more than a decade, and both faculty have extensive experience with teaching students and developing course materials for introductory core science courses. Dr. Williams has already begun the process of developing open materials for students in her astronomy courses, delivered online through the Cougarview course management system. Dr. Shaw conducts research in the area of student learning with particular focus on the effectiveness of teaching strategies in core science classes. Collectively, they are in an ideal position to develop effective no-cost or low-cost instructional materials for students in our core astronomy curriculum. In my opinion, their proposal to shift to an OpenStax Astronomy textbook and incentivize student use of this textbook, while simultaneously developing tools to assess the effectiveness of this shift, is well planned and should improve student mastery of astronomy concepts while eliminating the financial impediments students face when considering purchase of commercially available textbooks. I fully endorse this proposal, including long-term departmental support in order to sustain the results of the project for years to come.

Sincerely,
Clinton I. Barineau

Chair and Professor of Geology
Columbus State University
barineau_clinton@columbusstate.edu
706-507-8092



Textbook Transformation Grants, Round Thirteen (Spring 2019 –Spring 2020) Proposal Form and Narrative

Notes

- The proposal form and narrative .docx file is for offline drafting and review. Submitters must use the InfoReady Review online form for proposal submission.
- The only way to submit the official proposal is through the online form in Georgia Tech's InfoReady Review. The link to the online application is on the [Round 13 RFP Page](#).
- The italic text we provide is meant for clarifications and can be deleted.

Applicant, Team, and Sponsor Information

The **applicant** is the proposed Project Lead for the grant project. The **submitter** is the person submitting the application (which may be a Grants Officer or Administrator). The submitter will often be the applicant – if so, leave the submitter fields blank.

Institution(s)	Columbus State University
Applicant Name	Rosa Williams
Applicant Email	williams_rosa@columbusstate.edu
Applicant Phone #	706-649-1474
Applicant Position/Title	Professor of Astronomy
Submitter Name	
Submitter Email	
Submitter Phone #	
Submitter Position	

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

	Name	Email Address
Team Member 1	Rosa Williams	williams_rosa@columbusstate.edu
Team Member 2	Kimberly Shaw	Shaw_kimberly@columbusstate.edu
Team Member 3		
Team Member 4		
Team Member 5		
Team Member 6		
Team Member 7		
Team Member 8		

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

--

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

Dr. Clinton Barineau, Professor and Chair, Department of Earth and Space Sciences, Columbus State University.

Project Information and Impact Data

Title of Grant Project	<i>Transforming Solar System Astronomy courses using OER and Active Learning Techniques</i>
Type of Grant	<i>"No-or-Low-Cost-to-Students Learning Materials," and "Specific Core Curriculum Courses," Standard Scale Transformation</i>
Requested Amount of Funding	\$10,800
Course Names and Course Numbers	Descriptive Astronomy 1: The Solar System, ASTR 1105
Final Semester of Project	<i>Fall 2019</i>
Average Number of Students Per Course Section Affected by Project	41 per section of ASTR 1105
Average Number of Sections Affected by Project in One Academic Year	2 sections of ASTR 1105 (1 Fall semester, 1 Summer semester)
Total Number of Students Affected by Project in One Academic Year	82 students per academic year
Average Number of Students Affected per Summer Semester	41 students per Summer semester
Average Number of Students Affected per Fall Semester	41 students per Fall semester
Average Number of Students Affected per Spring Semester	
Title/Author of Original Required Materials	<i>Required textbook: "The Cosmic Perspective" by Bennett, Donahue, Schneider & Voit. Homework is handled through CougarView Desire2Learn.</i>
Original Total Cost Per Student	<i>\$117 for Solar System edition, \$190 for full edition of Cosmic Perspective textbook</i>
Post-Project Cost Per Student	<i>No cost to students</i>
Post-Project Savings Per Student	<i>Approximately \$154 per student</i>
Projected Total Annual Student	\$12,628

Savings Per Academic Year	
Using OpenStax Textbook?	Yes

Narrative Section

1. Project Goals

Our goals for this project are centered around the two principles of (a) converting the class to use the OpenStax free textbook, and (b) leveraging this and other freely available materials to facilitate active learning in and out of the classroom. Specifically, we intend:

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Summer semester: May

- Williams will create new “reading quizzes” on Desire2Learn in accordance with the schedule.
- Williams, advised by Shaw, will lay out a plan of lecture segments and activities for the course of the semester.
- Williams will revise or write new questions for clicker-response to be delivered during lecture segments, to assess student understanding of the topic and increase student participation during these segments.

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- Shaw and Williams will jointly develop assessments to determine success metrics.

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January 2020

- Review assessment data from Fall 2019 to determine which strategies were effective, and which require improvement.

6. Budget

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Note: Letter of Support