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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:	Kimberly Shaw
Appplication ID:	2862
Application Title:	412
Date Submitted:	01/15/2019 at 7:33 AM

Personal Details

Institution Name(s):	Columbus State University
Applicant First Name:	Kimberly
Applicant Last Name:	Shaw
Applicant Email Address:	shaw_kimberly@columbusstate.edu
Applicant Phone Number:	706-507-8344
Primary Appointment Title:	Professor of Physics
Submitter First Name:	Kimberly
Submitter Last Name:	Shaw
Submitter Email Address:	shaw_kimberly@columbusstate.edu
Submitter Phone Number:	706-507-8344
Submitter Title:	Professor

Application Details

Proposal Title
412

Final Semester of Project
Spring 2020

Requested Amount of Funding
$10800

Type of Grant

No-or-Low-Cost-to-Students Learning Materials

Course Title(s)
Introductory Physics 1 and Principles of Physics 1

Course Number(s)
PHYS 1111 and PHYS 2211

Team Member 1 Name
Kimberly Shaw

Team Member 1 Email
shaw_kimberly@columbusstate.edu

Team Member 2 Name
Andrew Puckett

Team Member 2 Email
puckett_andrew@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
Clint Barineau

Sponsor Title
Chair

Sponsor Department
Earth & Space Sciences

Original Required Commercial Materials (title, author, price)

In PHYS 1111, students are required to use Randall Knight's College Physics, 4th edition, which is published by Pearson. Students are also required to purchase a subscription to Mastering Physics, and to purchase an iClicker. The combined price for these materials is $293 per student.

In PHYS 2211, the current instructor uses University Physics 1, published by OpenStax plus a subscription to Sapling Learning, but her colleagues use Physics for Scientists and Engineers by Knight, along with Mastering Phyisics. The materials used by the current instructor cost students $42 for the semester; materials used by other instructors cost $235 or more per semester.

Our goal in developing these courses together is to leverage the expertise of the faculty member that has used this material before to develop a suite of materials that can be shared by all faculty at CSU. The biggest barrier to adoption of low cost materials has been the time and resources needed to adapt to a new text, and this grant would provide us the means to do so.

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

72 students per section in PHYS 1111; 48 students per section in PHYS 2211

Average Number of Sections Affected by Project in One Academic Year

3 sections per year of PHYS 1111; 1 section per year in PHYS 2211

Total Number of Students Affected by Project in One Academic Year

If uniformly adopted, this could impact 216 students per year

Average Number of Students Affected per Summer Semester

24

Average Number of Students Affected per Fall Semester

72

Average Number of Students Affected per Spring Semester

120

Original Total Cost per Student

$293 in PHYS 1111; $42 in PHYS 2211 this semester

Post-Project Cost per Student

$42

Post-Project Savings per Student

$251 per student in PHYS 1111

Projected Total Annual Student Savings per Academic Year

$42168

Using OpenStax Textbook?

Yes

Project Goals

Our goals for this transformation are several:

- To develop a set of active learning activities to better support our student population in being successful in learning physics, and to improve RPG rates in our student population.
- To develop a suite of narrated example problems, to satisfy requests by our students for more example problems to aid them in learning both content and problem solving skills.
- By offering courses using free texts and low cost homework systems, to encourage more students to have the ability to come to class better prepared to learn physics.
- To develop a suite of flipped lectures to accompany the OpenStax texts for our students, to further elucidate difficult concepts before students come to class.
- To leverage the experience of one of us (Shaw) in using OpenStax texts in preparing materials to offer both PHYS 1111 and PHYS 2211 using these free texts to our students.

We feel that by cooperating to transform these courses together, we will establish a critical mass of faculty with the skill set to teach courses in physics with OpenStax and other low cost resources, and will be able to develop a full complement of active learning activities to both sets of classrooms. The co-PIs are two of three faculty at Columbus State that regularly teach physics 1111, and it is likely that Puckett and Shaw will trade teaching assignments at some point in the near future. In addition, we feel that by developing a full suite of these materials that it will be more appealing for our other physics faculty member to adopt them as well.

It is also our intention, upon successfully completing this project, to extend our efforts to PHYS 1112 and PHYS 2212.

Statement of Transformation

Currently, the Department of Earth and Space Sciences at Columbus State University has three faculty who teach Physics courses: Shaw, Puckett, and Hrepic. At present, Shaw is assigned to teach PHYS 2211 in spring terms and Puckett is assigned to teach PHYS 1111 in spring terms, with both teaching the subsequent second semester course in fall terms. Faculty at CSU typically rotate assignments in these courses every 3 or 4 years, and Puckett is most likely to rotate into the 2211 sequence next.

At present, PHYS 1111 and 1112 are taught using Randy Knight's College Physics textbook, with Mastering Physics online homework system and clickers. This means that, according to our bookstore, maximum costs (newest edition, new text) for this course are typically $293 per student for PHYS 1111. In Fall 2018, we surveyed our students, and found that approximately 25% of our students do not have access to a textbook for this course, mainly due to cost issues.

In PHYS 2211, one of the PIs (Shaw) has already adopted OpenStax texts and Sapling Learning to provide low cost resources. In this course, some flipped lectures already exist as well, focusing on concepts that require the use of calculus.

According to the same survey, in both courses, less than half of our students come to class having read the text before class meetings, and faculty agree that students are typically unprepared to participate optimally when class begins.

We (Shaw and Puckett) proposed not only to shift to low cost resources (an inexpensive online homework system plus the OpenStax text) but also to develop a set of flipped class videos and narrated example problems for students to use to prepare for class, and a set of active learning activities in order to both incentivize that pre-class preparation, and to allow classtime to focus on the most difficult content and problem solving skills. These activities can be developed in parallel for both courses because both focus on classical mechanics, but at different levels of mathematical preparation. Thus, we can develop activities which serve PHYS 1111 (based on pre-calculus) and PHYS 2211 (based on Calculus 1) by developing a base of activities that can be used for the PHYS 2211 course, and then modifying these activities to meet the needs of the PHYS 1111 math preparation.

Sustainabiity: By working together to transform both courses, this will create a critical mass of materials ready to deploy by faculty, as well as a critical mass of students that have developed the habits of mind to expect and benefit from active learning skills. In addition, these resources will be shared with the third physics faculty member, for his adoption, upon request.

Transformation Action Plan

Shaw will review online low cost homework systems (Sapling Learning, ExpertTA); Shaw and Puckett will jointly choose one of these to adopt.

Puckett will be responsible for recording flipped lectures for pre-class review by students.

Shaw will be responsible for recording narrated example problems for pre-class review by students.

Shaw will develop the class time bank of problem solving and conceptual activities, with answer keys. (These will focus on metacognitive learning strategies in addition to homework style exercises).

Shaw and Puckett will jointly determine the preliminary bank of warm up questions.

These activities will be developed based on data from current students, to indicate the areas that our students currently require the most assistance in learning. While as faculty we can likely point the way anecdotally, the use of exam data as well as pre-post test data are a better way to be able to determine the “struggle points”.

Flipped lectures will all be designed with current ADA requirements for accessibility, and will be captioned by CSU’s Center of Online Learning’s captioning services.

In addition to sharing these resources via GALILEO, we will share resources internally via a shared Google Drive.

Quantitative & Qualitative Measures

The PIs will assess the success of the course transformation via the following assessments:

- Student satisfaction survey
- Use metrics: count the number of times each video is accessed
- student performance data on warmup exercises.
- Exam scores for each of three “hourly” exams, distributed through the term. These will be compared to prior year course exam averages for these content units.
- Final exam scores (compare course performance to prior year)
- Comparison of pre-post test scores with prior year data (use of Force Concept Inventory and Test of Understanding of Graphs and Kinematics: these are uniformly implemented across all sections of PHYS 1111 and 2211 for at least 5 years prior to this project).
- DWF rates (compared to prior data)

We will apply for IRB approval of this project in Fall 2019.

Timeline

Spring semester 2019

- Andy Puckett will train on video capture software in Center of Online Learning (COOL)
- Andy Puckett will review Flip Your Classroom to learn about best practices in flipping a course
- Shaw and Puckett will determine whether to use Expert TA or Sapling Learning as a low cost homework system in future
- Kahoot and other free apps will be reviewed for potential use in place of clickers and other subscription based software for in-class polling, both for warm-ups at the start of class to assess initial understanding and as mid-class checkpoint questions

Summer semester: May

- Shaw and Puckett will coordinate order of content in PHYS 1111 and 2211, and pacing of that content. This will be used to determine (along with prior course data) which lectures will be replaced with guided problem solving activities, and which will be replaced with concept development or hands on activities.
- Together, one traditional class “lecture” will be revised collaboratively, and Shaw and Puckett will work together to record flipped videos based on this lecture.
- Shaw and Puckett will develop a preliminary question bank for warm-up exercises, to be asked at the beginning of class using Kahoot (or another free app) to assess initial understanding of the material in the newly adopted text and the flipped videos.

Summer semester: June

- Puckett will be responsible for developing a series of flipped lecture videos, focusing on PHYS 1111 lectures. First, focus will be on revising the lecture presentations to mesh with the order and pacing determined in May, and to better coordinate with the OpenStax College Physics book to be adopted. Lecture revision/planning will take place over the first three weeks in June.During the last week in June, Puckett will record 3 “days” of lecture as flipped videos.
- Shaw will be mapping out and recording example problem videos. Goal is to map and record 12 examples per week for three weeks, for a total of 36 example problem videos.

Summer semester: July

- Puckett will record 5 “days” of lecture as flipped video per week for 4 weeks in July.
- Shaw will develop the class time bank of problem solving activities, with answer keys. (These will focus on metacognitive learning strategies in addition to homework style exercises).
- Shaw will continue to map and record an added 10 example problem videos.

Fall semester

- Submit IRB application to collect data for this project.
- Submit videos to COOL office for captioning.

Spring 2020:

- Implement new textbook (OpenStax) with flipped videos and active learning strategies in both PHYS 1111 and 2211.

May 2020

- Review assessment data from both classes to determine areas of success, and areas in need of further refinement.

Budget

- $800 travel funding
- $5000 stipend for Shaw
- $5000 stipend for Puckett

Sustainability Plan

Course materials will be maintained on a shared Google drive by the PIs. There will be file name designations to indicate whether materials require the use of calculus, in order to facilitate faculty use, and an index file will be maintained documenting changes to these materials and the reasons for such changes.

Work will be shared during the Fall Welcome Back Symposium for faculty development.

All materials will be shared with other physics faculty at CSU to allow them to determine whether they wish to adopt these changes, along with data documenting student learning outcomes.

By working together to transform both courses (PHYS 1111 and PHYS 2211) simultaneously, this will create a critical mass of materials ready to deploy by faculty, as well as a critical mass of students that have developed the habits of mind to expect and benefit from active learning skills. In addition, these resources will be shared with the third physics faculty member, for his adoption.

Upon successful completion of this project, Shaw and Puckett will determine how to apply these techniques, and any lessons learned, to developing a similar suite of materials for PHYS 1112 and PHYS 2212, the second semester in both introductory sequences.

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.

COLUMBUS STATE UNIVERSITY

Department of Earth and Space Sciences
College of Letters and Sciences

January 9th, 2019

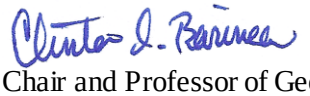
To: Textbook Transformation Grant Screening Committee

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

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

I would like to express my support for the Affordable Learning Georgia Textbook Transformation Grant proposal, *Flipping Introductory Physics 1 and Principles of Physics 1 in order to implement active learning strategies*, submitted by Dr. Kimberly Shaw and Dr. Andrew Puckett. Dr. Kimberly Shaw, Professor of Physics, has taught physics courses in our program for more than a decade and has extensive experience with teaching students and developing course materials for introductory core science courses. Dr. Shaw, additionally, conducts research in the area of student learning with particular focus on the effectiveness of teaching strategies in core science classes. Associate Professor of Astronomy, Dr. Andrew Puckett, shares in instruction of core physics curriculum as well as instruction of introductory and upper level astronomy coursework. Like Dr. Shaw, Dr. Puckett has extensive experience with both teaching and developing course materials for students in core science courses. Collectively, these faculty are in an ideal position to develop effective no-cost or low-cost instructional materials for students in our core physics curriculum. In my opinion, their proposal to shift to an OpenStax physics textbook and move to a "flipped-classroom" format, while simultaneously developing tools to assess the effectiveness of these changes, is well planned and should improve student mastery of physics 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 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	Kimberly Shaw
Applicant Email	Shaw_kimberly@columbusstate.edu
Applicant Phone #	706-507-8344
Applicant Position/Title	Professor of Physics
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	Kimberly Shaw	Shaw_kimberly@columbusstate.edu
Team Member 2	Andrew Puckett	Puckett_andrew@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.

Project Information and Impact Data

Title of Grant Project	*Flipping Introductory Physics 1 and Principles of Physics 1 in order to implement active learning strategies*
Type of Grant	*"No-or-Low-Cost-to-Students Learning Materials," Standard Scale Transformation*
Requested Amount of Funding	$10,800
Course Names and Course Numbers	PHYS 1111 and PHYS 2211
Final Semester of Project	*Spring 2020*
Average Number of Students Per Course Section Affected by Project	72 per section of PHYS 1111 48 per section of PHYS 2211
Average Number of Sections Affected by Project in One Academic Year	3 sections of PHYS 1111 (including summer) 1 section of PHYS 2211
Total Number of Students Affected by Project in One Academic Year	If uniformly adopted, this could impact 216 students per year
Average Number of Students Affected per Summer Semester	*24*
Average Number of Students Affected per Fall Semester	72
Average Number of Students Affected per Spring Semester	120
Title/Author of Original Required Materials	*OpenStax College Physics for PHYS 1111* *OpenStax University Physics Volume 1 for PHYS 2211* *Kahoot or similar to replace clickers* *Sapling Learning or Expert TA to replace MasteringPhysics*
Original Total Cost Per Student	*PHYS 1111: maximum $293 to include text, Mastering Physics and clicker* *PHYS2211: $40 for Sapling Homework system*
Post-Project Cost Per Student	*$40 per student for Sapling (or ExpertT)A only*
Post-Project Savings Per Student	*For PHYS 1111: maximum $253 per student*

	For PHYS 2211: $0
Projected Total Annual Student Savings Per Academic Year	*$42504 (maximum)*
Using OpenStax Textbook?	*Yes*

Narrative Section

1. Project Goals

Goals for a Textbook Transformation Grant project go beyond just cost savings. Include goals for student savings, student success, materials creation, and pedagogical transformation here.

Our goals for this transformation are several:

- *To develop a set of active learning activities to better support our student population in being successful in learning physics, and to improve RPG rates in our student population.*
- *To develop a suite of narrated example problems, to satisfy requests by our students for more example problems to aid them in learning both content and problem solving skills.*
- *By offering courses using free texts and low cost homework systems, to encourage more students to have the ability to come to class better prepared to learn physics.*
- *To develop a suite of flipped lectures to accompany the OpenStax texts for our students, to further elucidate difficult concepts before students come to class.*
- *To leverage the experience of one of us (Shaw) in using OpenStax texts in preparing materials to offer both PHYS 1111 and PHYS 2211 using these free texts to our students.*

We feel that by cooperating to transform these courses together, we will establish a critical mass of faculty with the skill set to teach courses in physics with OpenStax and other low cost resources, and will be able to develop a full complement of active learning activities to both sets of classrooms. The co-PIs are two of three faculty at Columbus State that regularly teach physics 1111, and it is likely that Puckett and Shaw will trade teaching assignments at some point in the near future.

2. Statement of Transformation

Textbook Transformation Grants are awarded to teams focused on creating impactful changes. This section allows teams to describe why the project should be awarded. Include the following:

- *A description of the current state of the course, department, and/or institution if relevant.*
- *An overall description of the project and how it will impact the course, department, and institution as described previously. Include references to scholarly literature to support the claims of your impact if possible.*

Currently, the Department of Earth and Space Sciences at Columbus State University has three faculty who teach Physics courses: Shaw, Puckett, and Hrepic. At present, Shaw is assigned to teach PHYS 2211 in spring terms and Puckett is assigned to teach PHYS 1111 in spring terms, with both teaching the subsequent second semester course in fall terms. Faculty at CSU typically rotate assignments in these courses every 3 or 4 years, and Puckett is most likely to rotate into the 2211 sequence next.

At present, PHYS 1111 and 1112 are taught using Randy Knight's College Physics textbook, with Mastering Physics online homework system and clickers. This means that, according to our bookstore, maximum costs (newest edition, new text) for this course are typically $293 per student for PHYS 1111. In Fall 2018, we surveyed our students, and found that approximately 25% of our students do not have access to a textbook for this course, mainly due to cost issues.

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According to the same survey, in both courses, less than half of our students come to class having read the text before class meetings, and faculty agree that students are typically unprepared to participate optimally when class begins.

We (Shaw and Puckett) proposed not only to shift to low cost resources (an inexpensive online homework system plus the OpenStax text) but also to develop a set of flipped class videos and narrated example problems for students to use to prepare for class, and a set of active learning activities in order to both incentivize that pre-class preparation, and to allow classtime to focus on the most difficult content and problem solving skills. These activities can be developed in parallel for both courses because both focus on classical mechanics, but at different levels of mathematical preparation. Thus, we can develop activities which serve PHYS 1111 (based on pre-calculus) and PHYS 2211 (based on Calculus 1) by developing a base of activities that can be used for the PHYS 2211 course, and then modifying these activities to meet the needs of the PHYS 1111 math preparation.

Sustainabiity: By working together to transform both courses, this will create a critical mass of materials ready to deploy by faculty, as well as a critical mass of students that have developed the habits of mind to expect and benefit from active learning skills. In addition, these resources will be shared with the third physics faculty member, for his adoption, upon request.

3. Transformation Action Plan

Textbook Transformation Grant projects can be work-intensive and require project management in order to be successful. This section allows teams to describe how the team will fulfill the goals of the project. Include the following:

Shaw will review online low cost homework systems (Sapling Learning, ExpertTA); Shaw and Puckett will jointly choose one of these to adopt.

Puckett will be responsible for recording flipped lectures for pre-class review by students.

Shaw will be responsible for recording narrated example problems for pre-class review by students.

Shaw will develop the class time bank of problem solving and conceptual activities, with answer keys. (These will focus on metacognitive learning strategies in addition to homework style exercises).

Shaw and Puckett will jointly determine the preliminary bank of warm up questions.

These activities will be developed based on data from current students, to indicate the areas that our students currently require the most assistance in learning. While as faculty we can likely point the way anecdotally, the use of exam data as well as pre-post test data are a better way to be able to determine the "struggle points".

Flipped lectures will all be designed with current ADA requirements for accessibility, and will be captioned by CSU's Center of Online Learning's captioning services.

In addition to sharing these resources via GALILEO, we will share resources internally via a shared Google Drive.

4. Quantitative and Qualitative Measures

All Textbook Transformation Grant projects must measure student satisfaction, student performance, and course-level retention (drop/fail/withdraw rates), but teams and institutions will do this in varied ways. Outstanding applications will include measures beyond the minimum to gain meaningful insights into the impact of the project. Include the following:

- *Each quantitative or qualitative measure to be used, along with a description of the methods and/or tools used to gather and analyze data.*
- *If the team needs IRB (Institutional Review Board) approval, please indicate this here. Each institution's IRB functions differently and teams will need to know how their institution's IRB evaluates and approves of institutional research.*

The PIs will assess the success of the course transformation via the following assessments:

- Student satisfaction survey
- Use metrics: count the number of times each video is accessed
- student performance data on warmup exercises.
- Exam scores for each of three "hourly" exams, distributed through the term. These will be compared to prior year course exam averages for these content units.
- Final exam scores (compare course performance to prior year)
- Comparison of pre-post test scores with prior year data (use of Force Concept Inventory and Test of Understanding of Graphs and Kinematics: these are uniformly implemented across all sections of PHYS 1111 and 2211 for at least 5 years prior to this project).
- DWF rates (compared to prior data)

We will apply for IRB approval of this project in Fall 2019.

5. Timeline

This section allows teams to describe how the project will progress from its inception to the final report (submitted at the end of the final semester of the project). Please provide a list of major milestones for the project here, aligning it with the Transformation Action Plan and your selected Final Semester of the project. Do not put this in the form of a table, as it will create issues within InfoReady Review for the official application – a bullet-point list is acceptable.

Spring semester 2019

- Andy Puckett will train on video capture software in Center of Online Learning (COOL)
- Andy Puckett will review Flip Your Classroom to learn about best practices in flipping a course
- Shaw and Puckett will determine whether to use Expert TA or Sapling Learning as a low cost homework system in future
- Kahoot and other free apps will be reviewed for potential use in place of clickers and other subscription based software for in-class polling, both for warm-ups at the start of class to assess initial understanding and as mid-class checkpoint questions

Summer semester: May

- Shaw and Puckett will coordinate order of content in PHYS 1111 and 2211, and pacing of that content. This will be used to determine (along with prior course data) which lectures will be replaced with guided problem solving activities, and which will be replaced with concept development or hands on activities.
- Together, one traditional class “lecture” will be revised collaboratively, and Shaw and Puckett will work together to record flipped videos based on this lecture.
- Shaw and Puckett will develop a preliminary question bank for warm-up exercises, to be asked at the beginning of class using Kahoot (or another free app) to assess initial understanding of the material in the newly adopted text and the flipped videos.

Summer semester: June

- Puckett will be responsible for developing a series of flipped lecture videos, focusing on PHYS 1111 lectures.
    - First, focus will be on revising the lecture presentations to mesh with the order and pacing determined in May, and to better coordinate with the OpenStax College Physics book to be adopted. Lecture revision/planning will take place over the first three weeks in June.
    - During the last week in June, Puckett will record 3 “days” of lecture as flipped videos.

- Shaw will be mapping out and recording example problem videos. Goal is to map and record 12 examples per week for three weeks, for a total of 36 example problem videos.

Summer semester: July

- Puckett will record 5 “days” of lecture as flipped video per week for 4 weeks in July.
- Shaw will develop the class time bank of problem solving activities, with answer keys. (These will focus on metacognitive learning strategies in addition to homework style exercises).
- Shaw will continue to map and record an added 10 example problem videos.

Fall semester

- Submit IRB application to collect data for this project.
- Submit videos to COOL office for captioning.

Spring 2020:

- Implement new textbook (OpenStax) with flipped videos and active learning strategies in both PHYS 1111 and 2211.

May 2020

- Review assessment data from both classes to determine areas of success, and areas in need of further refinement.

6. Budget

Include overall personnel & projected expenses. Be sure to include the $800 in travel funding, which is required for all Textbook Transformation Grants. Do not put this in the form of a table, as it will create issues within InfoReady Review for the official application – a bullet-point list is acceptable. Please keep all funding guidelines from the corresponding RFP in mind.

- *$800 travel funding*
- *$5000 stipend for Shaw*
- *$5000 stipend for Puckett*

7. Sustainability Plan

Textbook Transformation Grants should have a lasting impact on the course for years to come. In order for this to happen, a Sustainability Plan needs to be in place after the end of the project. Please include here your plans for offering the course in the future, including:

- *The maintenance and updating of course materials*
- *Any possible expansion of the project to more course sections in the future*
- *Future plans for sharing this work with others through presentations, articles, or other scholarly activities*

Course materials will be maintained on a shared Google drive by the PIs. There will be file name designations to indicate whether materials require the use of calculus, in order to facilitate faculty use, and an index file will be maintained documenting changes to these materials and the reasons for such changes.

Work will be shared during the Fall Welcome Back Symposium for faculty development.

All materials will be shared with other physics faculty at CSU to allow them to determine whether they wish to adopt these changes, along with data documenting student learning outcomes.

By working together to transform both courses, this will create a critical mass of materials ready to deploy by faculty, as well as a critical mass of students that have developed the habits of mind to expect and benefit from active learning skills. In addition, these resources will be shared with the third physics faculty member, for his adoption, upon request.

Upon successful completion of this project, Shaw and Puckett will determine how to apply these techniques, and any lessons learned, to developing a similar suite of materials for PHYS 1112 and PHYS 2212, the second semester in both introductory sequences.

Note: Letter of Support

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.