Affordable Learning Georgia Affordable Materials Grants  
Transformation Grants Final Report

*(or Textbook Transformation Grants, if R17 or earlier)*

Once you have completed this template, to submit your Final Report, go to the [Final Report submission](https://survey.usg.edu/s3/ALG-Final-Report-Submission-Form) form.

The final report submission form allows you to submit the following:

* This completed narrative document (required)
* Syllabus or syllabi (required)

*If multiple files, compress into one .zip folder*

* Qualitative/Quantitative Measures data files (optional, as needed)

*If multiple files, compress into one .zip folder*

* Photo of your team or a class of your students for future ALG promotions (optional)
* Invoice for the second half of the grant’s award amount (optional)

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

# General Information

**Date: 12/19/2021**

**Grant Round: R18**

**Grant Number: 561**

**Institution Name(s): Clayton State University**

**Project Lead: Dr. Dmitriy Beznosko**

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

Dr. Dmitriy Beznosko, Assistant professor, Chemistry and Physics Dept., dmitriybeznosko@clayton.edu

Dr. Tatiana Krivosheev, Professor, Dept. of Chemistry and Physics, tatianakrivosheev@clayton.edu

Brian Roberts, Center for Excellence in Learning and Teaching, brianroberts@clayton.edu

**Course Name(s) and Course Numbers:**

Solar System Astronomy - ASTR 1010

Stellar and Galactic Astronomy - ASTR 1020

Principles of Physics I - PHYS 2211

Principles of Physics II - PHYS 2212

**Semester Project Began: Spring 2021**

**Final Semester of Implementation: Fall 2021**

**Total Number of Students Affected During Project: 112**

# Narrative

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

The new textbooks from OpenStax were adopted for ASTR 1010/1020 and PHYS 2211/2212 courses to replace the old costly ones. Since the order of topics in the former commercial textbooks and the OpenStax textbooks is not the same, the syllabi for all four courses need to be adjusted to conform to the new textbook adoption.

A set of lecture slides for the ASTR 1010 (chapters 1-15) and for ASRT 1020 (chapters 16-30) courses were created. A set of quiz questions for each chapter was developed as well.

A set of lecture slides for the PHYS 2211 and PHYS 2212 was created to correspond to the topics and materials from OpenStax “University Physics” volume 1 and volume 2 respectively.

For ASTR 1010/1020, in-class quizzes for each chapter were produced.

A set of videos of lab experiments to be analyzed using Tracker software were created to be used as extra credit projects for PHYS 2211/2212. These videos were created by student assistants with the technical and graphics design support from Brian Roberts and external collaborator. Note that B. Roberts has been with the group only half of the project due to the change of employment to a different campus. Thus, only half of the pay has been disbursed ($2500) to him with the part of the remainder has been used to pay the student assistant to complete all the video processing tasks remaining.

External collaborator in close contact with the team has developed online tools to help students carry out creative astronomy projects: three were developed for ASTR 1010 and two for ASTR 1020.

The team members have presented their development, usage, and lessons learned in the process to the larger teaching community at Summer 2021 AAPT conference and the education part of the IRCR 2021 international conference (publication PoS(ICRC2021)1363 available at <https://pos.sissa.it/395/1363/pdf> ).

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

The main lesson was that it is nearly impossible to write all lectures at once. The best strategy that has proven itself is to prepare a lecture a day or two before a class and do the corrections/amendments after the class to incorporate any additional ideas as well as student questions and comments.

Student assistants were also very helpful so having a candidate or two in mind before the grant start is also a plus. Time may be lost in trying to find the candidate and get them through the hiring system, different for each campus but usually lengthy.

Due to pandemic, we experienced some very unexpected shifts in the enrollment patterns that caused a very low number of students attending the PHYS 2211/2212 classes this fall (and higher numbers for 2211 for the Spring 22 from pre-registration).

* 1. *Describe any materials you created or revised/remixed that will be shared with the public. Include the* [*open license your materials will be shared under*](https://creativecommons.org/share-your-work/)*—for most materials, this will be an Attribution 4.0 License (CC BY) as required in the Grants Request for Proposals.*

The following has been created and is shared for each class, all as CC BY:

FOR ASTR 1010:

A set of PowerPoint slides for each chapter.

A quiz for each chapter

Three projects for ASTR 1010:

* Create your own cosmology (project 1) – a guided constructor of ideas to help students assemble the outline and the in-browser text editor so that the project can be completed using a number of devices that support a modern web browser such as a tablet or cell phone, etc.
* Moon observation project (project 2) – a logbook interface that helps to store the observations and make a plot. The tool also plots the actual positions of the Moon on the observation dates and times so that the student can see the difference between the two. After the plot is displayed, entered data can’t be changed to rule out alterations of the observed data points.
* Extraterrestrial agent report (project 3) – an online tool that starts the students with the name and title encoded in ‘alien’ language and guided prompts that ask for the initial data and an image of the object. Here, students write a report on any body of the Solar system in the provided editor pretending to be an agent from another star system and concluding based on their data whether the planet should be colonized by the civilization that sent them.

FOR ASTR 1020:

A set of PowerPoint slides for each chapter.

A quiz for each chapter

Two projects for ASTR 1020:

* Extra-solar planet report – now it’s the turn of the Earth to send an agent to scout the extrasolar planets. Similar setup and idea as in project 3, adjusted for reporting the extrasolar planets.
* Solar rotation tool – this is a two-part project, in part 1 students need to find and download satellite images of the Sun that have the same sunspots over several consecutive days. Part 2 uses the online tool to provide advanced analysis of the images with the student identifying the sunspots with a click of the mouse.

FOR PHYS 2211 and 2212:

A set of PowerPoint slides for each chapter.

Video labs for Capstone projects

# Quotes

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

“The Workload was perfect   
The availability of the textbook was very convenient   
Give this man a raise!”

“Really enjoyed the sllides! Had great new information that was very intriguing.”

“Great Class Great Projects I learned more than I thought I would”

“They were different from what i expected. Enjoyed how they were not a cookie cutter, write a report style of assignment. The cosmology was one of the more enjoyable projects i have done.”

# Quantitative and Qualitative Measures

## Uniform Measurements Questions

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

**Student Opinion of Materials**

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

**ASTR (additional details are attached as survey results)**

Total number of students affected in this project: \_\_\_\_73\_\_\_\_\_\_

* Positive: \_\_80\_\_\_\_\_ % of \_\_\_51\_\_\_\_\_ number of respondents
* Neutral: \_\_\_18\_\_\_\_ % of \_\_\_\_51\_\_\_\_ number of respondents
* Negative: \_\_\_\_2\_\_\_ % of \_\_\_51\_\_\_\_\_ number of respondents

**PHYS 2211** (Spring’21 semester with the materials under development):

The PowerPoints useful 8/11 (73%) somewhat useful 3/11 (27%) not useful/never used 0/11 (0%)

Capstone Projects useful 11/12 (92%) somewhat useful 1/12 (8%) not useful/never used 0/12 (0%)

Quizzes useful 11/12 (92%) somewhat useful 1/12 (8%) not useful/never used 0/12 (0%)

The comments about the capstone projects were uniformly positive with the most students commenting on how much it helped to deeply understand the physics behind the projects.

**PHYS 2212** (Fall’21 semester):

1. Did you use the OpenStax textbook this semester?

yes 5/5 (100%) no 0/5 (0%)

1. Was it important for you to have a no-cost textbook this semester?

yes 5/5 (100%) no 0/5 (0%)

1. Do you think the OpenStax - based homework assignments were sufficient?

yes 5/5 (100%) no 0/5 (0%)

1. Would you rather use MasteringPhysics or similar system for the homework?

yes 3/5 (60%) no 2/5 (40%)

**Student Learning Outcomes and Grades**

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

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

Choose One:

* \_x\_\_ Positive: Higher performance outcomes measured over previous semester(s)
* \_\_\_ Neutral: Same performance outcomes over previous semester(s)
* \_\_\_ Negative: Lower performance outcomes over previous semester(s)

**Student Drop/Fail/Withdraw (DFW) Rates**

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

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

\_\_24\_\_\_\_\_% of students, out of a total \_\_56\_\_\_\_\_ 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)
* \_X\_\_ 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)

## Measures Narrative

*In this section, summarize the supporting impact data that you are submitting, including all quantitative and qualitative measures of impact on student success and experience. Include all measures as described in your proposal, along with any measures developed after the proposal submission.*

*[When submitting your final report, as noted above, you will also need to provide the separate file (or .zip with multiple files) of supporting data on the impact of your Textbook Transformation, such as surveys, analyzed data collected, etc.]*

* *Include measures such as:*
  + *Drop, fail, withdraw (DFW) delta rates*
  + *Course retention and completion rates*
  + *Average GPA*
  + *Pre-and post-transformation DFW comparison*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course** | **Fiscal Year** | **% DFW** | **# of Students in Class** | **# of DFW** |
| **PHYS 2211** | **FY 2019** | **25%** | **55** | **14** |
| **PHYS 2211** | **FY 2020** | **24%** | **51** | **12** |
| PHYS 2211 | FY 2021 | 28% | 38 | 11 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course** | **Fiscal Year** | **% DFW** | **# of Students in Class** | **# of DFW** |
| **ASTR 1010** | **FY 2019** | **19%** | **126** | **23** |
| **ASTR 1010** | **FY 2020** | **17%** | **129** | **22** |
| **ASTR 1010** | FY 2021 | 18% | 75 | 14 |

As we can see from the tables, there is no significant change in the FDW rate. The drop in the total enrollment is consistent with the drop of enrollment numbers in other classes such as math and chemistry, also consistent with smaller number of accepted freshman.

The average GPA of PHYS classes is not significantly affected with the average for all years around 2.9-3.1 out of 4 points. For the ASTR classes, the average for FY 2019-2020 was about 2.8-3.0 and in FY 2021 it has increased to be ~3.2

* + *Student success in learning objectives*
  + *Surveys, interviews, and other qualitative measures*

The surveys are provided separately. They include learning objective related questions as well as other measures.

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

The fall 2021 semester had unusually low enrolment rate into the ASTR and PHYS classes with no specific reason that we could find. The spring 2021 had somewhat below expected which can be attributed to the pandemic situation. However, the spring 2022 enrollment rate in ASTR and PHYS are very high, possibly compensating for the drop in the fall semester. However, it’s the Fall’21 semester that was the last semester of implementation.

# 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.*

The materials are locally saved on the shared drive accessible to all department faculty. Also, the team creating these materials (that is, Dr Beznosko and Dr. Krivosheev) will remain as responsible for the updating and maintenance as well as the point of contact for anyone planning to use these materials locally. We remain available to the questions etc. from instructors from other institutions who would like to use our files. The materials will be periodically updated to follow any significant changes in the Astronomy/University physics textbooks to keep the alignment.

The source code for the astronomy projects is also available at <https://aiakovlev.github.io/ASTR-1010-1020/> and each folder with the code also contains the shortcut to this page.

The videos that were used for the PHYS projects, is also available at <https://www.youtube.com/playlist?list=PLra9sbnMdYHMdOUxDbi5DjehX1LopVfZH>

The PowerPoint slides and the project source files for astronomy are also available at the OpenStax community resource (OER Commons Hub Resources) at <https://www.oercommons.org/courseware/lesson/88778>

The PowerPoint slides for the university physics course are also available at the OpenStax community resource (OER Commons Hub Resources) at <https://www.oercommons.org/courseware/lesson/88779>

# Future Affordable Materials 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.*

The transformation of the PHYS 2211-2212 courses has also necessitated the changes in the format, order and content of the associated laboratory sections. We have applied for the continuous transformation ALG grant to accomplish this task. The future plans further on include the transformation of the PHYS1111-1112 course that is an algebra-based physics for life sciences students (typically). The opportunity there is not only to change the textbook and course materials but also to extend things to include more material that is relevant to pre-med students such as viscosity and blood flow, etc.

# Future Scholarship Plans

*Describe any planned or actual papers, presentations, publications, or other professional activities that you expect to produce that reflect your work on this project.*

The results of this project and the experience of students taking the transformed classes is going to be presented at upcoming conferences such as Teaching Matters spring 2022 conference, AAPT upcoming conferences and possibly others. The abstract about the course transformation and the continuous improvement of the labs for the 2022 Teaching Matters Conference has been accepted – will take place in March 10-11th.

# Description of Photograph (optional)

*This is where a team can list the names of the people shown in this separately uploaded photograph, along with their roles, if applicable.*