Affordable Learning Georgia Textbook Transformation Grants

Final Report for Mini-Grants

General Information

Date: 12/17/18

Grant Round: 11

Grant Number: M16

Institution Name(s): Georgia Gwinnett College

Team Member: Edward R. Forringer, Physics, Georgia Gwinnett College, eforring@ggc.edu

Project Lead: Edward R. Forringer

Course Name(s) and Course Numbers: Introduction to Physics 1 with Lab, PHYS1111k

Final Semester of Project: Fall 2018

If applicable to your project:

Average Number of Students Per Course Section: 21.3

Number of Course Sections Affected by Implementation of Revised Resources: 3

Total Number of Students Affected by Implementation of Revised Resources: 64

1. Project Narrative

Project Purpose and Plan:

The purpose of this project was to improve rigor and student success in PHYS1111k by implementing specification grading ("Specification Grading: Restoring Rigor, Motivating Students, and Saving Faculty Time," by Linda Nilson).

As part of the implementation of specification grading, we chose to develop ancillary materials for the OpenStax College Physics textbook, namely a teacher's manual for teaching physics using specification grading and the OpenStax textbook. This manual includes suggested syllabus language, a detailed explanation of 20 skills students should demonstrate, and practice problems, and quizzes for each skill.

Timeline:

Fall 2017:

- Met with other professors who were implementing specification grading to learn some "best practices"

- Identified approximately 30 student outcomes and skills (i.e. “specifications”) for PHYS1111k
    - Wrote a short narrative describing the required skill/outcome including an example problem and required equations
    - Identified the appropriate chapters and sections from the OpenStax textbook
    - Wrote in-class problems for students to practice
    - Selected textbook problems for homework
    - Wrote an example quiz for students to practice/study
- Developed a syllabus and draft teacher’s manual
    - Attendance policies for a specification based classroom
    - Developed a semester calendar showing when each specification would be covered in class and when in-class quizzes would be offered.
    - Determined how grades would be assigned (i.e. how many quizzes must be passed to earn various grades.)

Spring 2018:

- Taught one section of PHYS1111k using specification grading and the OpenStax textbook
    - Used www.peruall.com to assign and assess textbook reading
    - Wrote up to 5 versions of each quiz
    - Worked with colleagues to offer retakes of quizzes outside of class time
    - Determined that 34 specifications were too many
    - Got feedback from students about specification grading

Summer 2018:

- Revised teacher’s manual and syllabus
    - Combined and/or dropped specification down to a list of 20
    - Revised requirements for retaking quizzes
    - Revised quiz versions A and B for most specifications

Fall 2018:

- Taught 2 sections of PHYS1111k using specification grading and the OpenStax textbook
- Completed final revisions to teacher’s manual
- Completed ALG mini-grant final report

Original Works:

The ancillary materials for this grant were written to complement the OpenStax College Physics textbook: https://openstax.org/details/college-physics

- A teacher’s manual with a description of how specification grading can be used in the physics classroom along with sample syllabus language.
- Twenty “specification documents” which include reading from the textbook, textbook problems, a description of the learning objective, criteria for passing the assessment, practice problems, and an example assessment.
- Twenty “quizzes” which can be used as “version A” in a specification grading course.

- A practice final exam with eight problems, one each from the five critical specifications and three additional problems.

Narrative:

Lessons Learned:

1. The students do not see a major difference between the OpenStax College Physics textbook and the Knight College Physics textbook. An expert may notice that the Knight book is superior in some ways, but as a tool to introduce students to concepts which will be reinforced during class, the OpenStax book is sufficient.
2. When implementing specification grading:
    a. 20 specifications are about the limit for a class like PHYS1111k
    b. It is very important to have a robust system for quiz retakes which happen outside of normal class time. Otherwise, giving and taking quizzes would take up too much instructional time.
    c. It is important to make quiz grading objective and simple. The pass/fail criteria must be clear to the student and easy to grade quickly. Otherwise the time required to grade all the retakes will become overwhelming.
    d. Rather than giving "points" for homework, reading and attendance, it is useful to make these activities requirements for retaking quizzes which were not passed on the first attempt.

2. Materials Description

- *"00 Specification Grading" – A teacher's manual for using specification grading in an introductory physics classroom. This document also includes sample language for a syllabus for this course.*
- *"Final Exam Practice" – An example final exam which includes eight questions, one from each critical specification and three additional problems.*
- *"Specs.zip" – A collection of 20 specification documents which each include reading from the textbook, textbook problems, a description of the learning objective, criteria for passing the assessment, practice problems, and an example assessment.*
- *"Quizes.zip" – A collection of 20 quizzes which can be used to assess whether or not students have mastered the associated learning objective.*

3. Materials Links

- *http://wiki.ggc.edu/wiki/Dr._Ted_Forringer*

4. Future Plans

- *We will present a workshop on teaching physics using specification grading (and the OpenStax textbook) at the Spring 2019 meeting of the Southern Atlantic Coast Section of the American Association of Physics Teachers (SACS-AAPT)*

- *At some future date, we will apply for a grant to produce similar resources for a physics 2 course.*