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| <b>Application Number</b>  | M16   |
| <b>Grant Amount</b>        | \$2,800   |
| <b>Applicant</b>           | Edward Forringer  |
| <b>Email</b>               | eforring@ggc.edu  |
| <b>Institution</b>         | Georgia Gwinnett College  |
| <b>Team Members</b>        | Not applicable  |
| <b>Works Being Revised</b> | <a href="https://oer.galileo.usg.edu/physics-collections/1/">https://oer.galileo.usg.edu/physics-collections/1/</a><br><a href="https://oer.galileo.usg.edu/physics-collections/2/">https://oer.galileo.usg.edu/physics-collections/2/</a><br><a href="https://oer.galileo.usg.edu/physics-collections/3/">https://oer.galileo.usg.edu/physics-collections/3/</a>   |
| <b>Final Semester</b>      | Fall 2018   |
| <b>Grant Amount</b>        | \$2,800   |
| <b>Description</b>         | <p>“Improving Rigor and Student Success in Physics 1111K with No-Cost to Student Course Materials and Specification Grading”</p> <p>The goals of this project are to:</p> <ol style="list-style-type: none"> <li>1. Improve rigor and student success among 72 students enrolled in three sections of introductory physics, PHYS 1111k, at Georgia Gwinnett College by implementing no-cost to student course materials. More specifically, the project aims to increase motivation and improve grades among the participating students.</li> <li>2. Extend and modify the existing ALG-funded resources chosen for the project so that Georgia physics professors can implement “specification grading,” in the course using free and low cost educational resources. The “specification grading”- related deliverables are: <ol style="list-style-type: none"> <li>(1) A teacher’s manual for specification grading in PHYS1111k; and</li> <li>(2) A test bank for evaluating students.</li> </ol> </li> </ol> <p>The ALG-funded physics courses utilized “College Physics” by OpenStax College. For this preliminary mini-grant, the PI will adopt this book. He will also choose the book chapters and review the syllabi and ancillary materials created by Georgia Highlands College, Valdosta State, and Middle Georgia College for adaptation. Students are currently purchasing the textbook “College Physics 3rd Ed.” by Knight at a cost of \$150.60 for the e-book or \$329.20 for the hardback. With the ALG materials and newly developed resources, 72 students in three sections of the Physics course in spring and fall 2018 will no longer have to pay for their textbooks. (GGC has small class sizes of between 24-27 students.) The total savings to the students is up to \$23,702.40. In addition, the proposed project will help improve student motivation and student success by focusing on authentic learning and higher order cognition.</p> <p>"Specifications Grading: Restoring Rigor, Motivating Students, and Saving Faculty Time," by Linda Nilson describes a system of grading in which students are provided with "specifications" detailing the outcomes which they are expected to demonstrate during the course. After appropriate course work, students have the opportunity to demonstrate their mastery of the specification with a graded assignment. The assignments are then judged on a "pass/fail" bases. For example, a multiple choice quiz might be "passing" if at least 80% of the questions are answered correctly. In this physics course, a force and acceleration problem might require a correct free body diagram, correct algebra, and a correct answer (with appropriate units and significant figures) to be judged</p> |

"passing." If students do not pass on their first attempt, they are allowed to try again several times in order to demonstrate mastery. At no point is "partial credit" awarded. The students' final grades are determined by the number of specifications that they successfully demonstrated by course's end. Dr. Nilson argues that this grading method allows for greater rigor in the classroom: only truly competent work earns credit. It also allows students a greater sense of control over their grade and hence greater motivation. It removes the burden of assigning partial credit for partially correct work. Moreover, by removing points earned for attendance, homework, and unsatisfactory work, the method ensures that students' final grades accurately reflect their mastery of the course objectives.

For this project, the PI will develop a teacher's manual consisting of approximately 30 specifications (or course objectives to be mastered) for the first semester algebra-based physics course. Each specification will include:

1. A reference to the appropriate sections in the free textbook "OpenStax College Physics";
2. A description of the skill that the student is expected to master;
3. Practice problems for homework on in-class work (both original and from the textbook);
4. An example quiz or assignment for the students to use in preparation for assessment; and
5. Additional quizzes or assignments for professors to use while assessing their students.

These materials will be made available under an appropriate creative commons license to supplement the existing textbook. These materials will lower the effort required for other professors to implement specification grading in their algebra-based physics courses.

The results of this project will be presented at the Southern Atlantic Coast Section of the American Association of Physics Teachers meeting, which is held in April each year.

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| <p><b>Timeline</b></p> | <p>Planning – Fall 2017: The PI (Dr. Forringer) will review the ALG-funded materials and resources, including the online textbook for adaptation in his class. From there, he will develop a list of specifications and identify the appropriate chapters and sections from “OpenStax College Physics” for each specification. The PI will meet with professors from other disciplines who have already implemented “specification grading” to develop a plan that conforms to best practices.</p> <p>Preliminary Testing and Development – Spring 2018: The PI will use the adapted online OpenStax textbook and the “specification grading” for one section of Introductory Physics 1 – PHYS1111k during the Spring 2018 semester. During this test-run, he will develop practice problems and assessments for each specification. The PI will gather data to report on improvements in the students’ performance. The PI will also present the preliminary results of implementing specification grading using open educational resources at the regional meeting of the American Association of Physics Teachers (AAPT).</p> <p>Writing – Summer 2018: The PI will collect and organize materials developed during Spring 2018 into a publishable format including handouts for students and materials, which should only be available to professors.</p> <p>Final Implementation – Fall 2018: The PI will use the organized version of the materials in two sections of Introductory Physics 1 – PHYS1111k in the Fall 2018 semester. Final modifications and revisions will be made during this semester. The PI will gather data to report on improvements in the students’ performance, attitude towards this no-cost-to-student project, efficacy of developed materials, and other data requested by ALG.</p> <p>Dissemination - Spring 2019: The PI will share the final results of his project in two annual campus-wide events: (1) the Science Technology and Research Show (STaRS), which is a well-attended event hosted by the School of Science and Technology to showcase the research and classroom work of faculty and students; and the (2) Teaching &amp; Learning Day hosted by the Center for Teaching Excellence, which features poster presentations showcasing faculty research. The PI will sustain the project by continuing to work on revising, updating, and expanding the manual, test bank, and any other ancillary materials produced through the grant.</p> |
| <p><b>Budget</b></p>   | <p>Compensation for one faculty: \$2,000<br/> Funds are requested to compensate the PI’s work related to his research, preparation, online posting, and evaluation of the success of the project.</p> <p>Project Expenses (travel, etc.): \$800<br/> Funds are requested for the PI to travel to the AAPT regional meeting to disseminate the benefits of the ALG grant and the outcomes of the project. No software is required at this time.</p> <p>Total: \$2,800</p>   |