

Affordable Learning Georgia Textbook Transformation Grants

Final Report

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Grant Number: 304

Institution Name(s): Georgia Highlands College

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Project Lead: Sarah Tesar, Allen Easton

Course Name(s) and Course Numbers:

CHEM 1211K Principles of Chemistry I and CHEM 1212K Principles of Chemistry II

Semester Project Began: Spring 2017

Semester(s) of Implementation: Fall 2017

Average Number of Students Per Course Section: 20

Number of Course Sections Affected by Implementation: 14

Total Number of Students Affected by Implementation: 280

1. Narrative

A. Describe the key outcomes, whether positive, negative, or interesting of your project.

The purpose of this project was to transition from the use of the student purchased textbook to the use of free resources in both CHEM 1211K Principles of Chemistry I and CHEM 1212K Principles of Chemistry II. In addition to converting to the OpenStax textbook (available for free), we created a comprehensive set of free materials to supplement the textbook.

We created approximately 70 instructional videos on various chemistry topics. The lecture screencasts are primarily focused on problem solving, while laboratory videos are “how to” videos featuring common laboratory equipment and techniques. We also created chapter checklists that contain an outline of concepts and include important terms, and lecture notes that are a short summary of each chapter.

All materials are published on a GHC LibGuide that is freely available to the public, <http://getlibraryhelp.highlands.edu/c.php?g=722488>. The Lib-Guide is organized into three main sections: CHEM 1211K, CHEM 1212K, and Laboratory. To facilitate navigation of the LibGuide, each course is organized by chapter of the OpenStax textbook. The laboratory page contains information for both courses. Furthermore, instructional videos are available to the public on the GHC Chemistry YouTube channel and all newly created materials are shared on MERLOT.

Transformative Impacts on Instruction & Students and Their Performance

The OpenStax textbook and ancillary materials had a positive impact on instruction. Instructors of record were able to direct students to videos on difficult topics, and create videos during the semester on topics their students were struggling with. The chemistry LibGuide houses all course materials, resources, and relevant links on one website, so the instructor is able to update and share materials easily with students.

We found that some students were more prepared, as they had read the textbook chapter and/or summarized lecture notes before class. These students were highly engaged during lecture periods as evident by increased class participation. Of the students surveyed, 96% of CHEM 1211K and 87% of CHEM 1212K students found the lecture instructional videos at least somewhat helpful, with nearly 50% indicating they were very helpful. While the majority of students had a positive opinion about the OpenStax textbook, only 22% of CHEM 1211K and 23% of CHEM 1212K students reported they used the textbook frequently or all the time. Interestingly, the average course grade in both courses remained constant but the DFW rate decreased by 10%. It is possible that the adoption of a free textbook and access to ancillary materials had a larger impact on those students that may have withdrawn or earned a failing grade in the course, rather than on improving course averages.

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

While the students appreciated the ancillary materials we created, many commented they wanted additional videos covering various concepts. However, we were not able to keep up with student demand because the sheer volume of materials that we created for this project was daunting. In hindsight, we feel it may have been better to have focused first on the course transformations, rather than attempting to create so many different types of supplemental materials simultaneously. We do plan to create additional videos to add to our already extensive library during the Spring 2018 semester.

2. Quotes

"It's important to have open access to textbooks. Science textbooks are among the most expensive, traditional books available, so having a free, reliable resource available to students is a must. Coming from an underprivileged family, I can hardly afford college let alone expensive textbooks, so OpenStax textbooks are definitely a leap in the right direction for me."

"The videos were well thought out and very informative. Having the freedom to rewind and focus on core material is a huge bonus and allows me to grasp concepts better."

"I think the instructional videos are very helpful for a couple of reasons. I know sometimes I find myself trying to keep up with taking down the notes that I'm not fully understanding as I'm writing. Being able to go home later and see a video on it just helps me fully pay attention and understand it clearly. Plus, it never hurts to see more example problems done by the teacher."

3. Quantitative and Qualitative Measures

3a. Overall Measurements

Student Opinion of Materials

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

Total number of students affected in this project: 280

CHEM 1211K: Principles of Chemistry I

- Positive: 70 % of 140 number of respondents
- Neutral: 24 % of 140 number of respondents
- Negative: 6 % of 140 number of respondents

CHEM 1212K: Principles of Chemistry II

- Positive: 60 % of 40 number of respondents
- Neutral: 25 % of 40 number of respondents
- Negative: 15 % of 40 number of respondents

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?

Choose One:

- 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?

Drop/Fail/Withdraw Rate:

CHEM 1211K: Principles of Chemistry I

37.4 % of students, out of a total 227 students affected, dropped/failed/withdrew from the course in the final semester of implementation.

CHEM 1212K: Principles of Chemistry II

28.3 % of students, out of a total 53 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)
- 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)

3b. Narrative

Qualitative data

Surveys distributed to students in CHEM 1211K and CHEM 1212K contained open-ended questions about the free online textbook and the newly created instructional videos. In regards to the text, three themes emerged: (1) the free text was comparable to using a purchased text, (2) the text was easy to access and navigate, and (3) students preferred to have choices regarding the format in which they access the text (print vs. online). Overall, the open-ended questions support the notion of continued use of free or low-cost resources in both courses. In regards to the ancillary materials, three themes emerged: (1) the resources created for each chapter provided helpful alternative explanations to

concepts covered, (2) instructional videos and tutorials were accessed the most, and (3) additional videos should be created. In conclusion, there is sufficient evidence to support the continued use of OERs and the creation of additional ancillary materials.

| Question | Responses reported | % 1211K | % 1212K |
|--|-----------------------------|---------|---------|
| When registering for a course, I am _____ about the cost of textbooks | At least somewhat concerned | 66.4 | 52.5 |
| How frequently did you use the textbook? | Sometimes or more often | 56.4 | 62.5 |
| Reading the textbook was _____? | Average or better | 83.6 | 75.0 |
| In comparison to other college textbooks rate the overall level of quality of the Chemistry OpenStax book was _____? | Somewhat good or better | 93.6 | 85.0 |
| I feel comfortable using web based or online resources for my college classes? | Agree or strongly agree | 78.6 | 75.0 |
| How often did you view the instructional videos associated with the lecture portion of the course? | Sometimes or more often | 87.1 | 7.50 |
| How helpful did you find the instructional videos? | At least somewhat helpful | 95.7 | 87.5 |

Table 1: Summary of quantitative data based on survey questions administered to all sections of CHEM 1211K and CHEM 1212K

Quantitative Data

The use of the open resources we and others have created has been numerically characterized by analyzing various metrics such as homework grades, examinations, final exams, and overall course grades. During the Spring 2017 (pre-transformation) and Fall 2017 (post-transformation) semesters of CHEM 1212K, we saw a 6% overall increase in homework scores from 72% to 78%. We also saw a 6% increase in lecture exam averages and a 9% increase in final exam scores. Overall course averages increased from 69% to 70% and DFW rates fell from 37.4% to 28.3%.

CHEM 1211K did not see as drastic of an increase in grades, but slight increases were observed. Homework grades improved from 75% to 77% and final exam averages increased from 52% to 54%, while lecture exams and overall course averages remained constant. DFW rates for CHEM 1211K decreased from 47.9% to 37.4%.

For both CHEM 1211K and CHEM 1212K we believe that the decrease in DFW rates is particularly encouraging. The number of withdrawals in CHEM 1211K decreased from 27% to 16% and from 18% to 11% in CHEM 1212K, statistics that we interpret as an indication of increasing student success. Although grades remained constant, the fewer withdrawals indicates that more students are successfully completing rather than dropping the course.

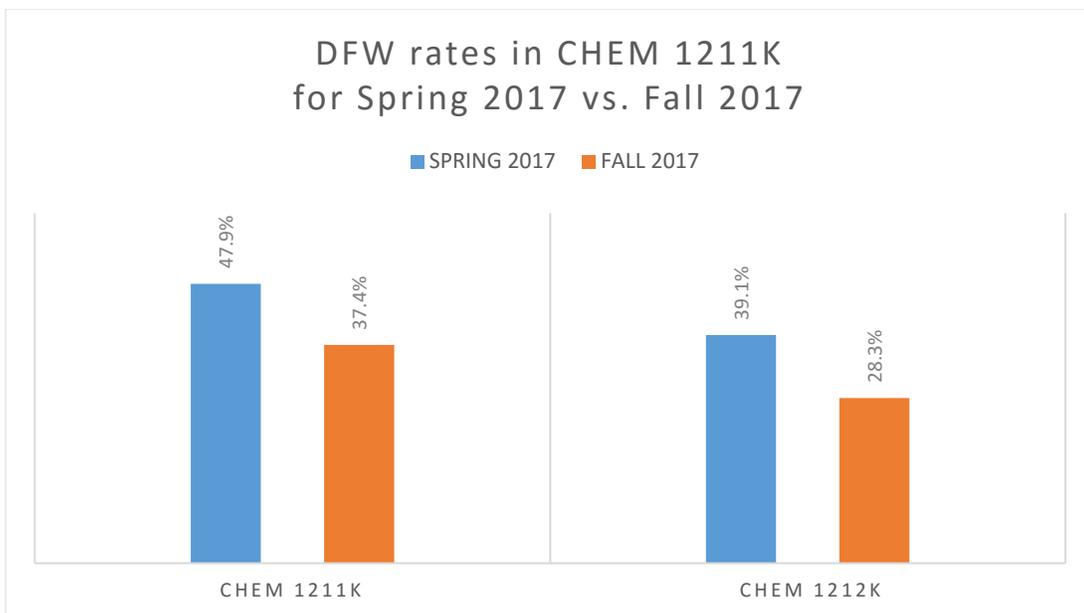


Figure 1: Comparison of DFW rates for CHEM 1211K and CHEM 1212K, Spring 2017-Fall 2017.

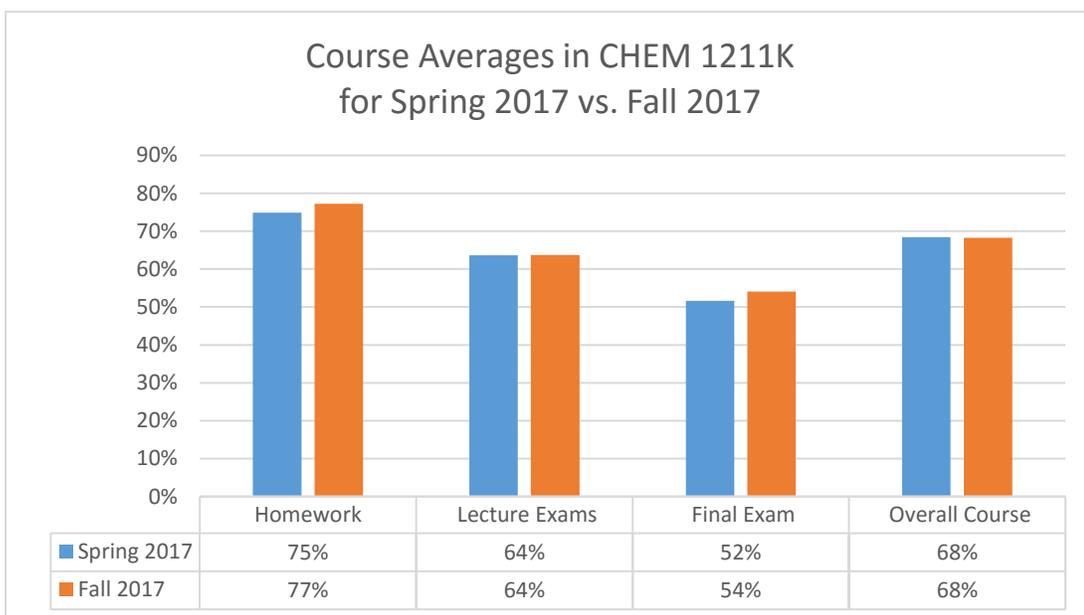


Figure 2: Comparison of course averages for CHEM 1211K, Spring 2017-Fall 2017.

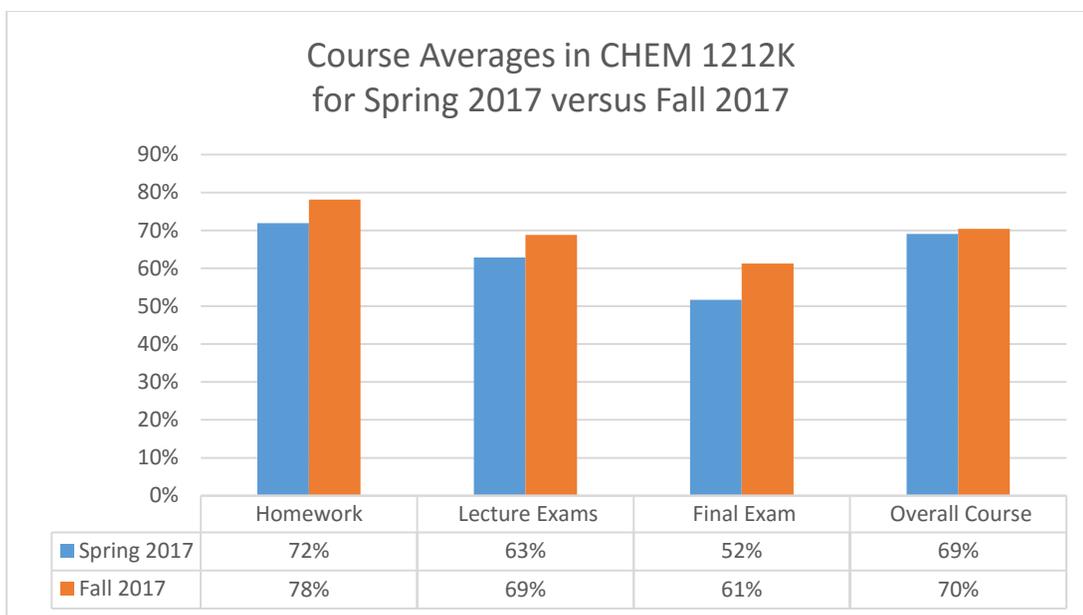


Figure 3: Comparison of course averages for CHEM 1212K, Spring 2017-Fall 2017.

4. Sustainability Plan

The Division of Natural Sciences and Physical Education at Georgia Highlands College is committed to using free or low-cost materials to support effective and affordable learning to students. Therefore, we will continue to use the current OpenStax textbook and create supplementary materials for the LibGuide created for both chemistry courses. Each semester, the chemistry faculty will meet to discuss student outcomes and course structure, as well as update course materials.

5. Future Plans

Using the information collected from the surveys at the end of the semester, more instructional videos will be created to address topics requested by students. Lecture notes will be updated on an as-needed basis. We will continue to create screencast videos to help students with solving chemistry problems, as well as introduce an algebra review to the course curriculum. We plan to apply for an ALG mini-grant to facilitate the creation of additional ancillary materials for both CHEM 1211K and CHEM 1212K. Furthermore, we will discuss transforming other chemistry courses at GHC. We will research the availability of OER's for the Survey of Chemistry sequence, and the feasibility of creating ancillary materials as we did for this project.

6. Description of Photograph

(left-right) Bottom row: Dr. Sarah Tesar, Co-PI, curriculum expert; Erin Kingston, curriculum expert; Top row: Dr. Allen Easton, Co-PI, curriculum expert; Charles Garrison, curriculum expert; Dr. Greg Ford, research support; Joseph Collins, curriculum expert; Sharryse Henderson, administrative and research support; Christin Collins, librarian