Spring 2018

Principles of Chemistry I & II (GHC)

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See next page for additional authors

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Grants Collection
Georgia Highlands College

UNIVERSITY SYSTEM OF GEORGIA

Sarah Tesar, Allen Easton, Erin Kingston, Joseph Collins, Charles Garrison, Sharryse Henderson, Greg Ford, and Christin Collins

Principles of Chemistry I & II

Affordable Learning Georgia

Georgia's Virtual Library GALILEO
An Initiative of the University System of Georgia

Grants Collection

Affordable Learning Georgia Grants Collections are intended to provide faculty with the frameworks to quickly implement or revise the same materials as a Textbook Transformation Grants team, along with the aims and lessons learned from project teams during the implementation process.

Each collection contains the following materials:

- Linked Syllabus
  - The syllabus should provide the framework for both direct implementation of the grant team's selected and created materials and the adaptation/transformation of these materials.
- Initial Proposal
  - The initial proposal describes the grant project's aims in detail.
- Final Report
  - The final report describes the outcomes of the project and any lessons learned.

Initial Proposal

Application Details

Manage Application: ALG Textbook Transformation Grants Round 8

Award Cycle:	Round 8
Internal Submission Deadline:	Sunday, December 11, 2016

Application Title:	304
Application ID:	#001300
Submitter First Name:	Sharryse
Submitter Last Name:	Henderson
Submitter Title:	Professor
Submitter Email Address:	shenders@highlands.edu
Submitter Phone Number:	678-872-8112
Submitter Campus Role:	Other
Applicant First Name:	Sarah
Applicant Last Name:	Tesar
Co-Applicant Name(s):	Dr. Allen Easton
Applicant Email Address:	stesar@highlands.edu
Applicant Phone Number:	678-872-8070
Primary Appointment Title:	Associate Professor of Chemistry
Institution Name(s):	Georgia Highlands College
Submission Date:	Monday, December 12, 2016

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

Allen Easton, Ph.D., Associate Professor of Chemistry, Division of Natural Science and Physical Education, Georgia Highlands College, aeaston@highlands.edu

Sarah Tesar, Ph.D., Assistant Professor of Chemistry, Division of Natural Science and Physical Education, Georgia Highlands College, stesar@highlands.edu

Erin Kingston, Instructor of Chemistry, Division of Natural Science and Physical Education, Georgia Highlands College, ekingston@highlands.edu

Charles Garrison, Laboratory Coordinator, Division of Natural Science and Physical Education, Georgia Highlands College, cgarrison@highlands.edu

Joseph Collins, Laboratory Coordinator, Division of Natural Science and Physical Education, Georgia Highlands College, jcollins@highlands.edu

Christin Collins, Assistant Librarian of Public Services, Paulding Campus Library, Georgia Highlands College, ccollins@highlands.edu

Sharryse Henderson, Professor of Biology and Science Coordinator, Division of Natural Science and Physical Education, Georgia Highlands College, shenders@highlands.edu

Greg Ford, Ph.D., Dean and Associate Professor, Division of Natural Science and Physical Education, Georgia Highlands College

Sponsor, (Name, Title, Department, Institution):

Renva Watterson, Ed.D., Vice President for Academic Affairs, Georgia Highlands College

Proposal Title: 304

Course Names, Course Numbers and Semesters Offered:

CHEM 1211K – Principles of Chemistry I

CHEM 1212K – Principles of Chemistry II

Both courses are required for science majors and are offered in fall, spring, and summer semesters.

Average Number of Students per Course Section:	23
Number of Course Sections Affected by Implementation in Academic Year:	32
Total Number of Students Affected by Implementation in Academic Year:	736

List the original course materials for students (including title, whether optional or required, & cost for each item):	Currently required textbook for both courses: Chemistry, 10th Edition with OWLv2 by Whitten, Davis, Peck, and Stanley, hybrid edition. $238.75CHEM 1211K ONLY: Chemistry 1211L Laboratory Manual: Kennesaw State University. ISBN: 978-1-943712-27-4. Current GHC Bookstore Price: $19.25CHEM 1212K ONLY: Chemistry 1212L Laboratory Manual: Kennesaw State University. ISBN: 978-1-943712-28-1. Current GHC Bookstore Price: $17.50
Requested Amount of Funding:	$29,826
Original per Student Cost:	$275.75
Post-Proposal Projected Student Cost:	$76.00 - $77.00
Projected Per Student Savings:	$180.25
Projected Total Annual Student Savings:	$132,664

Creation and Hosting Platforms Used ("n/a" if none):

Desire2Learn (D2L) by Brightspace will be used to share instructional materials with faculty and students within the division.

Furthermore, the following websites will be used to host and share newly created ancillary materials with the public:
1) MERLOT II
2) GALILEO Open Learning Materials repository
3) OpenStax Community Resource Partnership with OER Creative Commons Agreement

Proposal Category:	OpenStax Textbooks
Final Semester of Instruction:	Fall 2017

Project Goals:

The United State Public Interest Research Group (USPIRG) surveyed college students across the US and concluded that the rising cost of college texts has a direct impact on student enrollment in and progression through college (1). In their report, Fixing the Broken Textbook Market, 65% of those surveyed decided not to purchase a textbook for at least one class and of those students, 94% believed that not purchasing a text would hurt their grade. Nearly half the students surveyed stated that the price of textbooks directly impacted their decision regarding the number and type of courses in which to enroll. Studies have also shown a

correlation between not purchasing textbooks and increased likelihood of failure or withdrawal from courses (2). Furthermore, the Bureau of Labor Statistics reports that the cost of college textbooks has risen three times faster than the rate of inflation in the last 30 years - far outpacing health care expenses and home prices (3). Exacerbating this issue is that fact that only five publishers currently control 85% of the textbook market and the majority of publishers are marketing textbooks to faculty rather than to students who face numerous financial barriers to success in college (4). Obviously, there is a great need to remove the barriers that students face in pursuing higher education particularly in the STEM courses.

To address these barriers to success, our project goals are:

Decrease the financial burden of students enrolled in CHEM 1211K and CHEM 1212K by adopting and incorporating a no-cost textbook published by OpenStax at Rice University.
Increase retention and completion of students at Georgia Highlands College by creating and implementing multimedia instructional screencasts to supplement adopted OER for CHEM 1211K and 1212K.
Increase student access to course materials by offering all course materials in an open format via the course learning management system.
Survey enrolled students and teaching faculty to determine 1) the ease of availability, 2) quality of resources, and 3) helpfulness of OERs in meeting student learning outcomes.
Publish all newly created course materials on open resource websites such as MERLOT II, Galileo Open Learning Materials repository, and OpenStax Community Resource Partnership so that they are readily accessible to the public.

Statement of Transformation:

Georgia Highlands College (GHC) is a limited four-year college in the University System of Georgia that serves more than 6000 students throughout northwest Georgia and northeast Alabama. GHC offers transfer associate degree programs, career associate degree programs, and targeted baccalaureate degree programs. GHC has five campuses that provide instruction which allows for a unique opportunity to develop and implement new teaching materials and pedagogy and compare student data across campuses. This multi-site configuration also provides an opportunity to replicate and expand projects across campuses to prove scalability. Specifically, CHEM 1211K and CHEM 1212K constitute a science sequence that satisfies AREA D core curriculum science requirements in the University System of Georgia and the Technical College System of Georgia. Furthermore, CHEM 1211K/1212K are the recommended in all GHC science pathways maps as first and second semester courses for all STEM majors. Altogether, this chemistry sequence serves about 700-800 students per academic year at GHC.

Mean annual household income in the geographic areas served by GHC is about $61,927 (5). According to the 2014-2015 Georgia Highlands College Fact Book, the average student at GHC is a 23.9 year-old female. Furthermore, approximately 45.4% of GHC students are

eligible for Pell Grant. Many students are non-traditional students who are concurrently working a full-time job in addition to scholarly endeavors (6). Low-cost course materials will increase access to the chemistry courses taught at GHC and should lead to a higher rate of utilization of the resources (7). Currently, the cost of course materials for chemistry sequences at GHC use proprietary textbooks packaged together with online homework solutions at a cost of over $238 each. Furthermore, students lose access to the e-text after 18-24 months. The price of course materials makes the course an unnecessarily expensive barrier to the first year of college rather than a valued entry level science course that builds study skills. The course transformation will save students over $132,000 and provide students with a valuable, peer-reviewed, up-to-date reference at no cost.

This grant will fund the replacement of the current proprietary text with a free text and a lower-cost textbook independent homework system. The course redesign will allow students to save money and have future access a valuable reference, one that they will not feel the need to resell to recover funds. Furthermore, this grant will fund the redesign of course materials to complement the OpenStax Chemistry textbook and also the creation of a series of multimedia instructional videos to accompany the OpenStax Chemistry text. Studies have shown that multimedia resources are productive methods of conveying concepts and ideas (8).

Transformation Action Plan:

The action plan will consist of procuring and adopting an OER followed by evaluation of the OER to determine which materials may need to be adapted and whether new instructional materials need to be created in order to support the OER. After implementation, quantitative and qualitative data will be collected to determine the efficacy of the OER and related materials. The following activities will be conducted during the project:

Approval: Team members will submit a formal proposal to the GHC Institutional Review Board (IRB). Pre and post course surveys will be generated and presented to the IRB for approval prior to administration. Semester updates and a final report will be submitted to the IRB so that the college is fully informed about the progress and impact of this project.

Training: Team members will participate in various forms of training prior to and during implementation of this project. At least two team members will travel to Macon to attend the Kick-Off Meeting. Team members will participate in webinars hosted by USG staff on Galileo Open Learning Materials repository. Team members will receive training from OpenStax staff (if it is the chosen OER). Team members will view archived videos from adaptive and authoring software companies available on the ALG Textbook Transformation website in order to identify appropriate software sources and prepare for the creation of multimedia instructional resources.

Review and Adoption: Open Educational Resources will be identified and pooled for review by the team. Possible sources will include OER's already available through OpenStax, CNX,

Cool4Ed, MERLOT II, Saylor Academy, GALILEO, Lumen Learning, and others. Preference will be given to OpenStax but final decision will be made on the basis of current student learning outcomes for the transformed course(s), applicability in the classroom, and teaching experience of team members.

Evaluation of Selected OER: Once appropriate OER is selected, we will examine how and if these materials can be utilized in both face-to-face and online settings. Materials will then be organized into various areas of specialty and assigned to individual team members for review. Team members will determine if the content area needs to be adapted or if additional resources need to be created.

Adaptation and Creation: Each team member will adapt instructional materials in the content areas to which they are assigned. Any instructional materials found to be lacking, will be created and then evaluated by the team. Team members will create multimedia screencasts for ALL content areas.

Course Syllabi: Master syllabi for each course will be created and made available for faculty and students on D2L. The master syllabi will 1) provide consistency of instruction and assessment in all sections of the course, 2) provide clear instructions on how to access newly created course materials, 3) provide a list of assigned readings and associated deadlines from the OER textbook, and 4) a list of assigned multimedia screencasts and dates of use.

Course Evaluation/Redesign: After use of OER and newly created instructional materials begin, the team will evaluate the effectiveness of the new materials and feasibility for the students. This will include 1) a comparison of grades from when the previous textbook was used and during the incorporation of new materials and 2) distribution of surveys to determine how the students and faculty feel about the implementation and use of the new material. It will also include adjustments in the course material and syllabi, omission of unnecessary material, and creation/adoption of new material where needed.

Publish: At the conclusion of the grant cycle, all materials created as a result of this project will be published for access by the public on a variety of open resource websites. Some of these websites include: MERLOT II, GALILEO Open Learning Materials repository, and OpenStax Community Resource Partnership.

Each of the following team members will play a vital role in implementing the Transformation Action Plan:

Dr. Sarah Tesar: Co-PI and curriculum expert - will administer project from beginning to end, including: identification and adoption of appropriate OERs, development of related course materials, syllabi revision, administration of surveys and data collection, and creation of the final report. Will also oversee the development of multimedia resources.
Dr. Allen Easton: Co-PI and curriculum expert - will administer the project from beginning to

end, including: identification and adoption of appropriate OERs, development of related course materials, syllabus revision, administration of surveys and data collection, and creation of the final report.

Erin Kingston: Curriculum expert - will participate in the development of multimedia resources, work with library faculty to identify, review, select, and adopt appropriate OERs for CHEM 1211K and 1212K, and assist in the creation of surveys.

Charles Garrison: Curriculum expert - chemistry laboratory coordinator; will develop instructional materials necessary for 1211K and 1212K laboratories. Will aid in development of a master course schedule for CHEM 1211K Laboratory.

Joseph Collins: Curriculum expert - will develop instructional materials necessary for 1211K and 1212K laboratories. Will aid in development of a master course schedule for CHEM 1212K Laboratory.

Christin Collins: Library Faculty - will identify, review, and select various OERs for consideration for adoption; will present OERs to faculty.

Sharryse Henderson: Administrative and research support – will submit grant proposal, grant updates, and final grant report. Will work with the GHC Office of Planning, Assessment, Accreditation, and Research to develop and administer student and faculty surveys, data collection, and data analysis.

Dr. Greg Ford: Research support – will submit formal proposal to the GHC Institutional Review Board for approval prior to the administration of student surveys and collection of student data.

Quantitative & Qualitative Measures:	Throughout the length of this project, we will assess the impact of switching from proprietary course materials to OER and no-cost supplemental materials. Both quantitative and qualitative data will be collected. Quantitative measures will include: (1) a comparison of homework assignment, midterm exam, final exam, and overall course grades to previous semesters, (2) comparison of DFW rates (assigned course grade of D, F, or a withdrawal) to previous semesters, (3) comparison of number of students who successfully complete the Principles of Chemistry 2-course sequence at GHC, and (4) comparison of content usage data collected from D2L in transformed course versus non-transformed courses. Qualitative measures will utilize pre- and post- course student surveys to determine (1) frequency of use of OER, (2) ease of use and accessibility, and (3) overall opinion of the OER transformation. Student surveys will also be accessed to determine use and effectiveness of multimedia resources. All data will be compiled, analyzed, and presented in a final project report in the Fall of 2017.

Timeline:

Spring 2017	• Attend required “Kick Off” Meeting • Review and adopt OpenStax textbook or other appropriate OER • Identify topics/concepts that require adaptation and creation of supplemental materials • Grant team members participate in training with OpenStax staff, attend webinar(s) hosted by USG staff on the use of Galileo Open Learning Materials website, and view archived web events offered by adaptive and authoring software companies • Begin to create CHEM 1211K and CHEM 1212K ancillary materials, screencasts, and multimedia instructional resources • Begin to design CHEM 1211K and CHEM 1212K laboratory experiments and schedule to parallel OpenStax textbook

Summer 2017	• Redesign CHEM 1211K and CHEM 1212K course master syllabi for OpenStax textbook • Continue development of CHEM 1211K and CHEM 1212K instructional materials for lecture and laboratory components of the courses • Develop pre and post-course surveys for students and methodology for delivery and analytics • Meet with all full-time and part-time chemistry faculty and laboratory staff to train and prepare for implementation of Openstax textbook and all newly created ancillary materials • Upload newly created course materials into the college's Learning Management System (D2L) for dissemination and delivery to division faculty and students
Fall 2017	• Conduct CHEM 1211K and CHEM 1212K courses using OpenStax textbook and newly created screencasts and instructional materials • Administer student pre and post surveys • Revise and edit instructional screencasts based on student and faculty feedback • Compile and analyze Fall 2017 data at the conclusion of the semester • Generate final report to summarize study findings • Upload newly created instructional materials to MERLOT II, OpenStax CNS, and Galileo Open Learning Materials repository

Budget:

We are requesting grant funding according to the **Large-Scale Transformation** category for department-wide adoption of OER textbook for multiple courses and sections of CHEM 1211K and CHEM 1212K with enrollments of 500 students or more per academic year. The total amount of funding requested to support this project is: **$29,826**

NAME	ROLE/JUSTIFICATION	AMOUNT

Dr. Sarah Tesar	Co-Principal investigator – release time for creation of open resource materials for CHEM 1211K	$5000
Dr. Allen Easton	Co-Principal investigator – release time for creation of open resource materials for CHEM 1212K	$5000
Erin Kingston	Subject matter expert – release time for creation of multimedia resources for both CHEM 1211K and 1212K	$5000
Charles Garrison	Subject matter expert - release time for creation of open resource materials for the CHEM 1211K laboratory	$2500
Joseph Collins	Subject matter expert - release time for creation of open resource materials for the CHEM 1212K laboratory	$2500
Christin Collins	Library Faculty - release time to identify, review, and present OER resources to Chemistry faculty for consideration and adoption; preference will be given to OpenStax	$2500
Sharryse Henderson	Research support - release time to oversee development and dissemination of surveys, data collection, and analysis. Submit grant proposal, routine updates, and final grant report	$2500
Dr. Greg Ford	Research support - generate IRB proposal and present project to the Institutional Review Board for approval before implementation	$2000

Materials and Supplies	(2) iPad Pro 12.9 inch with 128 GB for recording multimedia screencasts - $899 each, (2) Apple Pencil for iPad Pro - $99 each, (1) Adaptive and authoring software license - $30	$2026
Travel	Travel funds for Drs. Tesar and Easton to travel to the ALG Kick-Off Meeting in Macon, GA on January 30, 2017	$800
	GRAND TOTAL	**$29,826**

Sustainability Plan:

Principles of chemistry I (1211K) and II (1212K) will always be offered at GHC, as they are required for science majors, as well as fulfill the lab science Area D requirement for non-science majors. Any course materials created by the funding of this grant will be made freely available under the Creative Commons license for the public to access and use. Course materials will be reviewed annually and any needed updates will be made. Links to online resources will be checked for availability and updated as needed. In addition, we will contribute to the quality of the OpenStax project by continuing to monitor and report any and all errors found in the OpenStax chemistry textbook to the editor-in-chief (David Harris). Once the transformation of CHEM 1211K/1212K is complete, we will explore the possibility of expanding some of the successful changes to CHEM 1151K/1152K, a sequence frequently taken by health science majors that also fulfills the Area D lab science for non-science majors.

GEORGIA HIGHLANDS COLLEGE

FLOYD CAMPUS
3175 Cedartown Highway
Rome, GA 30161

VICE PRESIDENT
FOR ACADEMIC AFFAIRS

September 1, 2016

Dear ALG Grants Committee Members:

I am pleased to write this letter in support of Assistant Professor of Chemistry Sarah Tesar, Associate Professor of Chemistry Allen Easton, Instructor of Chemistry Erin Kingston, and Lab Coordinators Charles Garrison and Joseph Collins, as they seek grant funding to redesign two courses, CHEM 1211K and 1212K, using open educational resources and for the creation of a high-impact video series to accompany those. There are numerous reasons of efficiency, pedagogy, and instructional transformation which compel me to support this initiative.

First, all of the grant proposers will engage in a thoughtful process that will broadly affect the student body at Georgia Highlands College. We expect to offer at least 32 sections of these courses across instructional sites at GHC in AY 2016. With an average 22 students in each section, over 700 students per semester will be advantaged by this effort through the funded grant.

Second, money saved through this plan's implementation will produce enormous savings. Through redirected use of student money spent on $238.75 per book, texts will not be nearly the economic obstacle that we experience today. When we consider that 64% of our students at Georgia Highlands College have family incomes at or below the poverty level, the need is even greater. Research shows us that there are both direct and indirect links to retention, progression and completion when we remove impediments such as this major economic stressor. Clearly, it impacts student success, especially for those students who can't afford the text and forego the learning that only an in-class, usable, supportive text and other high quality instructional materials can provide.

Finally, this affordable learning grant will serve as a catalyst for enhanced teaching and learning. It will serve as a springboard for innovation on the part of faculty and staff who work to make those materials more creative, applied, and relevant in today's chemistry classroom. It will send the message that GHC faculty care about their students, economically, socially and intellectually. It will urge students to persist and to complete in a discipline that too often is a stumbling block to college completion, as it provides one more vehicle to attack the unsettling D-F-W grade rates in this gateway course for all of our science majors, plus pre-nursing and pre-dental hygiene students. With more than 700 declared pre-nursing majors alone, it is unconscionable to not move swiftly in this initiative's direction.

I wholeheartedly endorse this ALG Transformation Grant application from these forward-thinking, action-oriented chemistry faculty and staff. Their plan is noteworthy and laudable. Please allow them to continue their essential work through the approval of the grant.

Sincerely,

Renva Watterson

Renva Watterson, Ed.D.

Affordable Learning Georgia Textbook Transformation Grants

Rounds Six, Seven, and Eight

For Implementations beginning Fall Semester 2016

Running Through Fall Semester 2017

Proposal Form and Narrative

Submitter Name	Sharryse Henderson
Submitter Title	Professor
Submitter Email	shenders@highlands.edu
Submitter Phone Number	678-872-8112
Submitter Campus Role	Other; Science Coordinator
Applicant Name	Sarah Tesar, Ph.D.
Applicant Email	stesar@highlands.edu
Applicant Phone Number	678-872-8070
Primary Appointment Title	Assistant Professor of Chemistry
Institution Name(s)	Georgia Highlands College

Team Members	**Allen Easton, Ph.D., Associate Professor of Chemistry, Division of Natural Science and Physical Education, Georgia Highlands College, aeaston@highlands.edu** **Sarah Tesar, Ph.D., Assistant Professor of Chemistry, Division of Natural Science and Physical Education, Georgia Highlands College, stesar@highlands.edu** **Erin Kingston, Instructor of Chemistry, Division of Natural Science and Physical Education, Georgia Highlands College, ekingston@highlands.edu** **Charles Garrison, Laboratory Coordinator, Division of Natural Science and Physical Education, Georgia Highlands College, cgarrison@highlands.edu** **Joseph Collins, Laboratory Coordinator, Division of Natural Science and Physical Education, Georgia Highlands College, jcollins@highlands.edu** **Christin Collins, Assistant Librarian of Public Services, Paulding Campus Library, Georgia Highlands College, ccollins@highlands.edu** **Sharryse Henderson, Professor of Biology and Science Coordinator, Division of Natural Science and Physical Education, Georgia Highlands College, shenders@highlands.edu** **Greg Ford, Ph.D. Dean and Associate Professor, Division of Natural Science and Physical Education, Georgia Highlands College, gford@highlands.edu**
Sponsor, Title, Department, Institution	**Renva Watterson**, Ed.D., Vice President for Academic Affairs, Georgia Highlands College
Proposal Title	ALG Textbook Transformation Project to Adopt an Open Educational Resource – OpenStax – for Principles of Chemistry I and II (CHEM 1211K and 1212K) at Georgia Highlands College
Course Names, Course Numbers and Semesters	CHEM 1211K – Principles of Chemistry I and CHEM 1212K – Principles of Chemistry II. Both courses are intended for science majors and are offered in fall, spring, and summer semesters. Project will begin Spring 2017 and conclude Fall

Offered	2017				
Final Semester of Instruction	Fall 2017				
Average Number of Students Per Course Section	23	**Number of Course Sections Affected by Implementation in Academic Year**	32	**Total Number of Students Affected by Implementation in Academic Year**	736
Award Category (pick one)	☐ No-or-Low-Cost-to-Students Learning Materials ☒ OpenStax Textbooks ☐ Interactive Course-Authoring Tools and Software ☐ Specific Top 100 Undergraduate Courses				
List the original course materials for students (including title, whether optional or required, & cost for each item)	Currently Required Textbook: Chemistry, 10th Edition with OWLv2 by Whitten, Davis, Peck, and Stanley, hybrid edition. $238.75 CHEM 1211K ONLY: Chemistry 1211L Laboratory Manual: Kennesaw State University. ISBN: 978-1-943712-27-4. Current GHC Bookstore Price: $19.25 CHEM 1212K ONLY: Chemistry 1212L Laboratory Manual: Kennesaw State University. ISBN: 978-1-943712-28-1. Current GHC Bookstore Price: $17.50				
Requested Amount of Funding	$29,826				
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Post-Proposal Projected Per Student Cost	Custom OWLv2 Instant Access for General Chemistry – 180 days, 1st Edition. ISBN: 978-1-305825-29-1. Current GHC Bookstore Price: $58.50				

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Creation and Hosting Platforms Used	Desire2Learn (D2L) by Brightspace will be used to share with faculty within the division and with students Furthermore, the following websites will be used to host and share newly created ancillary materials with the public: 1) MERLOT II 2) GALILEO Open Learning Materials repository 3) OpenStax Community Resource Partnership with OER Commons

NARRATIVE

1.1 PROJECT GOALS

The United State Public Interest Research Group (USPIRG) surveyed college students across the US and concluded that the rising cost of college texts has a direct impact on student enrollment in and progression through college (1). In their report, *Fixing the Broken Textbook Market,* 65% of those surveyed decided not to purchase a textbook for at least one class and of those students, 94% believed that not purchasing a text would hurt their grade. Nearly half the students surveyed stated that the price of textbooks directly impacted their decision regarding the number and type of courses in which to enroll. Studies have also shown a correlation between not purchasing textbooks and increased likelihood of failure or withdrawal from courses (2). Furthermore, the Bureau of Labor Statistics reports that the cost of college textbooks has risen three times faster than the rate of inflation in the last 30 years - far outpacing health care expenses and home prices (3). Exacerbating this issue is that fact that only five publishers currently control 85% of the textbook market and the majority of publishers are marketing textbooks to faculty rather than to students who face numerous financial barriers to success in college (4). Obviously, there is a great need to remove the barriers that students face in pursuing higher education particularly in the STEM courses.

To address these barriers to success, our project goals are:

1. Decrease the financial burden of students enrolled in CHEM 1211K and CHEM 1212K by adopting and incorporating a no-cost textbook published by OpenStax at Rice University.
2. Increase retention and completion of students at Georgia Highlands College by creating and implementing multimedia instructional screencasts to supplement adopted OER for CHEM 1211K and 1212K.
3. Increase student access to course materials by offering all course materials in an open format via the course learning management system.
4. Survey enrolled students and teaching faculty to determine 1) the ease of availability, 2) quality of resources, and 3) helpfulness of OERs in meeting student learning outcomes.
5. Publish all newly created course materials on open resource websites such as MERLOT II, Galileo Open Learning Materials repository, and OpenStax Community Resource Partnership so that they are readily accessible to the public.

1.2 STATEMENT OF TRANSFORMATION

Georgia Highlands College (GHC) is a limited four-year college in the University System of Georgia that serves more than 6000 students throughout northwest Georgia and northeast Alabama. GHC offers transfer associate degree programs, career associate degree programs, and targeted baccalaureate degree programs. GHC has five campuses that provide instruction which allows for a unique opportunity to develop and implement new teaching materials and pedagogy and compare student data across campuses. This multi-site configuration also provides an opportunity to replicate and expand projects across campuses to prove scalability. Specifically, CHEM 1211K and CHEM 1212K constitute a science sequence that satisfies AREA D core curriculum science requirements in the University System of Georgia and the Technical College System of Georgia. Furthermore, CHEM 1211K/1212K are the recommended in all GHC science pathways maps as first and second semester courses for all STEM majors. Altogether, this chemistry sequence serves about 700-800 students per academic year at GHC.

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1.3 TRANSFORMATION ACTION PLAN

The action plan will consist of procuring and adopting an OER followed by evaluation of the OER to determine which materials may need to be adapted and whether new instructional materials need to be created in order to support the OER. After implementation, quantitative and qualitative data will be collected to determine the efficacy of the OER and related materials. The following activities will be conducted during the project:

Approval: Team members will submit a formal proposal to the GHC Institutional Review Board (IRB). Pre and Post course surveys will be generated and presented to the IRB for approval prior to administration. Semester updates and a final report will be submitted to the IRB so that the college is fully informed about the progress and impact of this project.

Training: Team members will participate in various forms of training prior to and during implementation of this project. At least two team members will travel to Macon to attend the Kick-Off Meeting. Team members will participate in webinars hosted by USG staff on Galileo Open Learning Materials repository. Team members will receive training from OpenStax staff (if it is the chosen OER). Team members will view archived videos from adaptive and authoring software companies available on the ALG Textbook Transformation website in order to identify appropriate software sources and prepare for the creation of multimedia instructional resources.

Review and Adoption: Open Educational Resources will be identified and pooled for review by the team. Possible sources will include OER's already available through OpenStax, CNX, Cool4Ed, Merlot, Saylor Academy, GALILEO, Lumen Learning, and others. Preference will be given to OpenStax but final decision will be made on the basis of current student learning outcomes for the transformed course(s), applicability in the classroom, and teaching experience of team members.

Evaluation of Selected OER: Once appropriate OER is selected, we will examine how and if these materials can be utilized in both face-to-face and online settings. Materials will then be organized into various areas of specialty and assigned to individual team members for review. Team members will determine if the content area needs to be adapted or if additional resources need to be created.

Adaptation and Creation: Each team member will adapt instructional materials in the content areas to which they are assigned. Any instructional materials found to be lacking, will be created and then evaluated by the team. Team members will create multimedia screencasts for ALL content areas.

Course Syllabi: Master syllabi for each course will be created and made available for faculty and students on D2L. The master syllabi will 1) provide consistency of instruction and assessment in all sections of the course, 2) provide clear instructions on how to access newly created course materials, 3) provide a list of assigned readings and

associated deadlines from the OER textbook, and 4) a list of assigned multimedia screencasts and dates of use.

Course Evaluation/Redesign: After use of OER and newly created instructional materials begin, the team will evaluate the effectiveness of the new materials and feasibility for the students. This will include 1) a comparison of grades from when the previous textbook was used and during the incorporation of new materials and 2) distribution of surveys to determine how the students and faculty feel about the implementation and use of the new material. It will also include adjustments in the course material and syllabi, omission of unnecessary material, and creation/adoption of new material where needed.

Publish: At the conclusion of the grant cycle, all materials created as a result of this project will be published for access by the public on a variety of open resource websites. Some of these websites include: MERLOT II, Galileo Open Learning Materials repository, and OpenStax Community Resource Partnership.

Each of the following team members will take an active role in implementing the Transformation Action Plan:

- **Dr. Sarah Tesar**: Co-PI and curriculum expert - will administer project from beginning to end, including: identification and adoption of appropriate OERs, development of related course materials, syllabi revision, administration of surveys and data collection, and creation of the final report. Will also oversee the development of multimedia resources.
- **Dr. Allen Easton**: Co-PI and curriculum expert - will administer the project from beginning to end, including: identification and adoption of appropriate OERs, development of related course materials, syllabus revision, administration of surveys and data collection, and creation of the final report.
- **Erin Kingston**: Curriculum expert - will participate in the development of multimedia resources, work with library faculty to identify, review, select, and adopt appropriate OERs for CHEM 1211K and 1212K, and assist in the creation of surveys.
- **Charles Garrison**: Curriculum expert - chemistry laboratory coordinator; will develop instructional materials necessary for 1211K and 1212K laboratories. Will aid in development of a master course schedule for CHEM 1211K Laboratory.
- **Joseph Collins**: Curriculum expert - will develop instructional materials necessary for 1211K and 1212K laboratories. Will aid in development of a master course schedule for CHEM 1212K Laboratory.
- **Christin Collins**: Library Faculty - will identify, review, and select various OERs for consideration for adoption; will present OERs to faculty.
- **Sharryse Henderson**: Administrative and research support – will submit grant proposal, grant updates, and final grant report. Will work with the GHC Office of Planning, Assessment, Accreditation, and Research to develop and administer student and faculty surveys, data collection, and data analysis.

- **Dr. Greg Ford**: Research support – will submit formal proposal to the GHC Institutional Review Board for approval prior to the administration of student surveys and collection of student data.

1.4 QUANTITATIVE AND QUALITATIVE MEASURES

Throughout the length of this project, we will assess the impact of switching from proprietary course materials to OER and no-cost supplemental materials. Both quantitative and qualitative data will be collected. Quantitative measures will include: (1) a comparison of homework assignment, midterm exam, final exam, and overall course grades to previous semesters, (2) comparison of DFW rates (assigned course grade of D, F, or a withdrawal) to previous semesters, (3) comparison of number of students who successfully complete the Principles of Chemistry 2-course sequence at GHC, and (4) comparison of content usage data collected from D2L in transformed course versus non-transformed courses. Qualitative measures will utilize pre- and post- course student surveys to determine (1) frequency of use of OER, (2) ease of use and accessibility, and (3) overall opinion of the OER transformation. Student surveys will also be accessed to determine use and effectiveness of multimedia resources. All data will be compiled, analyzed, and presented in a final project report in the Fall of 2017.

1.5 TIMELINE

Spring 2017	• Attend required “Kick Off” Meeting • Review and adopt OpenStax textbook or other appropriate OER • Identify topics/concepts that require adaptation and creation of supplemental materials • Grant team members participate in training with OpenStax staff, attend webinar(s) hosted by USG staff on the use of Galileo Open Learning Materials website, and view archived web events offered by adaptive and authoring software companies • Begin to create CHEM 1211K and CHEM 1212K ancillary materials, screencasts, and multimedia instructional resources • Begin to design CHEM 1211K and CHEM 1212K laboratory experiments and schedule to parallel OpenStax textbook
Summer 2017	• Redesign CHEM 1211K and CHEM 1212K course master syllabi for OpenStax textbook • Continue development of CHEM 1211K and CHEM 1212K instructional materials for lecture and laboratory components of the courses • Develop pre and post-course surveys for students and methodology for delivery and analytics • Meet with all full-time and part-time chemistry faculty and laboratory staff to train and prepare for implementation of Openstax textbook and all newly created ancillary materials • Upload newly created course materials into the college’s Learning Management System (D2L) for dissemination and delivery to division faculty and students
Fall 2017	• Conduct CHEM 1211K and CHEM 1212K courses using OpenStax textbook and newly created screencasts and instructional materials • Administer student pre and post surveys • Revise and edit instructional screencasts based on student and faculty feedback • Compile and analyze Fall 2017 data at the conclusion of the semester • Generate final report to summarize study findings • Upload newly created instructional materials to MERLOT II, OpenStax CNS, and Galileo Open Learning Materials repository

1.6 BUDGET

We are requesting grant funding according to the **Large-Scale Transformation** category for department-wide adoption of OER textbook for multiple courses and sections of CHEM 1211K and CHEM 1212K with enrollments of 500 students or more per academic year. The total amount of funding requested to support this project is: **$29,826**

NAME	ROLE/JUSTIFICATION	AMOUNT
Dr. Sarah Tesar	Co-Principal investigator – release time for creation of open resource materials for CHEM 1211K	$5000
Dr. Allen Easton	Co-Principal investigator – release time for creation of open resource materials for CHEM 1212K	$5000
Ms. Erin Kingston	Subject matter expert – release time for creation of multimedia resources for both CHEM 1211K and CHEM 1212K	$5000
Charles Garrison	Subject matter expert – creation of open resource material for the CHEM 1211K laboratory	$2500
Joseph Collins	Subject matter expert – creation of open resource materials for the CHEM 1212K laboratory	$2500
Ms. Christin Collins	Library faculty – release time to identify, review, and present OER resources to Chemistry faculty for consideration and adoption; preference will be given to OpenStax	$2500
Ms. Sharryse Henderson	Research support – release time to oversee development and dissemination of surveys, data collection, and analysis. Submit grant proposal, routine updates, and final grant report	$2500
Dr. Greg Ford	Research support – release time to generate IRB proposal and present project to the Institutional Review Board for approval before implementation	$2000
Materials and Supplies	(2) iPad Pro 12.9 inch with 128 GB for recording multimedia screencasts - $899 each (2) Apple Pencil for iPad Pro - $99 each (1) Adaptive and authoring software license - $30	$2026

Travel	Travel funds for Drs. Tesar and Easton to travel to the ALG Kick-Off Meeting in Macon GA on January 30, 2017	$800
	GRAND TOTAL	**$29,826**

1.7 SUSTAINABILITY PLAN

Principles of chemistry I (1211K) and II (1212K) will always be offered at GHC, as they are required for science majors and fulfill the lab science Area D requirement for non-science majors. Any course materials generated by funding from this grant will be made freely available under the Creative Commons license for the public to access and use. Course materials will be reviewed annually and any needed updates will be made. Links to online resources will be checked for availability and updated as needed. In addition, we will contribute to the quality of the OpenStax project by continuing to monitor and report any and all errors found in the OpenStax chemistry textbook to the editor-in-chief (David Harris). Once the transformation of CHEM 1211K/1212K is complete, we will explore the possibility of expanding some of the successful changes to CHEM 1151K/1152K, a sequence frequently taken by health science majors that also fulfills the Area D lab science for non-science majors.

1.8 REFERENCES & ATTACHMENTS

1. United States Public Interest Research Group. 2014. Available at: http://www.uspirg.org/sites/pirg/files/reports/NATIONAL%20Fixing%20Broken%20Textbooks%20Report1.pdf

2. Florida Distance Learning Consortium. September, 2011. Florida Student Textbook Survey. Tallahassee, FL. Available at: http://www.openaccesstextbooks.org/projectInfo.html

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5. United States Census Bureau – American Community Survey. 2015. Available at: https://factfinder.census.gov/bkmk/navigation/1.0/en/d_dataset:ACS_15_5YR/d_product_type:DATA_PROFILE/

6. Georgia Highlands College Fact Book: Academic Year 2014-2015. Available at: https://www.highlands.edu/inc/files/userfiles/31-cbac5ca5b0647bc-2014-2015GHCFactBook-DRAFTwithhyperlinks.pdf

7. B.L. Lindshield and K. Adhikari, 2013, Online and Campus College Students Like Using an Open Educational Resource Instead of a Traditional Textbook MERLOT Journal of Online Learning and Teaching, 9(1), 26 – 38.

8. Digital video technologies enhancing learning for pupils at risk and those who are hard to reach. / Passey, Don. DIVERSE proceedings: 2005 & 2006: 5th International DIVERSE Conference, 5th-7th July 2005, Vanderbilt University, Nashville, USA, 6th International DIVERSE Conference, 5th-7th July 2006, Glasgow Caledonian University, Glasgow, UK. ed. / M. Childs; M. Cuttle; K. Riley. Glasgow: Glasgow Caledonian University Press, 2006. p. 156-168.

Syllabus

CHEM 1211K: Principles of Chemistry I – Course Outline

Week	Topics	LibGuide Lecture http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5274479	LibGuide Laboratory http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5274596
1	Measurements, Significant Figures	OpenStax Ch. 1, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5183264 Assignment: OWL Math Review Homework	
2	Dimensional Analysis, Atomic Structure, Periodic Table	Assignment: OWL Ch. 1 Homework OpenStax Ch. 2, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5183348	Significant Figures & Scientific Notation
3	Chemical Formulas, Nomenclature, Chemical Composition	Assignment: OWL Ch. 2 Homework OpenStax Ch. 3, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5310974	Nomenclature
4	Moles, Solutions	Assignment: OWL Ch. 3 Homework	Laboratory Measurements
5	Reaction Stoichiometry, Limiting Reagents	OpenStax Ch. 4, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5310975	Determination of Ionic Compound Formula
6	Chemical Reactions	Assignment: OWL Ch. 4A	
7	Chemical Reactions, cont.	Assignment: OWL Ch. 4B	Chemical Reactions
8	Review and Midterm exam		
9	Thermochemistry	OpenStax Ch. 5, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5310976	Acid-Base Titration and Analysis of Vinegar
10	Gases	Assignment: OWL Ch. 5	

		OpenStax Ch. 9, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5310980	
11		Assignment: OWL Ch. 9 HW	Ideal Gas Law
12	Electronic Structure and Periodic Properties	OpenStax Ch. 6, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5310977	Enthalpy of Dissolution and Neutralization, Enthalpy of Formation
13	Chemical Bonding and Molecular Geometry	Assignment: OWL Ch. 6 HW OpenStax Ch. 7, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5310978	Chemical Bonding and Structure
14	Advanced Theories of Covalent Bonding	OpenStax Ch. 8, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5310979	
15	Review, Catch-up	Assignment: OWL Ch. 7/8	
16	Final Exam		

CHEM 1212K: Principles of Chemistry II – Course Outline

Week	Topics	LibGuide Lecture http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5274505	LibGuide Laboratory http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5274596
1	CHEM I Review, Intermolecular Forces	Assignment: OWL Math Review Homework OpenStax Ch. 10, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5311154	
2	Properties of Liquids, Phase transitions, Solutions	Assignment: OWL Ch. 10 Homework OpenStax Ch. 11, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5310836	
3	Colligative Properties	Assignment: OWL Ch. 11 Homework	Introductory Lab - Graphing
4	Chemical Kinetics	OpenStax Ch. 12, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5274506	Lewis Structures, Polarity, and Chromatography
5	Chemical Kinetics, cont.	Assignment: OWL Ch. 12 Homework	Freezing Point Depression
6	Chemical Equilibirum	OpenStax Ch. 13, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5274549	Absorption vs. Concentration
7	Chemical Equilibrium, cont.	Assignment: OWL Ch. 13 Homework	Rates of Chemical Reactions
8	Review and Midterm exam		Chemical Equilibrium – LeChatelier's Principle
9	Acid-Base Chemistry	OpenStax Ch. 14, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5274594	Determination of an Equilibrium Constant, Keq
10	Acid-Base Equilibria	Assignment: OWL Ch. 14A Homework	

11	Buffers, Titration	Assignment: OWL Ch. 14B Homework	Buffers
12	Ionic Equilibria, Solubility	OpenStax Ch. 15, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5311139 Assignment: OWL Ch. 15 HW	Determination of the Ka for a Weak Acid
13	Thermodynamics	OpenStax Ch. 16, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5311144 Assignment: OWL Ch. 16 Homework	Vapor Pressure of Water
14	Electrochemistry	OpenStax Ch. 17, lecture notes, chapter checklist, videos http://getlibraryhelp.highlands.edu/c.php?g=722488&p=5311146	Electrochemistry
15	Review, Catch-up	Assignment: OWL Ch. 17 homework	
16	Final Exam		

Final Report

Affordable Learning Georgia Textbook Transformation Grants

Final Report

Date: 12/20/2017

Grant Number: 304

Institution Name(s): Georgia Highlands College

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

- Sarah Tesar, Ph.D., Associate Professor of Chemistry, Division of Natural Science and Physical Education, stesar@highlands.edu
- Allen Easton, Ph.D., Associate Professor of Chemistry, Division of Natural Science and Physical Education, aeaston@highlands.edu
- Erin Kingston, Instructor of Chemistry, Division of Natural Sciences and Physical Education, ekingsto@highlands.edu
- Joseph Collins, Laboratory Coordinator, Division of Natural Sciences and Physical Education, jcollins@highlands.edu
- Charles Garrison, Laboratory Coordinator, Division of Natural Sciences and Physical Education, cgarriso@highlands.edu
- Sharryse Henderson, Professor of Biology, Division of Natural Sciences and Physical Education, shenders@highlands.edu
- Greg Ford, Ph.D., Dean, Division of Natural Sciences and Physical Education, gford@highlands.edu
- Christin Collins, Librarian, ccollins@highlands.edu

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)
- _x_ 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:

- __x_ 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 an 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 rom 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.

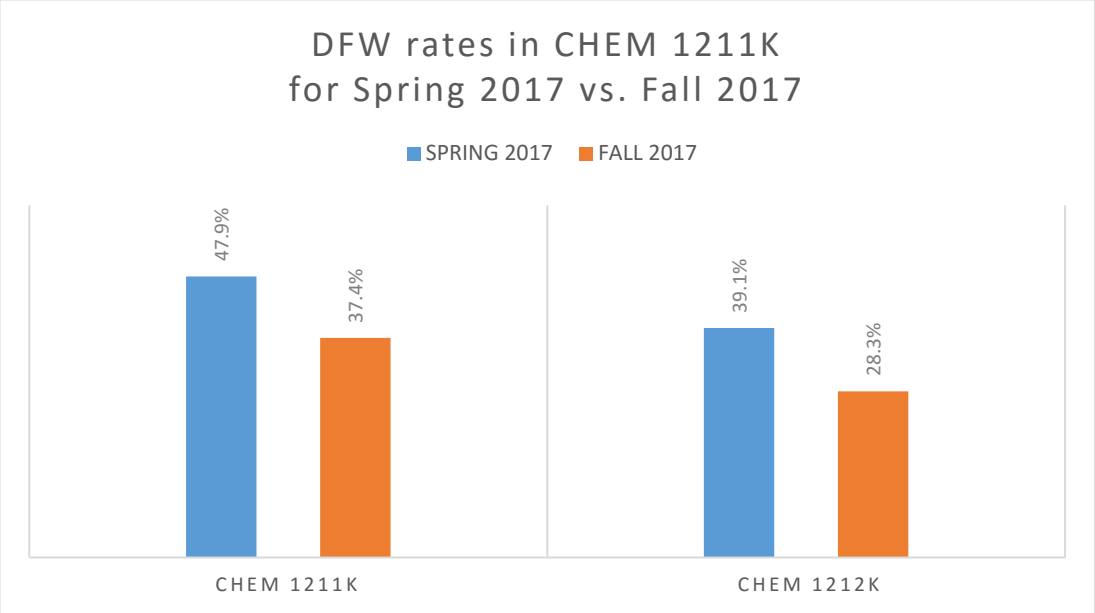
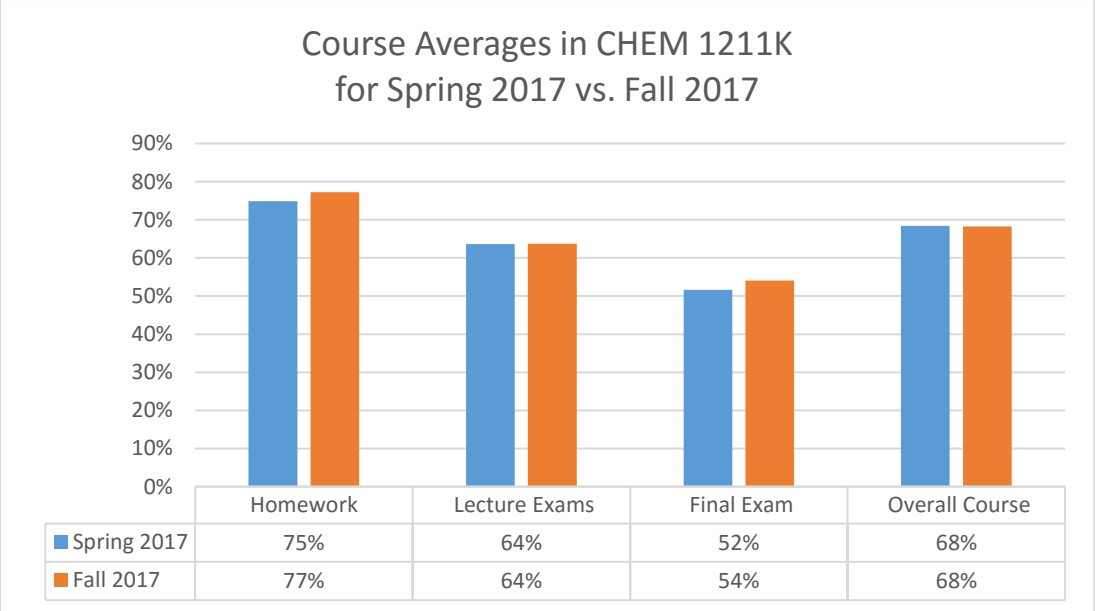


Figure 1: Comparison of DFW rates for CHEM 1211K and CHEM 1212K, Spring 2017-Fall 2017.



	Homework	Lecture Exams	Final Exam	Overall Course
Spring 2017	75%	64%	52%	68%
Fall 2017	77%	64%	54%	68%

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

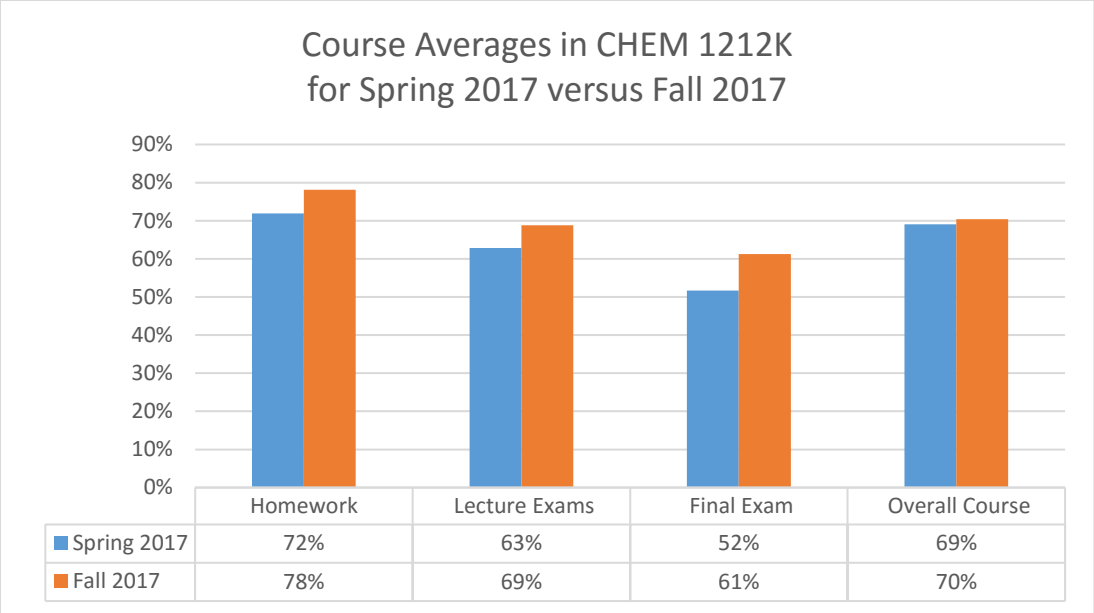


Figure 3: Comparison of course averages for CHEM 1212K, Spring 2017-Fall 2017.

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