

# Affordable Learning Georgia Affordable Materials Grants Transformation Grants Final Report

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

Once you have completed this template, to submit your Final Report, go to the [Final Report submission form](#).

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

- This completed narrative document (required)
- Syllabus or syllabi (required)  
*If multiple files, compress into one .zip folder*
- Qualitative/Quantitative Measures data files (optional, as needed)  
*If multiple files, compress into one .zip folder*
- Photo of your team or a class of your students for future ALG promotions (optional)
- Invoice for the second half of the grant's award amount (optional)

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

## General Information

**Date:** March 2021-May 2022

**Grant Round:** Round 19

**Grant Number:** Proposal #565

**Institution Name(s):** Georgia Gwinnett College

**Project Lead:** Gillian E. A. Rudd

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

Gillian E. A. Rudd	Professor of Chemistry	Chem. Dept.	<a href="mailto:grudd@ggc.edu">grudd@ggc.edu</a>
Charmita Burch	Assistant Professor of Chemistry	Chem. Dept.	<a href="mailto:cburch@ggc.edu">cburch@ggc.edu</a>
Julia E. Paredes	Professor of Chemistry	Chem. Dept.	<a href="mailto:jbarker@ggc.edu">jbarker@ggc.edu</a>
Richard Pennington	Professor of Chemistry	Chem. Dept.	<a href="mailto:rpenning@ggc.edu">rpenning@ggc.edu</a>
Candace Timpote	Professor of Biology	Biol. Dept.	<a href="mailto:ctimpote@ggc.edu">ctimpote@ggc.edu</a>

**Course Name(s) and Course Numbers:** CHEM1152K Survey of Chemistry II with Lab

**Semester Project Began:** Fall 2021

**Final Semester of Implementation:** Fall 2022

**Total Number of Students Affected During Project:** 366 students so far (including summer "control" students).

## 1. Narrative

- A. Describe the key outcomes, whether positive, negative, or interesting, of your project. Include:
- Summary of your transformation experience, including challenges and accomplishments

### Project Goals

1. **Develop new laboratory supplementary materials in line with course goals, including more biochemistry content in CHEM1152K for both in-person and online laboratory sections.**
2. **Deploy final products across all sections in fall 2021 and revise as needed per student comments. This will effectively reduce costs for GGC students. Final products will also be published to open educational resource sites, including ALG and the GALILEO Open Learning Materials repository**
3. **Increase student performance on a concept inventory (Brown) relevant to GOB course topics that indicate readiness for Allied Health professional school.**

Brown, C., Hyslop, R. and Barbera, J., 2014. Development and analysis of an instrument to assess student understanding of GOB chemistry knowledge relevant to clinical nursing practice. *Biochemistry and Molecular Biology Education*, 43(1), pp.13-19.

***In Support of Goal 1: Develop new laboratory supplementary materials in line with course goals, including more biochemistry content in CHEM1152K for both in-person and online laboratory sections.***

This proposal allowed for the development of low-cost, in-house laboratory exercises and supplemental materials for CHEM1152K, Survey of Chemistry II with Lab, to replace the previously used CHEM1152K Pearson custom laboratory manual. These new labs include aspects of organic and biochemistry concepts. Specifically, the lecture structure of the course has shifted to decrease the organic chemistry as an introduction and include a more intensive exploration of biochemical processes, including metabolism. Lab videos have been created to support the fully online labs.

***In Support of Goal 2: Deploy final products across all sections in Fall 2021 and Spring 2022 and revise as needed per student comments. This will effectively reduce costs for GGC students. Final products will also be published to open educational resource sites, including ALG and the GALILEO Open Learning Materials repository***

The laboratory manual is used and made available, for both all in-person and online laboratory sections. Therefore, use of the laboratory documents exclusively in this course has saved students money while increasing their working knowledge of biochemical processes.

CHEM1152K students have answered our qualitative evaluation questions posed both pre and post lab (beginning and end of each semester), as well as the quantitative pre and post set of multiple-choice questions. Feedback from this analysis has been used to improve the in-house labs and supplemental materials.

Materials for our open-source laboratory text, in both its in-person and online format, is 508 compliant and available for other institutions who wish to reference our experiments through OpenALG. We will also consider posting the labs on Research Gate, a site often used by other science professors, and on the GALILEO Open Learning Materials repository site.

***In Support of Goal 3: Increase student performance on a concept inventory (Brown) relevant to GOB course topics that indicate readiness for Allied Health professional school.***

We have built laboratory skills that support biology and allied health courses where students typically enroll after completing this course. As a result, labs focusing on biochemical concepts have been developed which incorporate equipment and procedures more often seen in a biochemistry lab. For example, students now develop a protein standard curve and explore enzyme kinetics. Students have acquired certain laboratory skills. These include working with micropipettes, using microcentrifuges and spectrophotometers.

- *Transformative impacts on your instruction*

All the labs developed for CHEM1152K under the ALG grant have adaptations that can be used for online and hybrid courses. Additionally, the labs are stored on Desire 2 Learn in a course specific folder for all faculty who will be teaching this course and it provides labs at no cost to students.

- *Transformative impacts on your students and their performance*

These changes have positively impacted students financially while providing better preparation for admission and success in Allied Health professional schools by increasing the biochemistry content of the course.

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

N/A. All outcome goals were achieved, and nothing would be done differently.

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

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Text to go on if website:

`<a rel="license" href="http://creativecommons.org/licenses/by/4.0/"></a><br />This work is licensed under a <a rel="license" href="http://creativecommons.org/licenses/by/4.0/">Creative Commons Attribution 4.0 International License</a>.`

## 2. Quotes

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

“My favorite topic in the lab was kinetics. This is my 2<sup>nd</sup> time taking this course because I needed to retake it since it expired. When I took the class the last time, I don’t remember learning so in depth about metabolism, and I am glad I was able to experience a new challenge and learn new topics before my journey in GGC’s nursing program.”

“My favorite labs were anything to do with biochemistry and, using the organic model sets to figure out carbons and hydrogens. I loved the hands-on experience, and it was fun! It was my favorite thing about chem!”

“My favorite topic in the class was surprisingly the beginning, when the focus was organic chemistry, specifically learning about alkanes, functional groups, and building them. It was very satisfying looking at a problem in lab and being totally stumped by it, but then breaking down the different functional groups, chains, and branches by building them and gaining a clear understanding. I definitely gained a lot of confidence moving forward in science. Thank you!”

### 3. Quantitative and Qualitative Measures

#### A. Uniform Measurements Questions

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

##### **Student Opinion of Materials**

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

Total number of students affected in this project: 366 (including summer 2021 as control) took the pre-tests. Summer 2021 was used as a control before the new labs were put into place for the start of Fall 2021. Data was taken from Question #5 of the Qualtrics attitudinal survey for this analysis (attached as Excel file Q5 Qualtrics analysis, sheets 1 and 2).

- Positive: 75.7 % (taken from combined Fall 2021 and Spring 2022 who strongly agree/agree) of 269 post-test number of respondents. Compared with 49.2% (taken from summer 2021 who strongly agree/agree) of 21 post-test number of respondents.
- Negative: 24.3% (taken from combined Fall 2021 and Spring 2022 who strongly disagree/disagree) of 269 post-test number of respondents. Compared with 50.8% (taken from summer 2021 who strongly disagree/disagree) of 21 post-test number of respondents.

**Conclusion:** The overall student opinion of the new lab materials was 26.5% higher than when the regular publishers' labs were used in Summer 2021.

## Student Learning Outcomes and Grades

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

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

- Positive: Higher performance outcomes were measured over previous semester(s)

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

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

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

Here is the summative data for before the introduction of ALG new materials in AY 2021-2021, versus the use of new ALG lab materials in AY 2021-2022.

### Summary AY 2020-2021

Eighteen sections of CHEM1152K GOB II taught. 366 students were enrolled after the add/drop, overall grades were 97A, 116B, 40C, 30D, 32F, 7FN. Fifty-seven students withdrew. Overall, 75.4% that stayed in the course after add/drop, passed with a C grade or better. The average D/F/FN/W was 35%.

### Summary AY 2021-2022

Twenty sections of CHEM1152K GOB II were taught. 392 students were enrolled after the add/drop, overall grades were 106A, 127B, 64C, 30D, 25F, 4FN and 1I. Thirty-seven students withdrew. Overall, 83.2% that stayed in the course after add/drop, passed with a C grade or better. The average D/F/FN/W was 24.4%.

#### Fall 2020

Eight sections of CHEM1152k GOB II were taught; one met for the evening session. 168 students were enrolled, overall grades were 34A, 43B, 19C, 16D, 19F, and 3FN. Thirty-four students withdrew. Overall, 71.6% that stayed in the course, passed with a C grade or better. The D/F/FN/W 43%.

#### Spring 2021

Ten sections of CHEM1152k GOB II were taught; one met for the evening session. 198 students were enrolled after the add/drop, overall grades were 63A, 73B, 21C, 14D, 13F, and 4FN. Twenty-three students withdrew. Overall, 79.2% that stayed in the course after add/drop, passed with a C grade or better. The D/F/FN/W was 27%.

#### Fall 2021

Eight sections of CHEM1152k GOB II were taught. 159 students were enrolled after the add/drop, overall grades were 46A, 49B, 24C, 12D, 10F, 1FN and 1I. Sixteen students withdrew. Overall, 83.2% that stayed in the course after add/drop, passed with a C grade or better. The D/F/FN/W was 24.5%.

#### Spring 2022

Twelve sections of CHEM1152k GOB II were taught (two of these were online). Two hundred and thirty-five students were enrolled after the add/drop, overall grades were 60A, 78B, 40C, 18D, 15F, 3FN and 0I. Twenty-one students withdrew. Overall, 83.2% that stayed in the course after add/drop, passed with a C grade or better. The D/F/FN/W was 24.3%.

Summary for final semester of implementation:

24.3% of students, out of a total 235 students affected, dropped/failed/withdrew from the course in the final semester of implementation.

- Positive: This is a lower percentage of students with D/F/W than previous semester(s)

## B. Measures Narrative

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

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

- *Include measures such as:*
  - *Average GPA: not known*
  - *Pre- and post-transformation DFW comparison and course retention and completion rates*

### Summary AY 2020-2021

Eighteen sections of CHEM1152K GOB II taught. 366 students were enrolled after the add/drop, overall grades were 97A, 116B, 40C, 30D, 32F, 7FN. Fifty-seven students withdrew. Overall, 75.4% that stayed in the course after add/drop, passed with a C grade or better.

### Summary AY 2021-2022

Twenty sections of CHEM1152K GOB II were taught. 392 students were enrolled after the add/drop, overall grades were 106A, 127B, 64C, 30D, 25F, 4FN and 1I. Thirty-seven students withdrew. Overall, 83.2% that stayed in the course after add/drop, passed with a C grade or better. The average D/F/FN/W was 24.4%.

- *Student success in learning outcomes*

**Quantitative Assessment** for Fall 2021 obtained from D2L pre and post survey

*(with Spring 2021 comparison in italics)*

Course outcome goals (#1-6)	Pre % average	Post % average	Percentage difference	Percentage achieved
1. Apply the concepts of bonding, stereochemistry, and 3-dimensional arrangement of atoms in molecules and their resulting influence on molecular properties.	38.57% (Q14) 23.57% (Q30)	35.29% (Q14) 46.22% (Q30)	-3.28 +22.65 OA average +9.69%	66.9 <i>Spring 2021</i>

<i>Conceptual pre and post Q's 14 and 30 from pre and post D2L survey</i>				
2. Apply the fundamental language and nomenclature of organic chemistry and biochemistry. <i>Conceptual pre and post Q's 19 and 23 from pre and post D2L survey</i>	29.29% (Q19) 22.14% (Q23)	45.38% (Q19) 36.97% (Q23)	+16.09 +14.83 OA average +15.46%	<i>71.2 Spring 2021</i>
3. Describe, predict, and apply fundamental organic chemistry and biochemistry mechanisms, reactions, and processes. <i>Conceptual pre and post Q's 29, 36 and 45 from pre and post D2L survey</i>	39.29% (Q45) 30% (Q36) 29.29% (Q29)	54.62% (Q45) 47.06% (Q36) 36.13% (Q29)	+15.33 +17.06 +6.80 OA average +13.06%	<i>70.2 Spring 2021</i>
4. Describe and apply fundamental concepts of organic chemistry to the structure and function of biologically relevant molecules and processes. <i>Conceptual pre and post Q's 26, 34 and 41 from pre and post D2L survey</i>	37.14% (Q26) 35.71% (Q34) 25.71% (Q41)	57.99 (Q26) 38.66 (Q34) 37.82 (Q41)	+20.85 +2.95 +12.11 OA average +11.97%	<i>67.9 Spring 2021</i>
5. Effectively and clearly communicate scientific information in written and oral form. <i>Obtained from average lab %</i>				89.3 Fall 2021 <i>91.2 Spring 2021</i>
6. Collect, present, and analyze scientific data gathered through experiment. <i>Obtained from average lab %</i>				89.3 Fall 2021 <i>91.2 Spring 2021</i>

**Quantitative Assessment** for Spring 2022 obtained from D2L pre and post survey

*(with Fall 2021 comparison in italics)*

Course outcome goals (#1-6)	Pre % average Spring 2022	Post % average Spring 2022	Percentage difference Spring 2022	Percentage difference from Fall 2021	Percentage achieved Spring 2022
7. Apply the concepts of bonding, stereochemistry,	26.94% (Q14) 30.05% (Q30)	38.96% (Q14) 35.06% (Q30)	+12.02 +5.01 OA average +8.52%		

and 3-dimensional arrangement of atoms in molecules and their resulting influence on molecular properties. <i>Conceptual pre and post Q's 14 and 30</i>				OA average +9.69%	
8. Apply the fundamental language and nomenclature of organic chemistry and biochemistry. <i>Conceptual pre and post Q's 19 and 23</i>	38.34% (Q19) 21.24% (Q23)	43.51% (Q19) 40.26% (Q23)	+5.17 +19.02 OA average +12.10	OA average +15.46%	
9. Describe, predict, and apply fundamental organic chemistry and biochemistry mechanisms, reactions, and processes. <i>Conceptual pre and post Q's 29, 36 and 45</i>	29.53% (Q45) 35.23% (Q36) 38.86% (Q29)	54.55% (Q45) 45.45% (Q36) 39.61% (Q29)	+25.02 +10.22 +0.75 OA average +12.00	OA average +13.06%	
10. Describe and apply fundamental concepts of organic chemistry to the structure and function of biologically relevant molecules and processes. <i>Conceptual pre and post Q's 26, 34 and 41</i>	33.16% (Q26) 29.02% (Q34) 27.46% (Q41)	48.7 (Q26) 38.31 (Q34) 43.51 (Q41)	+15.54 +9.29 +16.05 OA average +13.63	OA average +11.97%	
11. Effectively and clearly communicate scientific information in					87.7 Spring 2022

written and oral form. <i>Obtained from average lab %</i>					89.3 Fall 2021
12. Collect, present, and analyze scientific data gathered through experiment. <i>Obtained from average lab %</i>					87.7 Spring 2022  89.3 Fall 2021

- *Student success in learning objectives*

Data shows that there is an increase in student performance on the concept inventory (Brown) relevant to GOB course topics that indicate readiness for Allied Health professional school.

- *Surveys, interviews, and other qualitative measures*

The overall student opinion of the new lab materials was 26.5% higher than when the regular publishers' labs were used in Summer 2021 (refer to Q3a).

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

Faculty teaching the fully online class with lab, found it hard to get students to understand the realities of lab during the online course. Finding the disconnect was difficult: those that listened completed the labs, while those that were not connecting with the faculty lab expectations, failed the lab portion.

#### 4. Sustainability Plan

*Describe how your project team or department will offer the materials in the course(s) in the future, including the maintenance and updating of course materials.*

The new set of labs will continue to be given freely to students in their course D2L sites. Each lab is split into the following: pre-lab questions, whereby students are expected to do prior lab reading and submit these before the start of the lab; the actual lab content performed in the lab; and post-lab questions which test their understanding of each lab.

The ALG submission contains the lab content only.

The course coordinator is responsible for maintaining and updating the course materials.

#### 5. Future Affordable Materials Plans

*Describe any impacts or influences this project has had on your thinking about or selection of learning materials in this and other courses that you will teach in the future.*

Faculty who have taught with these new materials, contend their own and student happiness. The labs are available immediately at the start of the semester, so there is no waiting around for students to purchase a publisher's lab manual. The greater emphasis on biochemistry has been much needed, and students who attain to nursing school are appreciative of the course content overlap here with their biology courses. The new equipment (Eppendorf pipettes, dry bead heaters, spectrometers, and centrifuges) has made for an outstanding and well-equipped lab that students want to spend time in and develop their hands-on techniques.

Working well as a team, I think we're ready to tackle another OER project!

## 6. Future Scholarship Plans

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

An abstract has been submitted for the Kennesaw State University 6-7 October SoTL virtual conference. We also anticipate presenting at the Spring ACS National Meeting in March 2023.

We have produced several novel biochemistry labs that we plan on publishing, along with the quantitative and qualitative data obtained from both the pre/post concept set of questions, and the attitudinal survey.

## 7. Description of Photograph (optional)

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