Affordable Materials Grants, Round 19:

Transformation Grants

(Spring 2021-Spring 2022)

Proposal Form and Narrative

# Applicant and Team Information

| Requested information | Answer |
| --- | --- |
| Institution(s) | Georgia Gwinnett College (GGC) |
| Applicant name | Leonard Anagho |
| Applicant email  | lanagho@ggc.edu |
| Applicant position/title | Associate Professor of Chemistry |
| Submitter name  | Cathy Hakes |
| Submitter email  | chakes@ggc.edu |
| Submitter position/title | Executive Director, Office of Research, Sponsored Programs, and Accreditation |

Please provide the first/last names and email addresses of all team members within the proposed project. Include the applicant (Project Lead) in this list. Do not include prefixes or suffixes such as Ms., Dr., Ph.D., etc.

| Team member | Name | Email address |
| --- | --- | --- |
| Team member 1 | Leonard Anagho  | lanagho@ggc.edu |
| Team member 2 | Neville Forlemu | nforlemu@ggc.edu |
| Team member 3 | Xiaoping Li | xli@gc.edu |
| Team member 4 | Rebecca Kalman | rkalman@ggc.edu |
| Team member 5 | Sang Park | spark1@ggc.edu |
| Team member 6 | Emily Henary | ehenary@ggc.edu |

If you have any more team members to add, please enter their names and email addresses in the text box below.

|  |
| --- |
| **Team member 7,** Michael Kirberger, mkirberger@ggc.edu**Team member 8**, Joshua Morris, jmorris14@ggc.edu.**Team member 9**, Seungjin Lee, slee34@ggc.edu**Team member 10**, Patrice Bell, pbell@ggc.edu  |

**PROJECT TITLE: Zero Cost Clinical and Evidence Based Laboratory Experiments and Homework modules for Survey of Chemistry I**

# Project Information

| Requested information | Answer |
| --- | --- |
| Priority Category / Categories*Projects in these categories will receive three extra points in the final score for fitting a priority of these particular rounds of Transformation Grants. The type of funding for the project is determined by the funding categories criteria above. As of Round 18, projects can be a part of more than one category. Note that the below categories only indicate priority, not which applications qualify for a grant. Select all that apply.* | *Priority categories:* * *Collaborative Projects with Professional Support*
* *Departmental Scaling Projects*
 |
| Requested Total Amount of Funding*$30,000 maximum total award per grant* | *$30,000* |
| Final Semester of Project | *Spring 2022* |
| Using OpenStax Textbook? | *No* |

# Impact Data

## **Course 1**

| Row # | Requested information | Answer |
| --- | --- | --- |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Leonard Anagho |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 3 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 2 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 5 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 120 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $14,400.00  |

**Course 1**

| Row # | Requested information | Answer |
| --- | --- | --- |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Neville Forlemu |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 3 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 2 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 5 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 120 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $ 14,400.00  |

**Course 1**

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Xiaoping Li |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 2 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 2 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 4 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 96 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL : [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $ 11,520.00  |

**Course 1**

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Rebecca Kalman |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 2 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 3 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 72 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $ 8,640.00  |

**Course 1**

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Sang Park |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 2 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 3 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 72 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $ 8,640.00  |

**Course 1**

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Emily Henary |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 2 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 3 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 72 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL:: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $8,640.00 |

**Course 1**

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Michael Kirberger |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 2 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 3 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 72 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $8,640.00 |

**Course 1**

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Joshua Morris |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 2 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 3 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 72 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $8,640.00 |

**Course 1**

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Seungjin Lee |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 2 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 3 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 72 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $8,640.00 |

**Course 1**

|  |  |  |
| --- | --- | --- |
| Row # | Requested information | Answer |
| N/A | Course title and number | Survey of Chemistry I, CHEM1151K |
| N/A | Course instructor | Patrice Bell |
| 1 | Average number of students enrolled per section | 24 |
| 2 | Average number of affected course sections scheduled in Summer 2021 semester | 0 |
| 3 | Average number of affected course sections scheduled in Fall 2021 semester | 1 |
| 4 | Average number of affected course sections scheduled in Spring 2022 semester | 1 |
| 5 | Total number of course sections scheduled in an academic year *Add up rows 2-4.* | 2 |
| 6 | Total number of student section enrollments per academic year*Multiply row 1 and row 5.* | 48 |
| 7 | Original required commercial materials*Include each title, author, price for a new copy purchased from either your campus bookstore, the publisher, or Amazon, and a URL to the book showing the price.* | Title: Laboratory Manual for General, Organic, and Biological Chemistry, 3rd edition Author: Karen TimberlakePrice: $45.00URL: [Pearson Laboratory Manual Cost](https://www.pearson.com/store/p/laboratory-manual-for-general-organic-and-biological-chemistry/P100002482235)Title: Mastering Chemistry homeworkAuthor PearsonPrice: $74:99Login landing site URL: [Mastering Chemistry Standalone Access](https://registration.mypearson.com/?_ga=2.149187766.1484974205.1613348783-284703065.1611693596#payment-option) |
| 8 | Original cost per student section enrollment*Add up the cost of all materials in row 7.* | $120 |
| 9 | Average post-project cost per student section enrollment | $0 |
| 10 | Average post-project savings per student section enrollment*Subtract row 9 from row 8.* | $120 |
| 11 | Projected total annual student savings per academic year*Multiply row 10 and row 6.* | $5,760.00 |

**NARRATIVE SECTION**

**1. PROJECT GOALS**

**The goals of the project are:**

**A) Enhance nursing chemistry and non-science major student success by introducing evidence-base and clinical laboratory exercises and targeted homework modules.**

As the largest profession in the world with four million registered nurses (RN) in the USA alone, nurses are increasingly required to apply evidenced-based practices, data and technology, to deliver quality care to their patients.1, 2 Understanding the scientific method and possessing a basic understanding of physical and biological sciences is beneficial to people employed in many non-science occupations, including education, business, government, and healthcare. For students pursuing a degree in nursing, a solid foundation in chemistry provides insight into many aspects of patient care, including medicines, dosage, nutrition, therapeutics, and diagnostic methods. The introduction of evidence-based practices in an undergraduate curriculum can be challenging for students, particularly for non-science majors and nursing majors. For nursing students, these challenges may be due to limited exposure to science course content and general lack of academic preparedness or skills. Additionally, many of these students are non-traditional, and/or returning adult students, who often have family and employment responsibilities to manage in addition to their educational activities.3, 4 Aspiring non-science and pre-nursing students typically take two semesters of General, Organic, and Biological (GOB) chemistry as part of their pre-nursing science curriculum. Many students report that the General chemistry portion of GOB, their first college experience with a science course, is often the most challenging and frequently a barrier to progress towards achieving their goals.4 For instructors, it is quite challenging to maintain student interest and to ensure student success, especially when they find limited relevance between core chemistry concepts and the nursing career. There is ample data to indicate that student deficiencies in measurement skills, equipment use, graphical data analysis and interpretation, critical thinking and problem-solving skills, must be addressed and remedied to enhance student success. Many research studies have found that the chemistry grade is an effective predictor of performance on the NCLEX-RN and that these grades may be used to identify students requiring early academic interventions to keep them on the nursing career path.5-8

This course transformation proposes to teach non-science and nursing majors how science and chemistry are relevant to their future profession (e.g., nursing) and everyday activities. The transformation objective will be to replace formulaic laboratory exercises where students complete a checklist of tasks, with evidence-based activities where students generate data to answer questions having a clinical perspective. For example, instead of asking students to use a balance to measure the mass of lab glassware, we will connect this task to a drug dosage calculation problem. In the evidence-based laboratory setting, the student collects mass data for sample patients (mannequins) then utilizes the data for drug dosage calculations. We anticipate that building laboratory content that allow students to make connections with real life and/or occupation-based scenarios will improve student engagement and enthusiasm in learning science throughout the course.

This project proposes to develop new laboratory experiments on the “Clinical aspects of Chemistry and Everyday Household Chemicals” for the Survey of Chemistry I Course, CHEM 1151K at GGC. The majority of students who take CHEM1151K are pre-nursing majors and non-science major who want to understand the relevance of science in their own lives. The targeted laboratory content will offer multiple opportunities for students to apply the scientific method of asking a question, proposing a hypothesis, acquiring the evidence to support or reject their hypothesis, appraising, and then applying evidence to solve a scenario-based problem. This is a key aspect of decision making for nursing professionals and introducing this approach to students early in their career is expected to enhance student success. Currently, the course at GGC requires a single mandatory textbook (General, Organic, and Biological Chemistry: Structures of Life, 6th Edition by Timberlake), laboratory manual, and in most cases, access to one of several online homework systems (e.g., Mastering Chemistry, ALEKS or Sapling Learning). The PI and Co-PIs have already begun the process of replacing the laboratory manual with zero cost resources by developing proprietary laboratory materials to replace the $45 Pearson laboratory manual by Timberlake.

Here are some examples of the current in-house experiments developed:

1) Units of Measurement and Significant figures – In this exercise, student learn about units by exploring the units on multiple household products. This allows student to associate appropriate units to measured quantities. They then proceed to learn how to use measuring tools with the appropriate precision as determined by the required number of significant figures.

2) Dimensional analysis worksheet – This laboratory exercise was introduced to provide students with an opportunity to use a conversion factors card game to learn how to solve problems using dimensional analysis.

3) States of Matter, Energy and Temperature Changes – In this Lab, we allow students to use simulations to learn about the different states of matter and visualize the temperatures at which phase changes occur, and the corresponding molecular motions and forces involved.

This project will transform the labs to include evidence-based content relevant to nursing and non-science majors, that can be delivered both in-person and online. The novel pedagogy will allow students to generate data, learn and discover concepts in a clinical context, and use household materials in experiments. As a result of this new pedagogy, students will have a better appreciation for science in their daily lives and how it applies to the nursing profession.

Here are some proposed transformations of the in-house labs:

1) Units of Measurement and Significant figures – The transformed laboratory exercise will go one step further to ask students to use their measurements to answer clinical based questions like drug dose required for patients (i.e., mannequins) based on body mass.

2. Bone Density and Osteoporosis Diagnosis – In this transformed laboratory exercise students will learn how to measure the density of material by floatation, and then perform a literature review to determine average density of healthy and unhealthy bones. Provided with different bone samples, the students will collect and use their data to decide which bones may be thin and suffering from osteoporosis.

3) Energy Changes in Food Types – In this transformed laboratory exercise, students will use calorimetric techniques to determine the energy content of the different food types (proteins, carbohydrates, and fats). The expectation is for the students to correlate the energy content of food types with loosing and gaining weight.

**B) Enhance nursing chemistry and non-science major student success using cost free and targeted homework modules with a clinical bent**

Homework has historically been used to help students enhance their problem-solving skills, retain course concepts and achieve higher academic success rates. In this project, we propose to build zero-cost homework modules integrated with their learning management system and deployed in all the 34 sections of CHEM1151K. The online homework modules will include a variety of existing tools like faculty videos, PhET animations and computer simulations that provide relevance to increase student interest and engagement. The homework modules will include clinical and graphical content questions, account for different learning styles and aptitudes observed in students. The overarching goal is to bolster student engagement to learn and apply the material in every aspects of their lives and not just a grade. For example, some homework problems will have students use existing PhET animations to explore gas laws (Boyle’s, Charles’s, Gay-Lussacs and Avogadro’s) before solving problems, or run simulations to determine temperature effects on matter before solving calorimetry and food energy values problems

**2. STATEMENT OF TRANSFORMATION**

Georgia Gwinnett College is an open-access institution with lightly selective admission. Hence, it admits students whose GPAs may prevent their acceptance into colleges and universities that are more selective. However, students accepted at GGC are expected to the meet the same academic requirements for graduation as any other institution, so that they will be competitive in the post-academic job market. With the current changing socio-economic landscape, more and more students must work full-time, support families, and attend school. In their daily multitasking, students need information in practical formats that will enhance knowledge retention, and application of such knowledge.

At GGC, Survey of Chemistry I (CHEM1151K) is designed for students pursuing allied health careers. The course is also taken for credit by students in non-science majors in order to fulfill their Area D science requirement as prescribed by the University System of Georgia. Thus, for all the reasons cited above, this course is particularly challenging to many of our students and has a significant DFW rate of about 40%. Revised course outcomes will include the following:

1. Apply the scientific method to investigate chemical questions within the field of allied health.
2. Apply dimensional analysis to solve practical quantitative problems.
3. Clearly communicate orally and in writing, using chemical terminology and symbology and through graphs, charts and tables.
4. Utilize the fundamental principles of chemical structure and reactivity to describe the behavior of solutions of biochemical interest.
5. Relate the chemical concepts of equilibrium, kinetics and reactions to processes of biochemical interest, apply standard laboratory policies, procedures and safety practices when performing experiments.

Research has shown that students are more motivated to learn science when the content is more relevant to experiences in their daily lives.9 Additionally, following recent discussions with faculty and administrators from GGC’s Nursing School program, it was determined that our survey sequence courses could be revised to better reflect the expectations of the Nursing School programs. For example, the need to have students learn more about energy changes, how food is metabolized, measuring pH of household chemicals, and the impact of acids on body systems. These are all topics that have been cited by nursing faculty as essential for student success. Moreover, many of our current labs involve students performing a series of steps to observe pre-determined outcomes. The lack of interest in this format of laboratory exercise leads to student deficiencies in equipment and glassware handling. Our hope is that the enhanced engagement from clinical and evidence-based activities should help bridge these skills and content gaps.

In 2016, a group of faculty teaching Survey of Chemistry I (CHEM1151K) decided to write in-house laboratory experiments. These experiments replaced the prescribed laboratory manual that contained experiments with multiple errors that we could not fix, and some experiments that did not align with course content goals. In Fall 2017, the in-house laboratory reports were adopted for all sections of CHEM1151K. Since then, we have noticed that our students continue to struggle with passing the course and subsequently gaining admission into nursing programs. Our goal is to develop more engaging experiments that arouse student interest in science. Due to the recent COVID-19 pandemic, we have also realized the need to develop and deploy laboratory exercises in an online format, and this transformation effort seeks to achieve that.

**Description of current state of the course, department, and/or institution**

CHEM1151K, or Survey of Chemistry I, is the first course of a two-semester sequence (CHEM1151K/CHEM1152K) designed to present chemistry to Allied Health students, rather than STEM majors. CHEM1151K broadly encompasses general chemistry principles, with some focus on how these topics relate specifically to health. At present, this K course combines a lecture component and a lab component, comprising 75% and 25% of the student’s grade, respectively. The lab component provides students with the opportunity to observe practical aspects of topics introduced in lecture, through laboratory experimentation. Previously, labs for CHEM1151K were supplied to students in a lab manual purchased from the vendor (Pearson), and these labs were designed to coincide with the textbook in use at the time. These manuals were costly for students (~$45), and frequently students were unable to purchase the manuals at the beginning of the semester due to delays in financial aid.

Historical data for the last seven years shows that students consistently underperform in course outcomes 2, 3 and 4. According to the course assessment reports, a redesign of the laboratory experiments in 2017 has not produced significant improvement, which is why many faculty members on this project have come together to design and develop new laboratory experiments to help address the high DFW rates. Thus, in 2017 a working group of CHEM1151K instructors began developing labs that were not tied to a commercial manual, to reduce costs for students. When GGC moved to virtual and hybrid teaching modalities beginning spring 2020 (as a direct result of the pandemic), it was necessary to expand our efforts to include virtual labs that students could complete online using hypothetical data. To address this, we plan to revise the curriculum by developing our own proprietary laboratory manual with new and revised experiments designed to address specific academic needs of our Allied Health students, and that will have no associated cost for the students.

*Project impact on course.*

Impact on students: Through the development of new labs for CHEM 1151K course, the new design will consist of labs more relevant to students’ daily life experiences. The students will benefit from the evidence-based activities to achieve reinforced and refined course outcome goals in a manner that applies scientific methods to investigate chemical questions within the field of allied health. The students will also learn how to address questions by generating specific data rather than processing data provided in the lab manual or obtained from simple measurements. Such an approach will help particularly the non-science and nursing majors to prepare for health careers with better performance in the subsequent courses and on standardized exams, such as the TEAS exam. This will lead to improved grades with a lower DFW rate and enhanced retention of students in their academic pathway.10, 11 The students will benefit from significantly reduced costs for lab materials, while developing skills necessary for real world, everyday experiences such as calculation of correct dosages for drugs and solving scenario-based problems related to their occupations.12-17 At the same time, they will be equipped with the skill set required for the upper courses and eventually in their licensing.

Impact on faculty: Faculty will also benefit from this effort as development of new labs will produce customized pedagogy for their students.18 The shared common experiences with the resources and historical adjustment of the course materials among faculty members will fulfill the whole thrust of the project over all sections of the course. Accumulated materials and experiences will constitute the resources for future advancement in teaching and serve as the references for further design and development of labs.

*Project impact on department.*

Survey of Chemistry I (CHEM 1151K) course is a part of a pre-nursing science curriculum and offered to lay foundations for the CHEM 1152K, the second course of General, Organic, and Biological chemistry. To meet diverse needs of the current times including the pandemic and provide options for various teaching modalities, the expansion of the discipline’s efforts to respond to the needs became crucial. Special attention paid to the novel design of labs in virtual and in-person formats will translate into the discipline’s capability to diversify pedagogy for students’ retention and success. The outcomes of the project will, therefore, nurture the adaptive culture for the course and supportive interaction among other courses in the chemistry discipline as well as disseminate the newly established laboratory and its implementation methods.

*Project impact on institution.*

Successful completion of this project will equip the institution, the School of Science and Technology, and the School of Health Sciences, with the strong academic relationship founded on the redesigned course. The improved students’ performance along with higher retention in the course will be realized as student success at Georgia Gwinnett College. Thereby, the institution will continue to serve as a premier provider of health care professionals for the community while the faculty maintain competency in their disciplines and are knowledgeable of methods of providing innovative active-learning environments. The project has the potential to provide savings of $106,551.12, if adopted/adapted by the 37 CHEM1151K sections, which enroll 24 students per section. The large team of members involved are currently teaching the class and will facilitate publicity of developed content to the rest of chemistry discipline teaching the courses.

**3. ACTION PLAN**

The clinical and evidenced-based approach will provide students the framework to discover and explore the broad question: How do chemical and science principles impact the properties of materials and its application in nursing? Getting students to think this way will expose them to the scientific process and sharpen their critical thinking and analytical skills.

In order to accomplish the transformation, the team continues to review current offerings and has created a proposed framework for the transformed laboratory exercises. The current experiments developed provided the project team with examples of possible web resource links, which are provided in the table below in select topics of the proposed transformed laboratory manual.

**Plan for the selection, adoption, adaptation, and/or creation of new course materials**

The format for the proposed laboratory experiments will differ from the current lab manual. The differences will be on the laboratory experiments.

Below is a description current versus proposed experiments:

**CURRENT EXPERIMENTS**

The current set of experiments are 11 as listed below, however these experiments lack clinical components that are essential for the type of students that this course attracts. This course is designed for students interested in allied health professions like nursing.

1) Units of Measurement and Significant figures

2) Dimensional analysis worksheet

3) States of Matter, Energy and Temperature Changes

4) Electronic Configuration and Periodic Properties

5) Compounds and Formulas Worksheet

6) Molecular shape, polarity, and intermolecular forces

7) Chemical Reactions and Equations

8) The Mole Concept and Solving Stoichiometric Problems Worksheet

9) Gas Laws

10) Solutions, Electrolytes, and Concentration

11) Types of Mixtures, and pH of Household Products

**PROPOSED EXPERIMENTS**

Here, we proposed to develop 8 new laboratory experiments that will capture clinical components that will be beneficiary and more engaging to students with allied health professional goals. The new experiments will also be online friendly.

1) Units of Measurement and Significant figures – In this transformed laboratory experience, students use mass data and dimensional analysis to determine patient required doses. Faculty Responsible: Drs. Forlemu and Kirberger.

2. Bone Density and Osteoporosis Diagnosis – In this transformed laboratory experience, students diagnose Osteoporosis using bone density data. Faculty Responsible: Drs. Forlemu and Anagho.

3) Energy Changes in Food Types – In this transformed laboratory experience, students correlate the energy content of food types with weight loss and gain. Faculty Responsible: Drs. Anagho, Kalman and Kirberger

4) Molecular shape, polarity, and intermolecular forces with [PhET simulation](https://phet.colorado.edu/en/simulation/molecule-shapes). In this transformed laboratory experience, students explore intermolecular forces used by NSAIDS like aspirin to interact with enzymes. Faculty Responsible: Drs. Morris and Li

5) Chemical Reactions and Equations - [Simulation](https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations_en.html) In this transformed laboratory experience, students use chemical reactions as a diagnostic tool for metabolites

Faculty Responsible: Drs. Morris, Lee and Li

6) Gas laws experiments with [PhET simulations](http://www.glencoe.com/sites/common_assets/science/virtual_labs/PS08/PS08.html) and [Glencoe simulations](http://www.glencoe.com/sites/common_assets/science/virtual_labs/PS08/PS08.html). In this transformed laboratory experience, students use stoichiometry to determine the size of airbags. Faculty Responsible: Drs. Henary and Bell

7) Types of Mixtures, and pH of Household Products [PhET simulation](https://phet.colorado.edu/en/simulation/ph-scale-basics). In this transformed laboratory experience, students use the pH value to determine the acidity level and degree of hazardousness of various household products. Faculty Responsible: Drs. Henary, Lee and Bell

8) Isotonic, Hypotonic and Hypertonic mixtures: In this transformed laboratory experience, students analyze graphical data to determine solutions that are isotonic to body fluids and therefore appropriate for IV transfusion Faculty Responsible: Drs. Kalman and Park

**Roles of each team member**

Dr. Leonard Anagho will oversee the entire project and be responsible for the coordination of the different facets of the project and budgets. (Number of hours per person: 68)

Drs. Li and Park will divide the duty equally. Each of them will be responsible for developing assessment strategies and tools including measurement of student satisfaction, student performance, and course-level retention. (Number of hours per person: 68)

Drs. Neville Forlemu, Michael Kirberger and Joshua Morris will work on the development of online modules, computational laboratory aspects and biological relevance to each of the developed lab resources. (Number of hours per person: 68)

Drs. Rebecca Kalman, Emily Henary, Seungjin Lee and Patrice Bell will ensure that all the designed laboratory resources provide students with opportunities to analyze data graphically, develop critical thinking and appropriate experimental skills. (Number of hours per person: 68)

We anticipate that every member will participate in discussions to develop document template, individual laboratory content, homework question types while ensuring alignment with course goals. (Number of hours per person: 68)

All faculty members will utilize the free lab manual in their classes. The timetable indicates the faculty who will be piloting the manual in Fall 2021, and Spring 2022.

**Plan for redesigning your course**

The lab redesign will address three key requirements: affordability, accessibility, and relevance. Affordability will be addressed by providing students with lab instructions and reports that they can download from a central repository (e.g., D2L) at no cost. These documents will be designed in 508 compliant accessible formats according to parameters defined in the following tutorials:

* [Accessible document design](https://affordablelearninggeorgia.org/documents/OERAccessibility_DocDesign.pdf)
* Either [descriptive alternative text](https://affordablelearninggeorgia.org/documents/OERAccessibility_AltText.pdf) OR descriptive figure captions on all images
* [Accurate captioning on all videos and transcripts on all audio](https://affordablelearninggeorgia.org/documents/OERAccessibility_Captioning_Transcripts.pdf)
* [Accessible PowerPoint design](https://affordablelearninggeorgia.org/documents/OERAccessibility_PowerPoint.pdf)

The project team will work with Ms. Chris Robinson on ensuring the course materials on the website are ADA approved. GGC currently implements these standards for course syllabi, and D2L, our point of document dissemination with students in each class, provides additional verification of document accessibility.

The most significant changes will involve revisions to address relevance. Current consensus suggests that course material for CHEM1151K could be modified to more accurately reflect the academic needs of our students, the majority of whom are enrolled in the course as a requirement for Nursing School. To address these, a working group of CHEM1151K faculty will evaluate curriculum changes, including textbook options, and lab manuals, to identify more affordable options for students, and to modify our curriculum in a way that chemistry is more specifically directed towards healthcare related topics. The most effective approach to this will be to determine which of our existing labs can be retained in their current or modified forms and combine these with new evidence-based labs with targeted content that will present scenario-based problems to students where they can apply the scientific method to address chemistry in everyday life or as it relates to healthcare.

**Plan for providing open access to the new materials**

All newly developed laboratory modules, homework exercises, videos and D2L modules will be made publicly available through Galileo Open Learning Materials repository. Further, we will request that ALG host these files on our behalf. Additionally, the videos will be made publicly available through a nursing chemistry YouTube Channel created by the grant team. The description of each video posted will include a discussion of the open access lab and homework content as well as a link to all the materials produced through this grant. Lastly, our materials will be made available on OERcommons.org.

**4. QUANTITATIVE AND QUALITATIVE MEASURES**

Because the same faculty delivers lecture and lab for GGC chemistry courses, students can expect greater coherence between laboratory learning and lecture while spending hands-on laboratory time as part of a deep process of learning. Using the redesigned laboratories and online homework system, we aim to increase coherence between lecture and laboratory learning to promote a more integrated experience. The PIs will apply for an IRB once awarded to assess the outcomes below.

**GOAL 1: Measure student performance and attention**

**Quantitative Measures and Tools**

The PIs are planning to conduct the following quantitative assessments:

1. Class and laboratory course grades will be collected to give a quantitative perspective into student performance.
2. Class and lab course average scores will be compared with previous semesters to evaluate the effectiveness of the new lab design and homework.
3. Class final exam and Lab practical exam grades at the end of the semester will be collected to give another important quantitative perspective into student performance.
4. “DWF” rates will be collected and give a quantitative perspective into student retention.

One of the most challenging subjects for non-science major students in the course is to understand the complexity and ambiguity in empirical work. For example, many students have hard time applying significant figure rules in mathematical operation to the analysis and processing of laboratory data. Thus, the following assessment will also be added.

1. Students’ prior content knowledge and students’ ideas about learning chemistry in the laboratory will be measured at the beginning and at the end of the semester.

**Qualitative Measures and Tools**

These open-ended questions on student success will be included in the attitudinal survey that students complete at the end of the semester.

1. How did the laboratory activities and homework help to improve your performance in the course?
2. Did you see your lab skills set and knowledge increase as you work through the lab?
3. What additional resources will be helpful and can further improve your performance?
4. To what extent would the availability of free educational resources impact your decision to enroll in a future course?

**GOAL 2: Measure student satisfaction and attitudes toward chemistry**

**Quantitative Measures and Tools**

The attitudinal survey will ask students to rate the following questions on a four-point Likert scale of “Strongly Disagree” to “Strongly Agree” to avoid a neutral middle option and will consist following questions:

1. The labs are enjoyable experience.
2. The lab manual gives clear direction and steps to follow in “experimental procedure section.”
3. The course integrates well learning of chemistry content in lecture with learning about the processes of chemistry in the lab.
4. The lab manual is always easily and reliably accessed.
5. The lab materials provide enough background information, clearly explain concepts and are useful to learn the content.
6. The lab manual has enough exercises to support students’ learning needs.
7. The lab manual provides good critical thinking questions following each lab.
8. I prefer free online lab manual to traditional paper lab manual book.

**Qualitative Measures and Tools**

These open-ended questions on student satisfaction and attitudes toward chemistry will be included in the attitudinal survey that students complete at the end of the semester.

1. How well the online laboratory exercises were integrated into the learning?
2. What might be fun and useful features of the online labs you desire?
3. Overall experience of the electronic free lab manual compared to other traditional paper lab manual book.
4. How did the course affect your attitude toward chemistry and motivation for learning science?

**5. TIMELINE**

Pilot begins in Fall 2021 semester. Full implementation will be in the Spring 2022 semester

Project Period: Spring 2021-Spring 2022

SPRING 2021: Work will begin after the March 26, 2021 virtual kickoff meeting

1. Attend the Kick-Off meeting on March 26, 2021
2. Create a format or template for the laboratory documents.
3. Submit IRB approval
4. Survey to sample student interest in engaging health topics and conceptually difficult material.
5. Survey to sample student interest in engaging health topics and conceptually difficult material.
6. Authoring new homework modules

SUMMER 2021:

1. Faculty engage in research and authoring of new laboratory.
2. Complete lab manual for piloting in Fall 2021.
3. In accordance with Goal 1 – Measuring **student performance** and attention, the Summer 2021 timeframe will be the session to create the specialized curriculum (homework, laboratory, and pre-laboratory modules) to measure student performance –quantitative measures.
4. Submit ALG semester report.

FALL 2021

1. Written laboratory and homework exercises are migrated to D2L and Galileo.
2. Work presented to chemistry discipline for adoption.
3. Goal 1 – reinforce the quality and literary footprint associated with development of student performance tools.
4. Faculty swap tasks for peer critic/review. Goal 1 – (enhancing) student performance tools by peer review.
5. Pilot the newly developed laboratory experiments and homework by all faculty on the project teaching CHEM1151K.
6. Submit ALG semester report.

SPRING 2022

1. Full implementation will be done in spring 2022 semester by all faculty teaching CHEM1151K. This should have gone through discipline or departmental approval in Fall 2021.
2. Perform quantitative and qualitative data analysis.
3. Prepare and submit ALG final report in May 2022.

**6. BUDGET**

Type of Grant: Transformation grant, priority: collaborative with professional staff and department scaling.

Amount Requested: $30,000

Justification:

**A. INDIVIDUAL AWARDS ($5,000 MAX PER TEAM MEMBER): $ 30,000**

Funds are requested to cover the following personnel:

**Dr. Leonard Anagho** will oversee the entire project and be responsible for the coordination of the different facets of the project and budgets.

* Summer Pay: $2,566.52
* Fringe Benefits: $433.48. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and ORP 9.24% at the time of submission.

**Total award for Dr. Anagho**: $3,000

**Dr. Xiaoping Li** will work with Dr. Park in developing assessment strategies and tools including measurement of student satisfaction, student performance, and course-level retention.

* Summer Pay: $2,566.52
* Fringe Benefits: $433.48. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and ORP 9.24% at the time of submission.

**Total award for Dr. Li**: $3,000

**Dr. Sang Park** will work with Dr. Li to develop assessment strategies and tools including measurement of student satisfaction, student performance, and course-level retention.

* Summer Pay: $2,367.61
* Fringe Benefits: $632.39. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and TRS 19.06% at the time of submission.

**Total award for Dr. Park**: $3,000

**Dr. Neville Forlemu** will work with Drs. Michael Kirberger and Joshua Morris on the development of online modules, computational laboratory aspects and biological relevance to each of the developed lab resources.

* Summer Pay: $2,566.52
* Fringe Benefits: $433.48. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and ORP 9.24% at the time of submission.

**Total award for Dr. Forlemu**: $3,000

**Dr. Michael Kirberger** worked with Dr. Forlemu and Joshua Morris to work on the development of online modules, computational laboratory aspects and biological relevance to each of the developed lab resources.

* Summer Pay: $2,367.61
* Fringe Benefits: $632.39. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and TRS 19.06% at the time of submission.

**Total award for Dr. Kirberger**: $3,000

**Dr. Joshua Morris** will work on the development of online modules, computational laboratory aspects and biological relevance to each of the developed lab resources.

* Summer Pay: $2,566.52
* Fringe Benefits: $433.48. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and ORP 9.24% at the time of submission.

**Total award for Dr. Morris**: $3,000

**Dr. Rebecca Kalman** will work to ensure that all the designed laboratory resources provide students with opportunities to analyze data graphically, develop critical thinking and appropriate experimental skills.

* Summer Pay: $2,367.61
* Fringe Benefits: $632.39. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and TRS 19.06% at the time of submission.

**Total award for Dr. Kalman**: $3,000

**Emily Henary** will work to ensure that all the designed laboratory resources provide students with opportunities to analyze data graphically, develop critical thinking and appropriate experimental skills.

* Summer Pay: $2,367.61
* Fringe Benefits: $632.39. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and TRS 19.06% at the time of submission.

**Total award for Dr. Henary**: $3,000

**Seungjin Lee** will work to ensure that all the designed laboratory resources provide students with opportunities to analyze data graphically, develop critical thinking and appropriate experimental skills.

* Summer Pay: $2,367.61
* Fringe Benefits: $632.39. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and TRS 19.06% at the time of submission.

**Total award for Dr. Lee**: $3,000

**Patrice Bell** will ensure that all the designed laboratory resources provide students with opportunities to analyze data graphically, develop critical thinking and appropriate experimental skills.

* Summer Pay: $2,566.52
* Fringe Benefits: $433.48. This will cover employer’s portion at the rates of FICA SS 1.45%, FICA Med 6.2%, and ORP 9.24% at the time of submission.

**Total award for Dr. Bell:** $3,000

The design specialist team member, Ms. Chris Robinson, will be assisting the project as a service to the institution, as per institutional guidelines.

**B. TOTAL REQUEST: $ 30,000**

**7. SUSTAINABILITY PLAN**

**The maintenance and updating of course materials**

The Chemistry department at GGC implements a course coordinator model to manage large multi-section courses such as CHEM 1151K. The course coordinator is a full-time faculty member elected by the discipline to oversee a course for two years. The Chemistry department also puts in place the CHEM1151K/1152K working group that is charged with developing curriculum and organizational improvements for this course sequence. Upon completion of the project, the course coordinator and the working group will be responsible for continual review and editing of the finalized materials produced through this grant. Storage of materials will be present on both campus share drives and flash drives, in case of emergency. Furthermore, the course coordinator and working group will make updated versions of all materials available through the open access sharing plan discussed in section 3. The PI and Co-PIs on this project are part of the above-described teams and will work on updating links and adding new resources based on student and faculty feedback over the years. This updated action and review will occur on a semester basis.

As iterations of the finalized course materials occur, there will be a need for continued conference presentations in the area of SOTL and improved Chemical Education for nursing students. Extended support for future conference attendance and presentations to experts in the field will be required in order to remain relevant and current in this sector of teaching and learning. Future plans with this project include developing lecture/study modules that target challenging student topics and specialized interactions (online or face-to-face) with experts in the field, including GGC nursing faculty or local hospital board administrators, to engage in discussions about how chemistry affects their current positions.

**The commitment of the department(s) or institution(s) to continue the use of affordable materials**

Georgia Gwinnett College remains one of the most affordable institutions in the USG and strives to cut costs to students wherever possible. , The chemistry discipline and Georgia Gwinnett College are committed to expanding low- and no-cost course materials wherever possible. As a testament to this commitment, the chemistry department recently switched all sections (roughly 900 students a semester) of general chemistry to the OpenStax chemistry textbook saving students over $100,000 per semester compared to the previously used textbook. The department would likewise support the use of affordable materials in this course.

**Any possible expansion of the project to more course sections in the future**

CHEM 1151K is offered at institutions across the USG. Once successfully implemented at GGC, these materials can readily be used at public colleges throughout Georgia. Our dissemination plan (see below) will specifically share this work with other USG colleges and universities.

**Future plans for sharing this work with others through presentations, articles, or other scholarly activities**

The course materials funded by this grant will be distributed through the proper academic journals. For example, novel laboratory procedures will be submitted to The Journal of Chemical Education or The Journal of Laboratory Chemical Education.

Presentation of these new materials at conference proceedings will target other USG institutions that offer CHEM1151K. Findings will be presented at the USG Teaching and Learning Conference as well as at the SOTL Commons Conference at Georgia Southern University in Spring 2022.

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*I understand that any new materials or revisions created with Affordable Learning Georgia funding must be developed in compliance with the specific accessibility standards defined in the* [*Request for Proposals*](https://www.affordablelearninggeorgia.org/about/rfp_r18)*.*

# Letter of Support

*The Department Chair from the corresponding project, or the Department Chair’s direct report such as the Dean or Provost, must provide a signed Letter of Support for the project. This letter should acknowledge the following:*

* *The department will provide support for fund disbursement in correspondence with the Grants/Business Office.*
* *The department approves of the work on the proposal by the applicant(s).*
* *The department acknowledges the sustainability of the use of these affordable resources after the grant work is complete.*

*In the case of multi-institutional affiliations, all participants’ institutions must provide a letter of support.*

*Please provide the name and title of the department chair (or other administrator) who provided you with the Letter of Support.*

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| --- |
| Dr. Sonal DekhaneInterim DeanSchool of Science and Technology |

# Grants or Business Office Letter of Acknowledgment

*Institutional Grants/Business Offices will be responsible for fund disbursement, often in correspondence with the Department Chair, including expense and travel reimbursement. Applicants will need to provide a short Letter of Acknowledgment stating that the Grants/Business Office knows about the applicant’s intent to apply for an Affordable Materials Grant. Either the Department Chair or the Project Lead can work with the Grants/Business Office to get this signed letter.*

*In the case of multi-institutional affiliations, all participants’ institutions must provide a letter of acknowledgment.*

*Please provide the name and title of the grants or business office representative who provided you with the Letter of Acknowledgment.*

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| --- |
| Dr. Cathy HakesExecutive DirectorOffice of Research, Sponsored Programs, and Accreditation |