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Application Summary

Competition Details

Competition Title:	Textbook Transformation Grants, Round Seventeen (Summer 2020 - Summer 2021)
Category:	University System of Georgia
Award Cycle:	Round 17
Submission Deadline:	04/20/2020 at 11:59 PM

Application Information

Submitted By:	John Meyers
Application ID:	4785
Application Title:	544
Date Submitted:	04/21/2020 at 8:49 AM

Personal Details

Institution Name(s):	Clayton State University
Applicant First Name:	John
Applicant Last Name:	Meyers
Applicant Email Address:	JohnMeyers@clayton.edu
Applicant Phone Number:	678-466-4773
Primary Appointment Title:	Assistant professor of chemistry
Submitter First Name:	John
Submitter Last Name:	Meyers
Submitter Email Address:	JohnMeyers@clayton.edu
Submitter Phone Number:	678-466-4773
Submitter Title:	Assistant professor of chemistry

Application Details

Proposal Title

544

Requested Amount of Funding

\$30,000

Priority Category (if applicable)

Course Title(s)

Survey of Chemistry I

Course Number(s)

CHEM 1151

Team Member 1 Name

Augustine Agyeman

Team Member 1 Email

AugustineAgyeman@clayton.edu

Team Member 2 Name

Kelli Bain

Team Member 2 Email

KelliBain@clayton.edu

Team Member 3 Name

Drew Brandon

Team Member 3 Email

DrewBrandon@clayton.edu

Team Member 4 Name

Aubrey Dyer

Team Member 4 Email

AubreyDyer@clayton.edu

Additional Team Members (Name and email address for each)

John Meyers (JohnMeyers@clayton.edu); Emily Surber (EmilySurber@clayton.edu)

Sponsor Name

Nasser Momayezi

Sponsor Title

Dean of the College of Arts and Sciences

Sponsor Department

College of Arts and Sciences

Total Number of Student Section Enrollments Affected by Project in One Academic Year

484

Average Number of Student Section Enrollments Affected per Summer Semester

56

Average Number of Student Section Enrollments Affected per Fall Semester

244

Average Number of Student Section Enrollments Affected per Spring Semester

184

Original Required Commercial Materials (title, author, price, and bookstore or retailer URL showing price)

General, Organic, and Biochemistry (9th ed.). Denniston, K.; Topping, J.; Dorr, D., \$190 for e-text/homework system access code package, \$283.95 for hard-cover textbook/e-text/homework system access code package,

<https://lochshop.bncollege.com/shop/clayton/page/find-textbooks>; OR

<https://lochshop.bncollege.com/shop/BNCBTBListView?catalogId=10001&langId=-1&storeId=89326>

Original Total Cost per Student

\$190

Post-Project Cost per Student

\$39.95

Post-Project Savings per Student

\$150.05

Projected Total Annual Student Savings per Academic Year

\$72,624

Using OpenStax Textbook?

No

Project Goals

The goals for this project are as follows:

Goal 1: Reduce cost to students.

Goal 2: Provide engaging resources on the first day of the semester.

Goal 3: Expand the Chemistry LibGuide for our students.

Goal 4: Increase class attendance.

Goal 5: Reimagine and develop in-class activities including lecture materials.

Goal 6: Assess student gains through qualitative and quantitative evaluation.

Statement of Transformation

Survey of Chemistry I (CHEM 1151) is a traditionally difficult course with high DFW rates in equivalent courses across the nation. At Clayton State University (CSU), this course is taken by 1) undergraduate students majoring in the health sciences (e.g., pre-nursing), 2) students from various majors in order to fulfill their Area D science requirement as required by the University System of Georgia, as well as 3) dual-enrolled high school students. As such, the average semester sees students from a wide range of backgrounds in terms of interest in, and preparedness for, learning chemistry. Additionally, many faculty members in the Department of Chemistry and Physics are involved with this course since a large number of students enroll in order to complete a major/Area D requirement. For example, CHEM 1151 offers the most number of sections each semester out of all classes offered in the department, which will have a large impact on our educational practices. All of these instructors are listed as team members in this proposal as we all desire to offer more engaging, more effective (regarding student learning), and lower-cost materials to a large swath of CSU students.

The faculty at CSU have been using commercial materials in CHEM 1151 for several years. For the past three years, the students have had two options centered around the textbook "General, Organic, and Biochemistry," by Denniston et al. The first option is to purchase the e-text/homework system package and the second option is to purchase the printed textbook/e-text/homework system package. In the university bookstore, the first package can be purchased for \$194.00 and the second package can be purchased for \$283.95. According to data provided by the bookstore manager, approximately 35% of enrolled students buy the first package and 10% buy the second package (the remainder of enrolled students purchase elsewhere such as from the publisher directly).

In order to best reach the enrolled students, the instructors who most regularly teach this course propose a redesign to create a textbook-agnostic, low-cost course. Instructors will design their lectures to deliver most of the necessary information during lecture and leverage an online homework system for optimal learning. Moreover, educational research indicates that student success in a class increases with their attendance.¹ To this end, a higher and more consistent attendance should be observed since students will be aware that the lessons will be presented primarily in class. As subject matter experts, team members will be able to further identify and vet useful resources to add to the LibGuide (currently managed by the CSU electronic resources librarians) as we search for OER materials. The resources will be distributed to all sections of CHEM 1151 each semester. The electronic resources librarians in the university library have already expressed readiness and excitement in building and maintaining a Chemistry LibGuide. For any other interested student who may want a physical copy of the textbook, we will construct a short-list of already-vetted, recommended textbooks from which a student can choose (whichever option best fits their budget). These books are not required, but are simply recommended if a student wants to have a printed copy to read. The team will create a topic cross-reference sheet with which students can match the topic in lecture to a given section/page in the textbook they chose.

As part of our textbook-agnostic class design, a low-cost homework system is desirable. The top contender for the homework system is Chem101 (<https://101edu.co/>). The cost to the student will be \$39.95 at the university bookstore (according to the university bookstore manager) or \$29.95 at the publisher's website. With an average of 484 students per year and a cost savings of \$150.05 per student, we can save our students \$72,624 per year. Since many of our students rely on financial aid, this will help their financial well-being in the long run.

A further advantage of the newly available technologies such as Chem101, Knewton, and TopHat are the engaging platforms. For example, Chem 101 has options for in-class activities (e.g., "clicker" questions, think-pair-share, and exams) as well as out-of-class activities (e.g., interactive homework questions). The homework assignments can be built to start the student off with interactive, color-coded, drag-and-drop type questions from which to learn the basics. This can be useful when learning the related chemical math, which is often a stumbling block for many chemistry students. More questions can then be assigned to assess whether or not the student learned the material by asking more challenging and typical word problems.

Additionally, a recent survey of 1000 college students (500 in the US and 500 in Canada) showed that students who have access to materials on day 1 of the semester perform better in the course.² Recognizing this fact, several companies offer free two-week trials, including Chem101, which will allow students to immediately start taking advantage of the technology. The lower cost of the homework system should lower the financial barrier our student demographic often faces when purchasing course materials. Students should be more likely to purchase a less expensive homework system and, therefore, more likely to complete the learning objectives of the course. By incorporating "clicker" questions into lecture, the faculty member will be able to assess student understanding in real time and react accordingly from day 1. This is opposed to waiting until after the first exam to see each student's progression. Team members can then direct the students to the support they need (e.g., office hours) before more challenging content is introduced and/or the student falls behind.

In addition to using technology in and out of the classroom, this grant will allow the team members to reimagine and develop new in-class activities for use during lecture. Chemistry offers the chance to perform exciting visual—and sometimes hands-on—demonstrations in order to make the science real to students.

Often, there is not sufficient time or resources available to perform live demonstrations in the classroom. As such, team members will put together recorded demonstrations of chemical concepts that tie into the content delivered. These videos will be recorded and edited with the aid of Center for Excellence in Learning and Teaching (CELT) at CSU, and will be available for all faculty to access and deliver to their classes. We will also record tutorial videos on solving traditionally difficult calculations utilizing the recording services of CELT, with interactive quizzing features. These videos would supplement content delivered in lecture to allow a deeper dive for students that need a more thorough tutorial. As we will be working together on these videos, each faculty member will have the opportunity to contribute and the students will gain exposure to the entire team.

Finally, student gains will be evaluated both qualitatively and quantitatively to determine the success of these goals. Both pre- and post-attitudinal surveys will be given to the students at the beginning and end of each semester, respectively, in order to assess student perceptions of relevance of the material. In addition, student preparedness for the content will be assessed using a pre-test at the beginning of the semester and compared to a department-wide standard final exam to assess student gains across all sections. In addition to assessing students, we will also assess the course itself. As a large majority of the students who enroll in this course are majoring in health sciences (e.g., pre-nursing and pre-dental hygiene), we will enlist the expertise of the faculty and administration in the College of Health to provide feedback on the topics list and learning objectives of CHEM 1151. For example, they can assist by helping the team identify topics that are most or least relevant to the students' future coursework/career and also which topics we should cover that are not currently covered. For example, topics such as reaction kinetics (a possible preparation for pharmacokinetics), thermochemistry, and equilibrium could be useful to the students, but are not currently covered. These discussions with faculty members from the College of Health could help us make meaningful connections for the students. We will begin these discussions in the Fall 2020 semester and continue reevaluating the impact on the students throughout the grant period with periodic evaluations in subsequent years.

References

1. Chou, P.T.-M.; Kuo, Y.-H. Examining Factors Relating to Classroom Attendance and Performance. *Journal of Studies in Education*. **2012**, 2 (2), 193.
2. Wakefield Research.
<https://get.vitalsource.com/hubfs/2018%20Wakefield/Wakefield%20Research%20QuickRead%20Report%20for%20VitalSource.pdf>. May 2018. Last Accessed: April 20, 2020.

Transformation Action Plan

All team members:

- Select low-cost homework system for course adoption, optional textbook recommendation list, and assessments (attitudinal surveys and content preparation assessments)
- Update course objectives and specific learning objectives and alignment with final exam questions
- Develop course materials (e.g., practice problems, in-class activities, exam and quiz test bank questions) that align with objectives and host on D2L for all instructors to access
- Record demonstration videos and in-depth tutorials (one faculty member per video)
- Participate in discussion regarding learning objectives and topics list with faculty from the College of Health

Dr. Brandon:

- Submit IRB Approval

Dr. Dyer:

- Coordinate and facilitate interaction with faculty from the College of Health
- Coordinate with CELT and faculty to develop demonstration videos and in-depth tutorial videos with all faculty involved in recording
- Work with curriculum designer at CELT to revise specific learning objectives (SLOs) and develop plan to assess alignment of final exam questions to SLOs

Dr. Meyers:

- Coordinate with resource librarian to incorporate open access content (images, videos, etc.) into courses to replace publisher content
- Coordinate writing and submission of interim and final report

Course instructors (TBD for each semester but includes team members):

- Implement use of course materials in sections taught along with assessments administered
- Evaluate assessments in individual courses and supply data to team

Quantitative & Qualitative Measures

In order to measure student success with a textbook-agnostic lecture and a new and engaging homework system, several parameters will be reviewed regularly. These include pre- and post-surveys, final exam scores, final course grades, and DFW rates.

The final exam scores and course grades (ABC and DFW rates) will allow a quantitative perspective into student success. However, a more in-depth understanding of where students are succeeding and where more support is needed will be assessed by correlating specific final exam questions with specific learning objectives (SLOs) and, ultimately, course outcomes. The student performance on these learning objectives will allow for feedback to the department and individual instructors on student understanding of concepts. We will also be administering pre-tests to gain insight into what the understandings of chemistry and chemical concepts the students have at the beginning of the semester. We will map student progress and gains from the beginning to the end of the semester.

Qualitatively, pre- and post-attitudinal surveys will be used to gauge student perception of their learning, student opinion of the adopted course materials, the impact of using a new technology, the impact of a textbook-agnostic course, and student perceptions of the relevance of the content to their future careers. Questions could include Likert scales for both general ideas such as "Chemistry has a global impact" and specific ideas such as "I understand how to convert mass to atoms," as well as "The homework system was useful to my learning." Evaluation of these assessments will allow the instructors to understand the impact of the course material (e.g., lectures, produced videos, and interactive content) on student perceptions of the usefulness of the material on their success and relevance.

Timeline

Summer 2020 – Summer 2021 grant period:

May 2020:

- Select low-cost homework system for course adoption in Fall 2020
- Submit IRB Approval

Summer 2020:

- Attend ALG online kick-off meeting on June 1st from 9 am to 3 pm
- Select student assessment instruments (attitudinal surveys and content preparation assessments)
- Select optional textbooks for recommendation list to students and create a topic cross-reference sheet
- Update existing course objectives and develop specific learning objectives. Share with faculty from the College of Health
- Develop list of demonstration videos and in-depth tutorial videos to be developed
- Work with resource librarian to incorporate open access content (images, videos, etc.) into courses to replace publisher content

Fall 2020:

- Implement use of low-cost homework system.
- Administer assessments
- Meet with faculty from the College of Health for feedback on course objective coverage. Revise specific learning objectives if necessary.
- Develop practice problems, quizzes, tests, and common final exam to align with learning objectives.
- Record demonstration videos and in-depth tutorials (one faculty member per video) with assistance from CSU CELT.

Spring 2021:

- If revision of specific learning objectives needed, begin implementation.
- Continue implementation of low-cost homework system
- Continue assessment of student learning and gains with pre- and post-surveys
- Continue development of demonstration videos and in-depth tutorials with assistance from CSU CELT. Launch content as available

Summer 2021:

- Evaluate assessments from Fall and Spring semesters
- Review course materials and revise as needed
- Continue implementation of low-cost homework system
- Continue administering assessments.
- Submit final report summarizing findings of impact for all sections

Budget

Overload stipend for each team member = \$30,000 (6 x \$5,000)

Sustainability Plan

As a key core science course at CSU, CHEM 1151 is highly likely to be offered for many semesters to come. This increases the number of students to be impacted since all health science majors and several non-science majors fulfilling their Area D requirement enroll in this course. Additionally, many dual-enrolled high school students (up to 10% of each class) take CHEM 1151 for college credit and exposure to collegiate science courses. CSU is now responsible for covering the cost of course materials for dual-enrolled high school students in accordance with recent changes in state policy. Therefore, this grant will also help the administration redirect money to serve a more effective purpose elsewhere in line with the university's mission.

In order to ensure the new adopted course materials are benefiting our students, the team members will meet after each semester to discuss the pros and cons of the chosen technology and revise specific learning objectives as needed. The team members will compare how the students are doing with the new materials against how they did with the previous materials. To help understand the changes, we will review and compare final exam scores, final course grades, and DFW rates across semesters. The final exam scores, course grades, and DFW rates will provide quantitative evidence of success, especially since the team members all use a departmental standardized final exam. The pre- and post-attitudinal surveys will assist us by delving into student perception of their learning and their opinions on the usefulness of the chosen technology in accordance with the redesigned textbook-agnostic lecture.

As the team members continue to teach this course, we will each vet and submit any newly found OER to the university's electronic resources librarians for addition to the Chemistry LibGuide. The librarians have already indicated their willingness to participate in such activities such as locating relevant material and maintaining the LibGuide on behalf of the team and Department of Chemistry and Physics.

If the chosen technology (e.g., Chem101) is beneficial to CHEM 1151 students, then we propose to use this same technology in the recitation sections for Principles of Chemistry I & II (CHEM 1211 & 1212), which is taken primarily by undergraduate students majoring in a STEM field. Future plans for this course include focusing on learning through problem solving through mandatory recitation sections during which faculty, enrolled students, and learning assistants work together on the traditionally difficult topics that cause issues for students (e.g., unit conversions, quantum mechanics, and stoichiometry).

Finally, team members will present the data and lessons that we will learn at various conferences, which will serve to advertise the great steps that Georgia is making to help our college students. One obvious venue is the 2022 USG Teaching and Learning Conference. A second possible venue is presenting this grant's work in the Chemical Education division at the American Chemical Society (ACS) National Meeting in Spring 2022. Dr. Meyers has a history of attending the Spring ACS National Meeting with his research students and is willing to share what the team learns.

Acknowledgment

Grant Acceptance

[Acknowledged] I understand and acknowledge that acceptance of Affordable Learning Georgia grant funding constitutes a commitment to comply with the required activities listed in the RFP and that my submitted proposal will serve as the statement of work that must be completed by my project team. I further understand and acknowledge that failure to complete the deliverables in the statement of work may result in termination of the agreement and funding.



College of Arts & Sciences

April 15, 2020

Re: Letter of Support for FY 20120 ALG Grant Proposal

Dear Committee Members,

As the Dean of the College of Arts and Sciences, I enthusiastically support the application for the Affordable Learning Georgia (ALG) Textbook Transformation grant submitted by Dr. John Meyers. Dr. Meyers is a tenured Associate Professor of Chemistry, and he received The College of Arts and Sciences Teacher of the Year Award last year. Dr. Meyers is committed to the success of our students and he has an exemplary teaching record at Clayton State University. He and his colleagues in the Department of Chemistry are applying for an ALG Textbook Transformation grant for our CHEM 1151 course. They are proposing a low-cost solution that impacts a large number of students at CSU, since we experience a large enrollment from health sciences, non-majors fulfilling their Area D requirement, and dual-enrolled high school students. The faculty will utilize grant monies awarded to them to replace the existing course textbook for CHEM 1151 course, which is among the Top 100 USG undergraduate courses.

Currently, the course is taken by a large number of undergraduate students majoring in Health Sciences, such as nursing and students from various majors in order to fulfill their Area D Science requirements as mandated by the University System of Georgia. Students are required to purchase a textbook that costs anywhere from \$190 to \$284. Each year on average 463 students are enrolled in this course. With their fully-funded textbook transformation project, Dr. Meyers and his colleagues estimate an annual cost savings to our students of more \$72,000.

This proposal will benefit a large number of our students by reducing their total cost of learning materials. Most of our students are the first in their families to attend college. They come from low-income households, work at least 20-30 hours each week, and they are Pell Grant recipients. A reduction in the cost of textbooks will more than likely assist them in completing their degrees on time. It would also enhance our retention and progression rates.

Dr. Meyers and his colleagues are capable and motivated to pursue the goals of the Affordable Learning Georgia initiative. We sincerely hope that the University is awarded this very important grant to help us achieve our ongoing commitment to a successful transformation to free and online texts. Thank you for your consideration of this proposal.

Sincerely,

A handwritten signature in black ink, appearing to read "Nasser Momayezi". The signature is fluid and cursive, with the first name "Nasser" and last name "Momayezi" clearly distinguishable.

Nasser Momayezi, Dean

College of Arts and Sciences

2000 Clayton State Boulevard, Morrow, Georgia 30260-0285 Voice: (678) 466-4700 FAX: (678) 466-4899

www.clayton.edu

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Textbook Transformation Grants, Round Seventeen (Summer 2020 – Summer 2021) Proposal Form and Narrative

Notes

- The proposal form and narrative .docx file is for offline drafting and review. Submitters must use the InfoReady Review online form for proposal submission.
- The only way to submit the official proposal is through the online form in Georgia Tech's InfoReady Review. The link to the online application is on the [Round 17 RFP Page](#).
- The italic text provided below is meant for clarifications and can be deleted.

Applicant, Team, and Sponsor Information

The **applicant** is the proposed Project Lead for the grant project. The **submitter** is the person submitting the application (which may be a Grants Officer or Administrator). The submitter will often be the applicant – if so, just list the applicant as the submitter.

Institution(s)	Clayton State University
Applicant Name	John J. Meyers, Jr.
Applicant Email	JohnMeyers@clayton.edu
Applicant Phone #	678-466-4773
Applicant Position/Title	Assistant professor of chemistry
Submitter Name	John J. Meyers, Jr.
Submitter Email	JohnMeyers@clayton.edu
Submitter Phone #	678-466-4773
Submitter Position	Assistant professor of chemistry

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.

	Name	Email Address
Team Member 1	Augustine Agyeman	AugustineAgyeman@clayton.edu
Team Member 2	Kelli Bain	KelliBain@clayton.edu
Team Member 3	Drew Brandon	DrewBrandon@clayton.edu
Team Member 4	Aubrey Dyer	AubreyDyer@clayton.edu
Team Member 5	Emily Surber	EmilySurber@clayton.edu

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

N/A

Please provide the sponsor's name, title, department, and institution. The sponsor is the provider of your Letter of Support.

Nasser Momayezi, Dean, College of Arts and Sciences, Clayton State University

Project Information and Impact Data

Priority Category / Categories	None
Requested Amount of Funding	\$30,000 (for a large-scale project)
Course Names and Course Numbers	Survey of Chemistry I (CHEM 1151)
Final Semester of Project	Summer 2021
Total Number of Student Section Enrollments Affected by Project in One Academic Year	484 (average total enrollment for the three most recent academic years)
Average Number of Student Section Enrollments Affected per Summer Semester	56 (over last 3 years)
Average Number of Student Section Enrollments Affected per Fall Semester	244 (over last 3 years)
Average Number of Student Section Enrollments Affected per Spring Semester	184 (over last 3 years)
Original Required Commercial Materials	General, Organic, and Biochemistry (9th ed.). Denniston, K.; Topping, J.; Dorr, D., \$190 for e-text/homework system access code package, \$283.95 for hard-cover textbook/e-text/homework system access code package, https://lochshop.bncollege.com/shop/clayton/page/find-textbooks ; OR https://lochshop.bncollege.com/shop/BNCBTBListView?catalogId=10001&langId=-1&storeId=89326
Average Price of Original Required Materials Per Student Section Enrollment	\$190
Average Post-Project Cost Per Student Section Enrollment	\$39.95
Average Post-Project Savings Per Student Section Enrollment	\$150.05

Projected Total Annual Student Savings Per Academic Year	\$72,624 (= 484 students/year x \$150.05/student)
Using OpenStax Textbook?	No

Narrative Section

1. Project Goals

The goals for this project are as follows:

Goal 1: Reduce cost to students.

Goal 2: Provide engaging resources on the first day of the semester.

Goal 3: Expand the Chemistry LibGuide for our students.

Goal 4: Increase class attendance.

Goal 5: Reimagine and develop in-class activities including lecture materials.

Goal 6: Assess student gains through qualitative and quantitative evaluation.

2. Statement of Transformation

Survey of Chemistry I (CHEM 1151) is a traditionally difficult course with high DFW rates in equivalent courses across the nation. At Clayton State University (CSU), this course is taken by 1) undergraduate students majoring in the health sciences (e.g., pre-nursing), 2) students from various majors in order to fulfill their Area D science requirement as required by the University System of Georgia, as well as 3) dual-enrolled high school students. As such, the average semester sees students from a wide range of backgrounds in terms of interest in, and preparedness for, learning chemistry. Additionally, many faculty members in the Department of Chemistry and Physics are involved with this course since a large number of students enroll in order to complete a major/Area D requirement. For example, CHEM 1151 offers the most number of sections each semester out of all classes offered in the department, which will have a large impact on our educational practices. All of these instructors are listed as team members in this proposal as we all desire to offer more engaging, more effective (regarding student learning), and lower-cost materials to a large swath of CSU students.

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design their lectures to deliver most of the necessary information during lecture and leverage an online homework system for optimal learning. Moreover, educational research indicates that student success in a class increases with their attendance.¹ To this end, a higher and more consistent attendance should be observed since students will be aware that the lessons will be presented primarily in class. As subject matter experts, team members will be able to further identify and vet useful resources to add to the LibGuide (currently managed by the CSU electronic resources librarians) as we search for OER materials. The resources will be distributed to all sections of CHEM 1151 each semester. The electronic resources librarians in the university library have already expressed readiness and excitement in building and maintaining a Chemistry LibGuide. For any other interested student who may want a physical copy of the textbook, we will construct a short-list of already-vetted, recommended textbooks from which a student can choose (whichever option best fits their budget). These books are not required, but are simply recommended if a student wants to have a printed copy to read. The team will create a topic cross-reference sheet with which students can match the topic in lecture to a given section/page in the textbook they chose.

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References

1. Chou, P.T.-M.; Kuo, Y.-H. Examining Factors Relating to Classroom Attendance and Performance. *Journal of Studies in Education*. **2012**, 2 (2), 193.
2. Wakefield Research. <https://get.vitalsource.com/hubfs/2018%20Wakefield/Wakefield%20Research%20QuickRead%20Report%20for%20VitalSource.pdf>. May 2018. Last Accessed: April 20, 2020.

3. Transformation Action Plan

All team members:

- Select low-cost homework system for course adoption, optional textbook recommendation list, and assessments (attitudinal surveys and content preparation assessments)
- Update course objectives and specific learning objectives and alignment with final exam questions
- Develop course materials (e.g., practice problems, in-class activities, exam and quiz test bank questions) that align with objectives and host on D2L for all instructors to access
- Record demonstration videos and in-depth tutorials (one faculty member per video)
- Participate in discussion regarding learning objectives and topics list with faculty from the College of Health

Dr. Brandon:

- Submit IRB Approval

Dr. Dyer:

- Coordinate and facilitate interaction with faculty from the College of Health
- Coordinate with CELT and faculty to develop demonstration videos and in-depth tutorial videos with all faculty involved in recording
- Work with curriculum designer at CELT to revise specific learning objectives (SLOs) and develop plan to assess alignment of final exam questions to SLOs

Dr. Meyers:

- Coordinate with resource librarian to incorporate open access content (images, videos, etc.) into courses to replace publisher content
- Coordinate writing and submission of interim and final report

Course instructors (TBD for each semester but includes team members):

- Implement use of course materials in sections taught along with assessments administered
- Evaluate assessments in individual courses and supply data to team

4. Quantitative and Qualitative Measures

In order to measure student success with a textbook-agnostic lecture and a new and engaging homework system, several parameters will be reviewed regularly. These include pre- and post-surveys, final exam scores, final course grades, and DFW rates.

The final exam scores and course grades (ABC and DFW rates) will allow a quantitative perspective into student success. However, a more in-depth understanding of where students are succeeding and where more support is needed will be assessed by correlating specific final exam questions with specific learning objectives (SLOs) and, ultimately, course outcomes. The student performance on these learning objectives will allow for feedback to the department and individual instructors on student understanding of concepts. We will also be administering pre-tests to gain insight into what the understandings of chemistry and chemical concepts the

students have at the beginning of the semester. We will map student progress and gains from the beginning to the end of the semester.

Qualitatively, pre- and post-attitudinal surveys will be used to gauge student perception of their learning, student opinion of the adopted course materials, the impact of using a new technology, the impact of a textbook-agnostic course, and student perceptions of the relevance of the content to their future careers. Questions could include Likert scales for both general ideas such as “Chemistry has a global impact” and specific ideas such as “I understand how to convert mass to atoms,” as well as “The homework system was useful to my learning.” Evaluation of these assessments will allow the instructors to understand the impact of the course material (e.g., lectures, produced videos, and interactive content) on student perceptions of the usefulness of the material on their success and relevance.

5. Timeline

Summer 2020 – Summer 2021 grant period:

May 2020:

- Select low-cost homework system for course adoption in Fall 2020
- Submit IRB Approval

Summer 2020:

- Attend ALG online kick-off meeting on June 1st from 9 am to 3 pm
- Select student assessment instruments (attitudinal surveys and content preparation assessments)
- Select optional textbooks for recommendation list to students and create a topic cross-reference sheet
- Update existing course objectives and develop specific learning objectives. Share with faculty from the College of Health
- Develop list of demonstration videos and in-depth tutorial videos to be developed
- Work with resource librarian to incorporate open access content (images, videos, etc.) into courses to replace publisher content

Fall 2020:

- Implement use of low-cost homework system.
- Administer assessments
- Meet with faculty from the College of Health for feedback on course objective coverage. Revise specific learning objectives if necessary.
- Develop practice problems, quizzes, tests, and common final exam to align with learning objectives.
- Record demonstration videos and in-depth tutorials (one faculty member per video) with assistance from CSU CELT.

Spring 2021:

- If revision of specific learning objectives needed, begin implementation.
- Continue implementation of low-cost homework system

- Continue assessment of student learning and gains with pre- and post-surveys
- Continue development of demonstration videos and in-depth tutorials with assistance from CSU CELT. Launch content as available

Summer 2021:

- Evaluate assessments from Fall and Spring semesters
- Review course materials and revise as needed
- Continue implementation of low-cost homework system
- Continue administering assessments.
- Submit final report summarizing findings of impact for all sections

6. Budget

Overload stipend for each team member = \$30,000 (6 x \$5,000)

7. Sustainability Plan

As a key core science course at CSU, CHEM 1151 is highly likely to be offered for many semesters to come. This increases the number of students to be impacted since all health science majors and several non-science majors fulfilling their Area D requirement enroll in this course. Additionally, many dual-enrolled high school students (up to 10% of each class) take CHEM 1151 for college credit and exposure to collegiate science courses. CSU is now responsible for covering the cost of course materials for dual-enrolled high school students in accordance with recent changes in state policy. Therefore, this grant will also help the administration redirect money to serve a more effective purpose elsewhere in line with the university's mission.

In order to ensure the new adopted course materials are benefiting our students, the team members will meet after each semester to discuss the pros and cons of the chosen technology and revise specific learning objectives as needed. The team members will compare how the students are doing with the new materials against how they did with the previous materials. To help understand the changes, we will review and compare final exam scores, final course grades, and DFW rates across semesters. The final exam scores, course grades, and DFW rates will provide quantitative evidence of success, especially since the team members all use a departmental standardized final exam. The pre- and post-attitudinal surveys will assist us by delving into student perception of their learning and their opinions on the usefulness of the chosen technology in accordance with the redesigned textbook-agnostic lecture.

As the team members continue to teach this course, we will each vet and submit any newly found OER to the university's electronic resources librarians for addition to the Chemistry LibGuide. The librarians have already indicated their willingness to participate in such activities such as locating relevant material and maintaining the LibGuide on behalf of the team and Department of Chemistry and Physics.

If the chosen technology (e.g., Chem101) is beneficial to CHEM 1151 students, then we propose to use this same technology in the recitation sections for Principles of Chemistry I & II (CHEM 1211 & 1212), which is taken primarily by undergraduate students majoring in a STEM field. Future plans for this course include focusing on learning through problem solving through mandatory recitation sections during which faculty, enrolled students, and learning assistants work together on the traditionally difficult topics that cause issues for students (e.g., unit conversions, quantum mechanics, and stoichiometry).

Finally, team members will present the data and lessons that we will learn at various conferences, which will serve to advertise the great steps that Georgia is making to help our college students. One obvious venue is the 2022 USG Teaching and Learning Conference. A second possible venue is presenting this grant's work in the Chemical Education division at the American Chemical Society (ACS) National Meeting in Spring 2022. Dr. Meyers has a history of attending the Spring ACS National Meeting with his research students and is willing to share what the team learns.

Note: Letter of Support