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Institution Name(s): Savannah State University

Team Members (Name, Title, Department, Institutions if different, and email address for each): Drs. Cecil Jones, Zhiyan Song, and Adegboye Adeyemo

Project Lead: Dr. Cecil L. Jones

Course Name(s) and Course Numbers: Principles of Chemistry 1211 and 1212

Semester Project Began: Spring 2016

Semester(s) of Implementation: spring and summer 2016.

Average Number of Students Per Course Section: Spring = 36 and Summer = 19

Number of Course Sections Affected by Implementation: Spring =7 sections and Summer = 3 sections

Total Number of Students Affected by Implementation: 232

1. Narrative

The transformation from the commercial text, Chemistry, 11th Edition by Raymond Chang and Kenneth A. Goldsby (ISBN 978-0-07-340268-0) to the OpenStax Chemistry text was simple. Meetings held well in advance of the first day of classes ensured that the course instructor had access to the on-line text in addition to a hard copy version in our department. The on-line location of the text was included on all syllabi for Chemistry 1211 and 1212 making it readily accessible to students in these courses.

Instructors generally agree that teaching at an acceptable pace dramatically improved due to the availability of the OpenStax text. Before adopting the text, students often fell behind in homework so critical for success in chemistry. This lag in completed homework exercises was due to a wait for financial aid that would allow students to purchase the once required commercial text. The availability of the text on the first day of class allows the instructor to provide supportive homework for that first and following lectures.

A survey was conducted during the spring semester of 2016 to measure students' attitudes about open educational resources (OERs). A total of 232 students were surveyed and only 21% of them were aware of OERs for any course. A significant group among them (26%) were planning to complete the course without purchasing a text; the chief complaint being that the commercial text was too expensive. Typically, these students suffer from low performance on Chemistry examinations. The survey showed that 93% of the students were made more comfortable with

the course and 95% expected good performance as a result of having the OpenStax text available.

The course is instructed primarily from the OpenStax text, however, I have also referred instructors to the OER Chemistry text at (<http://www.oercommons.org/courses/general-chemistry-principles-patterns-and-applications/view>). The text titled “General Chemistry Principles, Patterns and Application” was initially considered for adoption. However, too many errors were found in the text and we decided to go with the OpenStax text instead. Despite the errors in the OER, the text is rich in examples that are useful for learning key concepts in chemistry.

Instructors are also informed of websites that contain support material as seen at (<http://www.oercommons.org/courses/the-chemwiki/view>). This site not only contain worksheets and homework exercises, but great simulations as well particularly through PhET Simulations. Another useful site even for our other chemistry courses is http://chem.libretexts.org/LibreTexts/University_of_California_Davis.

The initial outcomes were positive as will be discussed in section 3 of this report. For long-term effectiveness, this effort to improve student learning through OERs must continue to evolve and our instructors are committed to methods of enhancing the outcomes initiated through Affordable Learning of Georgia. We are now exploring the use of affordable packages of on-line homework and quizzing programs for credit to reinforce the concepts of chemistry.

2. Quotes

Students of Chemistry 1212 stated “I wish we had the OpenStax text when I was in 1211”. Another common quote is “I don’t have to worry about how I am going to pay of the text”. Finally, students often ask “Can you get OERs for the other chemistry course?” I am responding with the probable application for an interdepartmental proposal that would include an introductory chemistry course, biology and behavioral analysis.

3. Quantitative and Qualitative Measures

3a. Overall Measurements

Student Opinion of Materials

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

Total number of students affected in this project: 232

- Positive: 94 % of 221 number of respondents
- Neutral: _____ % of _____ number of respondents
- Negative: _____ % of _____ number of respondents

Student Learning Outcomes and Grades

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

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

Choose One:

- Positive: Higher performance outcomes measured over previous semester(s)
- Neutral: Same performance outcomes over previous semester(s)
- Negative: Lower performance outcomes over previous semester(s)

Student Drop/Fail/Withdraw (DFW) Rates

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

Drop/Fail/Withdraw Rate:

20 % of students, out of a total 232 students affected, dropped/failed/withdrew from the course in the final semester of implementation.

Choose One:

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

3b. Narrative

Impact of OERs on student learning in the chemistry courses was measured by the number of students who successfully completed these courses before and after adopting the OpenStax text. The percent of unsuccessful students in Chemistry 1211 and 1212 were measured from fall 2014 to spring 2016. Summer 2016 is included in the data as it involved the implementation of the program. Data from previous summers was unavailable because faculty members are not required to submit grade distribution forms during the summer.

The data indicate a substantial decrease in unsuccessful students as a result of using OERs. For example, the average failure rate ranged from 34-to-48% in these courses prior to using OERs. A failure rate of only 20% was recorded following the spring semester where all sections of chemistry had adopted the OpenStax text. Unsuccessful students are defined by students who received a non-passing grade for the course; that would be a “D”, “F” or “W”. Learning objectives are measured through examinations and correlate to the course grade. The data show that student learning has improved. Key to success in this area is that students have access to the text on the first day of class.

The survey conducted during the spring 2016 semester shows that students are more comfortable with the OpenStax and generally have high expectations with regard to their ability to meet the learning goals.

4. Sustainable Plan

Members of the Principles of Chemistry Committee (PCC) will be responsible for reviewing new OERs and offer ways by which these may be incorporated into the two courses. Each instructor is challenged and encouraged to further develop their course and share any new practices with the PCC. The PCC will evaluate and consider these practices for department wide usage, particularly with regard to enhancing student learning and graduation rates.

5. Future Plans

The adoption of OERs for Chemistry has initiated interest in low-cost learning in the departments of math, biology and behavioral analysis. The success described herein has prompted the consideration of an interdepartmental proposal for piloting Introductory Chemistry & Chemical Calculations, Principles of Biology, and Behavioral Analysis. This effort would demonstrate a campus-wide movement toward affordable learning.

6. Dr. Cecil L. Jones collected student surveys and data needed for measuring the impact of OERs used on student success rate in Chemistry 1211 and 1212. He also included on meeting agendas the availability of alternative OERs and measured instructors' attitudes regarding the use of these materials. Instructors are generally excited about the use of OERs and are researching affordable methods to improve student learning in freshman chemistry. Critical information obtained from the Affordable Learning webinars were shared. Dr. Jones will continue to lead the effort at Savannah State University to make learning affordable campus wide.