Adapting, remixing, and adopting an OER in General Chemistry I and II

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Abstract

Through the generous support of the OSU-OIT library and Open Oregon, General Chemistry I and II (CHE 201 and 202) at Oregon Institute of Technology has been able to switch to OER texts this academic year. It is estimated that this switch has saved each student up to $300 per semester. The shift from Openstax Chemistry as our test texts and multimedia and hosted online via LibreTexts. A printed version was also created to give students an option who prefer print. Besides lowering student cost, benefits include specific tailoring of the information for the course, supplemental to suit different types of learners, and instant updates of information. Student reactions to the text have been mostly positive, with a majority of students reporting using the text more than a traditional textbook. Additionally, a statistical difference has been found in the number of students completing pre-class Reading Checks.

Introduction

At Oregon Tech, CHE 201 and CHE 202 (CHE 20X) are offered:
• 18 sections (Fall and Winter) and 5 sections (Spring and Summer)
• Approximately 150-110 students annually
• For most of the engineering majors on our campus (except Civil Engineering)

CHE 20X had traditionally used the textbook. A majority of students in the fall sections had used a textbook (Fall 2018).

Instructor surveys were given to the students in the pre-class Reading Checks.

Student Outcomes

Student Use of the Text

We started by making a list of all the sections of the Textbook we taught in both courses and the sections that could be substituted from Openstax, deleting irrelevant information (to our course). We then curated our collection of supplements, and as a last report for a few pieces of information, we wrote ourselves. We then chose the relevant end of section problem, determined the answers for even problems, and made solution videos for select problems. CHE 201 was mostly completed in Summer 2018 and ready for use in Fall 2018. CHE 202 was mostly completed in Fall 2018 and ready for use in Winter 2019. Because some students still like to have a physical copy of the textbook, an online-only text could not be the only version. Because this, in early adoption terms, students were given the option to purchase the physical copy of Openstax and the appropriate section references and practice problems were made available to them where possible. In the subsequent trailer sequences, a course pack (PDF) was created from the online material, with short links and QR codes generated for online only material to maintain a degree of high accessibility for students (Fig. 3). Working with Open Oregon, future course pack printings will be available through Lulu for less than $25 per text ($50 for both CHE 201 and CHE 202 instead of $300).

Conclusions & Future Work

An online (free) and in print (cost-effective) resource has been created for General Chemistry I and II at Oregon Tech, which is fully revised and updated to the information presented in the courses and contains online supplements previously listed separately in LMS or sought independently by students.

Most of the students opted to use the online resource over the print resource and the majority of students in CHE 201 and CHE 202 self-report using the textbook a lot a little more than they would have used a traditional textbook.

Instructor surveys show that using the practical problems at the end of sections, which seems to have had a positive effect on student grades (Fig. 8).

Future Work: Short links in the end of section problems were added to the bottom of homework assignments this quarter to make the resource more readily available. Students will be surveyed at the end of this quarter for feedback on this inclusion as well as asking about use of link for print version of the textbook.

Results within the course will be compared to see if use improved.

The online resource appears to be a substantial difference over the pre-class Reading Check completion. We hypothesize that this is due to the increased ease and universality of access while taking an online quiz.

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Fig. 1: Institutions using some form of LibreTexts in the United States

Fig. 2: Students used the textbook and recorded definitions in Figure 1

Fig. 3: Example page from course pack with online links

Fig. 4: Course pack was created for CHE 201 and CHE 202.

Resource tracking across LibreTexts on the platform

LibreTexts: An Overview

From the website: "The LibreTexts mission is to unite students, faculty and scholars in a cooperative effort to develop an easy-to-use online platform for the construction, customization, and dissemination of open educational resources (OER) to reduce the financial burdens of unreasonable textbook costs to our students and society."

• 393 textbooks, electronic and LibreTexts
• 154 courses using LibreTexts
• 313 million dollars saved

Students include: Biology, Business, Chemistry, Engineering, Geosciences, Humanities, Mathematics, Medicine, Physics, Social Sciences, Statistics, and Workforce

LibreTexts began as the ChemWiki (UC Davis), managing a large number of chemistry resources, including 17 textbooks and maps for General Chemistry, were already available.

Resources on LibreTexts are:
• Open, free, and accessible to everyone with an internet connection
• Comprehensive, with new texts being developed and shared regularly
• Free and open-source
• Topical and always up to date
• Active, with a community of collaborators
• Interactive, with visualizations, simulations, and videos

Benefits of LibreTexts to CHE 20X

Che 20X textbooks began as the ChemWiki (UC Davis), managing a large number of chemistry resources, including 17 textbooks and maps for General Chemistry, were already available.

• Chosen base resource: Openstax Chemistry (entirely mapped on LibreTexts)
• CHE 20X supplements: Crash Course & Sci Show Videos and others (embedded), PhET simulations (HTML simulations already available in LibreText to insert on pages)

• Availability of interactive resources for students was a large selling point

• Instantly Editable (i.e. When IUPAC announced the new definitions for the kilogram, I was able to update that section that day [Fig. 23])

• Learning Objectives for each Unit and Section make it easy for students to track the information they are responsible for.

• End of chapter problems are available for students to get extra practice before weekly quizzes and I was able to make more than the odd problem had answers and 2 post-solution videos for students to see me working practice problems outside of class/office hours.

• Real time feedback and built-in editors: every page has link requests to support solution videos, give anonymous feedback, report typos for extra credit, and report wrong answers.

• Students given choice and free to choose with the OER, choosing what best suits their learning style.

• Open Oregon...