Project Year

2015-2016

Project Title

Applying Applied Chemistry
Completed Project Videos: http://yesyouchem.johnshopkins.edu/

Project Team

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Audience

This material is being developed to supplement the instruction in 030.103 *Applied Chemical Equilibrium and Reactivity*, an accelerated one semester introductory chemistry course that enrolled 120 freshmen in 2014. The course fulfills the introductory chemistry requirement for discipline-related majors in the Whiting and Krieger schools.

Pedagogical Challenge

Class time in the course is best used working problems. When problems are worked in class students are able to work together, ask questions and receive immediate feedback on whether or not their answer is correct. However, this type of problem solving takes time. To allow more time for problem solving in class, content needs to be moved online. One of the goals of this project is to produce high quality online instruction that will allow class time to be used for problem solving.

A second challenge is that the material in introductory chemistry is foundational; this course is a prerequisite for other courses. However, as student's progress in their education they frequently fail to make the connection between the topics that they learned in introductory chemistry and their applications to other disciplines. The fact that students generally rent digital texts or sell back printed texts to save money makes it difficult to reference previous instruction.

Solution

A series of instructional modules will be developed. These will be organized on a website for easy access by students who are currently enrolled in the class and those who have completed the class. Links will be put on the course Blackboard site to help students find the materials at the appropriate time in the course.

The instructional module for each topic will include the introduction of a concept beginning at a basic level and progressing to the level expected in the course. Following the explanation of the concept, there will be an interview with a Hopkins scientist on how they use that concept in their research. Then the video will move from concept to how to solve problems on the topic. Sample problems will be embedded into the footage. Where appropriate, this will be followed by either a video tour of a research lab or instruction on the laboratory technique to perform a specific experiment.

Assessment Strategy

This project will be assessed both on its success in improving the learning of students in 030.103 and on its overall usage. The success of the project will be evaluated on the increase in content knowledge on the part of the students, as well as on the increased understanding of the importance of these concepts.

To evaluate the content knowledge, the final exam scores of students in the course with the instructional modules will be compared to the final exam scores of the students in semesters of the course before the modules were introduced. Students will be asked about the value of the videos to their learning, and about their attitudes towards chemistry. Some statements will be taken from the Colorado Learning Attitudes about Science Survey, Chemistry Version. This entire survey has been administered in the past to the class, but for this project a few statements will be chosen and compared to historical data for this class. Usage statistics for the modules will also be tracked.

Faculty Proposal

It would be beneficial to students to increase the amount of in class time spent on problem solving, but to do so it is necessary to provide high quality online instruction. The current video material consists of lectures recorded by the faculty member using Panopto, links to other content on the web that the faculty member has vetted, and links to videos prepared by students as part of course assignments (students have agreed to make these publicly available). While the Panopto lectures focus on topics for which students most need additional instruction, these could be improved with visuals, more creative approaches to the material, and research applications to make them more engaging to students.

The development of the list of topics to be produced will be a joint endeavor between the fellows and faculty. The fellows are expected to bring creativity and technical production expertise to the project. Two of the fellows produced an effective, high quality video on lab safety for a past project. [See (https://www.youtube.com/watch?v=enFFIK2Mhzw.] The fellows also remember how they successfully learned difficult topics in this and related courses. The list of proposed modules and an outline for each will be developed jointly. The fellows will then write a script, which will be carefully checked by the faculty member for scientific content. After the module is produced by the fellows it will be reviewed by the faculty member for any additional editing that is needed.

Both video and animated content for the organic lab was prepared with a Technology Fellows grant in 2010. The animations have proved popular, with one of the animated videos receiving over 63,000 hits on YouTube. We expect to repeat this success with the new content produced for introductory chemistry. The material will be posted to YouTube and linked on a dedicated webpage, which the faculty member will maintain after the end of the grant period. Students will be able to refer to this material after they have completed the introductory course. Christov Roberson, who teaches introductory biology, and Sunita Thyagarajan, who teaches a large lecture section of introductory chemistry, will recommend this material to their students as well.