



College of
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TEMPLE UNIVERSITY

Methods to Enhance Chemistry Student Engagement

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Abstract

The university student may find the applications and experimentation possible through chemical methods as engaging, but find challenges in understanding concepts of chemistry, leading to disengagement from learning. Computer-based learning (CBL) such as interactive websites and software, and live demonstrations are two methods to enrich and enhance learning. CBL has seen teaching use in the undergraduate organic chemistry curriculum such as Spartan and Trinity software and efforts to introduce interactive 3D websites have been investigated by Fleming et al. However, much material is taught with a textbook first mindset leading students to struggle with engagement. Finally, live chemical demonstrations are innately attention drawing, so teaching challenging topics in chemistry through demonstrations provides an engaging format for instruction.

In this project, topics in general and organic chemistry will be taught with a modified recitation curriculum to include a combination of CBL and visual demonstrations. These methods will be assessed through comparison with current teaching methods. Differences in understanding will be obtained through questionnaires and exam feedback. This project entails creating and incorporating demonstrations and CBL to enhance the general chemistry and organic chemistry curriculum at Temple University.

Keywords: Chemistry; education; computer-based learning; undergraduate; curriculum

Objectives

This project seeks to enhance and enrich the current Chemistry curriculum to emphasize student engagement from two perspectives; internal and external to the classroom.

Methods and Materials

An internal approach entails supplementing the lecture, laboratory, and recitation sections of a course with additional content, such as demonstrations, alternative explanations, question-and-answer sessions, and computer-based learning assignments. While learning objectives for the courses will remain unchanged (as per accreditation requirements) the approaches to teaching these concepts will be modified.

An external approach involves creating resources such as a Chemistry help-desk, scheduled demonstrations, and increased networking and professional development opportunities for students.

Engagement begins with finding a personal connection or interest to the material; Chemistry is a wonderfully diverse and far-reaching field. Real world applications of course content will be emphasized. For example, food chemistry and the science of everyday materials.

Internal Approach

Modify Lecture Component

- + Largest access to students
- + Connection between instructor and students
- + Connection between text and demonstration
- + Connection between demonstration and coursework
- Scheduling

Modify Laboratory Component

- + Fair access to students
- + Access to hands-on learning and collaboration
- + Opportunity for exploration and creativity
- + Connection between text; lab-technique; and course
- Safety
- Scheduling

Modify Recitation Component

- + Closest access to students
- + Opportunity for exploration and creativity
- + Team problem solving/collaboration
- + Scheduling
- Distant from immediate lecture/lab objectives

Collaboration

External Approach

Chemistry Help Desk

- + Casual helpful environment
- + Connection between instructor and students
- + Connection between text and demonstration
- + Connection between demonstration and coursework
- + Scheduling

Scheduled Demonstrations

- + Fair access to students
- + Access to hands-on learning and collaboration
- + Opportunity for exploration and creativity
- + Connection between text; lab-technique; and course
- + Safety
- + Scheduling

Professional Development and Networking

- + Bridge students and faculty
- + Opportunity for exploration and creativity
- + Team problem solving/collaboration
- + Scheduling
- + Ties in immediate lecture/lab objectives to future goals

Instructional Formats and Assessment

In-person; Computer-based learning; Video-based learning; usage of 3D and physical models to explain concepts; revised “office-hours”; adaptation to virtual learning; sensory demonstrations (i.e. food chemistry); asynchronous-learning.

Methods will be assessed through comparison with current teaching methods. Differences in understanding will be obtained through questionnaires and exam feedback.

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Conclusion

Project is currently in progress.

Future Goals

With a set of demonstrations and revised curriculum with demonstration and CBL components, a research study will be piloted in the 2024-2025 academic year to evaluate benefits to engagement and student success for the general and organic chemistry courses at Temple University.

