



# Expanding Engagement via Formative Assessment in a Survey Chemistry Course

Alexandra D. Tamerius

College of Arts and Sciences, Marian University Indianapolis

3200 Cold Spring Rd, Indianapolis, IN 46222

## ABSTRACT

Chemistry 100, a survey course in chemistry primarily for students in the health sciences, provides an excellent opportunity for creating a course tailored to student interests, while posing the challenge many non-major courses face of capturing student interest and motivating study of the subject. Typically taken by 1st year students, Chemistry 100 also provides an opportunity help students build good learning habits. Here, efforts to improve student engagement via formative assessments are presented.

### Project Aims

- Expand active learning in and out of class
- Develop frequent and varied formative assessments to monitor student learning
- Explore methods for obtaining frequent feedback on student-perceived strengths and weaknesses
- Connect chemistry explicitly to health science

## ELEMENTS OF GENERAL AND BIOLOGICAL CHEMISTRY

Chemistry-100 is an introduction to the principles of general, organic and biological chemistry designed for students in the health sciences.

### Prerequisite for admission into the Nursing Program

**Student Population:** Majority 1<sup>st</sup> year students in Nursing

**Course Structure:** 4 credit hours, 3x per week for 90 min

**Assessments:** 4 unit exams, weekly reading questions, in-class problem solving, review activities, and homework

## WEEKLY READING QUESTIONS

**Format:** quick weekly canvas quizzes to help students check their understanding.

**Assess:** Graded for correctness. Source of easier exam questions.

Reading questions help me monitor how students progressing in understanding material.

## HOMEWORK

**Format:** homework from textbook with answers provided.

**Assess:** Graded on completion. Source for harder exam questions.

Practice with immediate feedback on more challenging problems.

## PROBLEM SOLVING

**Format:** Various practice problems distributed throughout class time enabling students to ask questions and work through answers before seeing the instructor solution.

**Assess:** Ungraded and full solutions provided. Source for the most exam questions. Developing problems with connections to health science.

In class practice problems enable me to model good problem-solving strategies

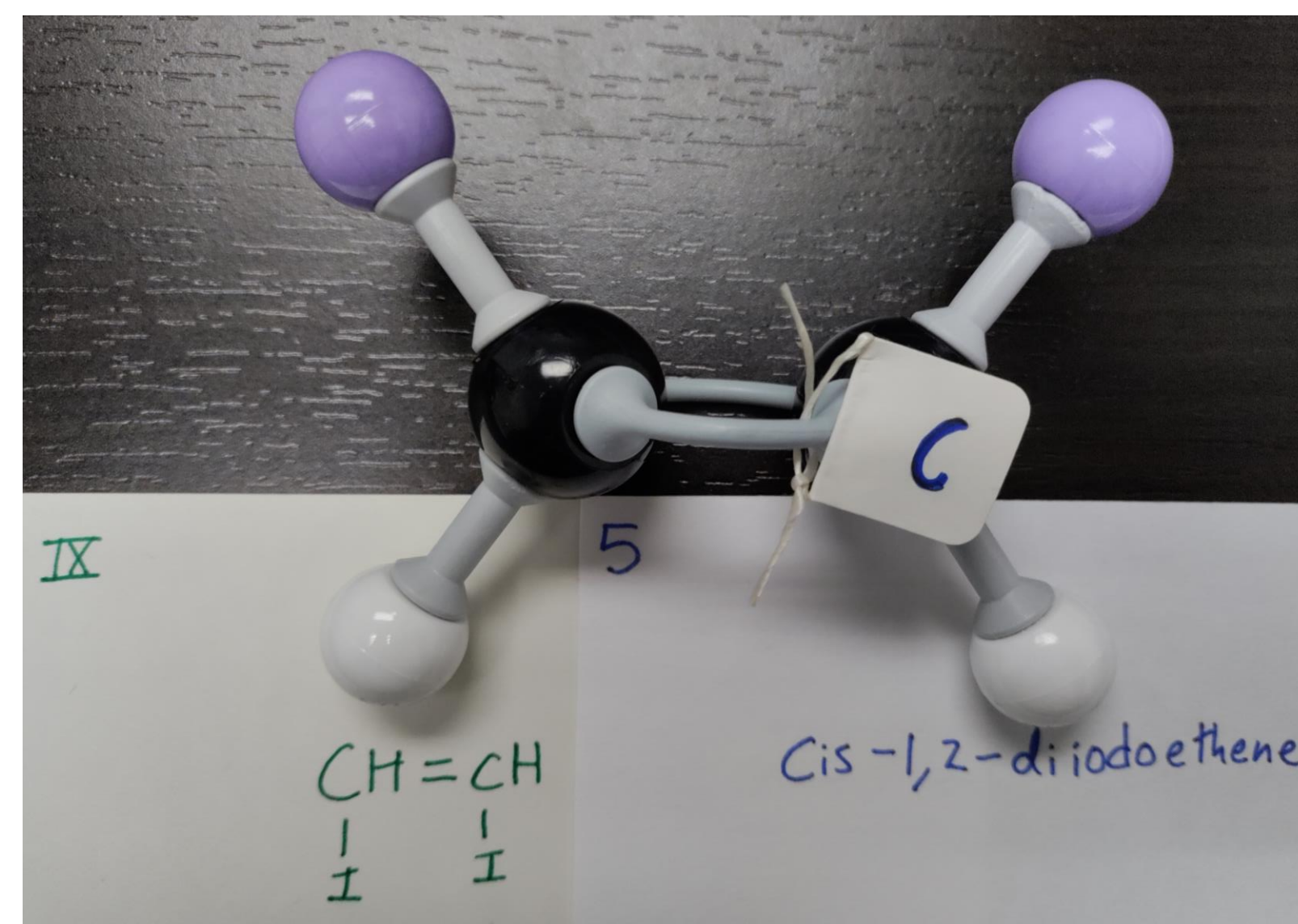
"I might not understand at first but after we do more practice questions, I get a better understanding."

**Quote 1.** From midterm evaluations: The aspects of the course that help my learning the most are...

## MOLECULE MATCHING

**Format:** over 2-3 rounds, students are given either a model, drawing, or name of a molecule and form groups to make a matching set. Then students answer questions about the molecule, before sharing their molecule with another group.

**Figure 1.** One of twenty molecule sets used in this activity. Each set includes a molecular model (C), structural drawing (IX) and formal name (5). As part of the activity students must form groups to match the sets are record the code: C, 5, IX.



**Assess:** Graded on correctness. Serves as the review for exam 3. Review activities for other unit exams are under development.

## BIO-ORGANIC QUIZ

**Format:** Quiz in same format as exams 3 and 4. Given between exams 3 and 4 to connect topics and help students improve.

After taking the quiz alone, students discuss solutions and study strategies in small groups.

**Assess:** Graded for correctness. Opportunity to improve on exam 3, which usually has the lowest average, practice for exam 4, and explore how the concepts connect.

## MUDDIEST POINT SURVEYS

**Format:** An optional anonymous survey where students can submit questions on course content that guide the topics for the in-class problem solving.

### Prompts:

- Write one concept or technique you learned recently that you feel confident about
- Write one or more things that are confusing you
- Write one medical application of a concept you learned

"The specific heat function problems and the heat of fusion problems confused me this week. I tend to get the variables mixed up and struggle to start the problems correctly."

**Quote 2.** From a muddiest point survey. Inspired class time on setting-up heat problems.

**Assess:** Common themes used to guide in class problems. Response rate is a major challenge for these surveys, considering making these an assignment for future courses.

## CONNECTION TO HEALTH SCIENCE SURVEY

**Format:** Final exam question about the connections students make between chemistry and health science.

**Assess:** Sorting responses by unit showed that unit two had the weakest connection to health science. Improving this connection will be the focus of future work.

### Prompt:

Describe one concept that you learned in this course and how it will help you in your future studies or career.

## FUTURE WORK

- Continue incorporating more in class practice problems
- Use a simple problem followed by a problem in context to strengthen connection to health science
- Develop review activities similar to molecule matching for each of the unit exams
- Develop method for improving survey response rates

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