Peer-Graded Assignment #2 **October 27, 2016**

Olivia Chesniak

For this peer-graded assignment, we're asking you to draw connections between principle and practice. First, describe a strategy for active learning instruction that you would like to implement in a future teaching context. Then, respond to a series of questions about that strategy, one question for each of the learning principles addressed in Weeks 1 and 2. Where the previous peer-graded assignment focused on content (learning objectives), this one focuses on the teaching and learning process.

Here are the questions you'll be asked about the active learning strategy you choose:

1. When implementing the active learning strategy, what steps would you take to activate students' prior knowledge in ways that would help them learn effectively?
2. How might you use the active learning strategy to help students develop more robust knowledge organizations in your domain?
3. What choices would you make when implementing the active learning strategy to make sure students had opportunities for practice and feedback?
4. When implementing the active learning strategy, what are two or three steps you could take to attend to the affective domain?

The structure of this peer-graded assignment is similar to that of a "jigsaw" cooperative learning activity. In a typical jigsaw activity, students split into, say, four groups. Each group investigates a different topic. Then new groups are formed so that each new group has a representative from each of the original four groups. Members of the new groups teach their groups about the four topics investigated earlier, resulting in students learning from and with each other.

In this peer-graded assignment, you're likely to be asked to evaluate peer responses an active learning strategy you didn't write about in your responses. This is your chance to better understand a different teaching practice, while leveraging what you know about the four learning principles to provide useful feedback to your peers.

Complete the following:

Describe a strategy for active learning instruction that you would like to implement in a future teaching context. Consider strategies discussed this week, as well as earlier in the course. Mention the teaching context you have in mind—course, topic, student population, "lecture" or "lab" course, and so on—and provide sufficient detail so that a peer evaluator in another discipline will be able to assess your response.

Course: Organic Chemistry Lab

Topic: Introducing students to experimental organic synthesis via ring-closing metathesis

Student population: Second year science majors

Activity: In groups of two, students will study the effects of various factors on the ring-closing metathesis reaction. The instructor will introduce the topic with relevant literature background. First, students will repeat the synthesis, purification, and characterization from a key literature reference according to the published conditions, with the optimization conditions presented, but its results withheld. Performing literature searches and repeating literature procedures is a significant step in experimental organic chemistry, which should be emphasized to the students. Second, each group will select a research question relevant to the optimization of the experiment, such as “How sensitive to water is the catalyst?,” “What is the optimal catalyst concentration?,” “What is the best solvent for the reaction, why?,” “What is the best solvent for column chromatographic purification of the product?,” and others. Students will design their own experiments to study these questions, discuss their plans with the instructor, and have the opportunity to revise their experiment before performing it. After performing the experiment the first time, another meeting with the instructor will guide students to optimizing their techniques and approach, with the opportunity to perform their experiment again to improve their results. Their reports will be written in the format of a peer-reviewed journal article and discuss their findings of the optimization and reasoning. Each group will also orally present their experimental results to the class, with the students assessing their peers’ use of the scientific method, results, and analysis and discussing the optimal reaction conditions.

We know that students’ prior knowledge and experiences shape how they make sense of new information. When implementing the active learning strategy you described above, what steps would you take to activate students’ prior knowledge in ways that would help them learn effectively? This might involve helping students bring to bear on a problem what they already know, or working to help students resolve existing misconceptions.

In order to effectively activate students’ prior knowledge, I would use the frequent instructor-student meetings to ask guiding questions about their previous experiences in organic chemistry lab, and the knowledge they have from both general and organic chemistry lectures. For example, with the students working on determining the optimal solvent, I could ask them guiding questions relating to the concepts of dissolution (like dissolves like) to help them determine relevant solvents to use in their experiment.

We know that how students mentally organize their knowledge affects their ability to solve problems. How might you use the active learning strategy you described above to help students develop more robust knowledge organizations in your domain? Consider ways to help students identify and understand relationships among concepts and examples.

This activity will highlight the use of the scientific method, something young scientists have been exposed to for years, in real research. They will need to draw upon their prior conceptual knowledge of chemistry in order to hypothesize and design their experiment while building new hands-on laboratory skills in order to perform their experiment, analyze their data, and revise when necessary. Ring-closing metathesis is a Nobel Prize-winning chemical reaction and is taught in many organic chemistry courses, so its presentation in the lab will allow the students to connect their conceptual knowledge with hands-on knowledge. Furthermore, as ring-closing metathesis is a Nobel Prize-winning reaction, it has tremendous relevance to industry and society and, in that regard demonstrates to students the importance of organic chemistry in real life, beyond a second year organic chemistry course.

We know that learning new concepts or skills requires iterative practice and feedback. What choices would you make when implementing the active learning strategy you described above to make sure students had opportunities for practice and feedback?

As described above, students will meet with the instructor at specific points in their design and experimentation process to obtain feedback on their hypothesis and experimental plan, as well as on their results after they complete their initial experiment. After receiving this feedback, they have the opportunity to revise their plan and/or repeat their experiment, therefore practicing their experimental development and laboratory skills.

We know that designing effective learning environments requires attention to the affective domain—feelings, values, beliefs, motivations. When implementing the active learning strategy described above, what are two or three steps you could take to provide a more positive classroom climate? Consider strategies for motivating students to learn, as well ways of fostering positive interdependence among students.

1. From my experience as an organic chemistry TA in a course where the purity and yield of products is the basis of students' grades, many students worry about their grade while performing the experiments, which distracts them from their learning. While I think students should know the importance of purity and yield of their products, I think that focusing more on the application of the scientific method in the context of organic chemistry is a better learning metric for students in a lower-division course. The grade for this activity will be determined based on the students' use of the scientific method when addressing this problem, as assessed by the instructor in the periodic meetings with students, their final lab report, and feedback forms filled out by each student during the oral presentations. For example, students will be assessed on their use of evidence to revise their hypothesis or procedure, the discussion in their lab report, the asking of questions to their peers during oral presentations (each student will be expected to ask at least one question), and their responses to those questions and questions from the instructor. This grading scheme will emphasize to students that they should be focusing on their scientific inquiry skills, rather than solely on their ability to perform the experiment.
2. In many classrooms there are students who have friends as well as others who don't know anyone. Working in pairs sometimes emphasizes these friendships and divisions and can cause students to feel left out. Additionally, group work sometimes falls to one high-achieving student while the other partner(s) do not contribute equally. Collaboration is a significant component of scientific work, and an example of this will be presented to students when they receive the introduction to this activity. In this activity (or the course as a whole), the students will be assigned partners based on the instructor's observations

of their performance throughout the initial portion of the course, pairing up students who are not friends and have not yet worked together. Further, a portion of students' grades will be based on a final evaluation of their performance, both their own, their partner's, and together as a team. Hopefully this levels the playing field for students and encourages positive interdependence.

3. I hope that providing examples and stories of the importance of ring-closing metathesis will convince students of the value of scientific research and motivate them through the difficulties they may encounter in this activity and in their futures as students and scientists.