# CETL Capstone Project

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**Revamping of chemistry Pre-laboratory Instruction Involving Active learning**

This year in the Faculty Teaching Certificate Program, we have discussed many ways to improve our teaching. I think the most powerful concept we need to work on is incorporation of as many active learning strategies into curriculum as possible.

**Purpose of project**

A perennial problem facing the laboratory sciences is that students often come to the laboratory ill-prepared. This has been observed in Chemistry 201 (Chem 201), and General Chemistry I. While the laboratory manual is well written and gives students the necessary background and detailed information about the procedure; instructors spend 15-45 minutes of class time each week preparing students for the laboratory experience. Some students highlight or underline in their laboratory manual or otherwise provide evidence that they have read the laboratory manual. However, there is often a disconnect when students are in the laboratory setting where it appears that students become focused on minute details and become nearly paralyzed in functioning in the laboratory setting. These students frequently ask questions whose answers are clearly stated in the manual and seem as thought they not read the manual. This leads to frustration for both the students and instructors. This project is intended to revamp the pre-laboratory instruction for Chem 201 to involve them in active learning and improve critical thinking necessary for students to be successful in the laboratory experience. My goal was to help students critically read and understand the laboratory manual. One lecture section (120 students) of Chem 201 in the spring semester was involved in this project.

**Project description**

Each week before a new laboratory started I asked students to come to class prepared for the diagnostic test, students were asked also to create the flow charts (the criteria for flow charts' evaluation were uploaded on D2L) which reflect the content and basic concepts of the current laboratory. At the beginning of each pre-laboratory instruction time I provided my explanation and utilized my own flow charts with laboratory equipment shown and connections between experimental steps and theoretical concepts involved. See attachment # 1.

I think their flow charts and my explanation helped students to visualize the laboratory setting and familiarized students with the equipment. Also each pre-lab preparation was finished with a 7-10 minute diagnostic quiz (five multiple choice questions to reinforce the concepts and procedure of the lab). See attachment # 2.The diagnostic quizzes were taken in groups of 3-4 students. Successfully passed diagnostic test and completed flow chart gave my students a chance to earn an extra one point for the lab score.

I would like to extend this work next semester and produce videos about equipment involved in laboratory and provide my pre-lecture guidelines. It will reduce class time spent working on lab preparation and will reinforce students' independent active learning and critical thinking as well.

I will share my results with others in our department teaching general chemistry. If this method is adopted by those teaching general chemistry, it will impact more than 500 students next semester.

In summary, I have come to the conclusion that active learning is something that I can continually use to enhance my courses. With a little extra effort on the course preparation, I am convinced that more active engagement of students through course related activities and assessment of these activities will improve my performance as a professor. Active learning strategies will help me to expend my pedagogical skills as well as develop critical thinking of my students.