

Improving Student Learning in General Chemistry II through Development and Recurring Assessment of Learning Objectives

The goals of my Scholarship of Assessment project involved addressing challenges in student learning and performance in CHEM 1252. I teach General Chemistry II using Process Oriented Guided Inquiry Learning (POGIL), a well-developed, evidence-based teaching strategy in chemistry. I aimed to gain insight on designing the course so that instructional time and assessments are well-aligned with the greater goal of improving student's learning and retention of knowledge in this critical progression course.

I met with the Office of Assessment and Accreditation staff (Elise Demeter, Karen Singer- Freeman, and Harriet Hobbs) in April 2019 after being notified that I received the Scholarship of Assessment grant. We discussed the anecdotal feedback I have received from students when teaching General Chemistry II using POGIL in the past. I sensed that students did not see the connection between the guided-inquiry activities that I use in class with the assessments (mainly exams). I was currently teaching the course that my Scholarship of Assessment project was about (General Chemistry II), so Karen suggested I ask students what they thought about the in-class activities to get their perspective in written form. Karen wrote the survey, and administered it anonymously to my Spring 2019 CHEM 1252 class. The survey confirmed my suspicions and let me see the students' perspectives specifically on how instructional time was spent. This survey was more valuable to me than the typical end-of-semester evaluation that all students are asked complete for every course in which they take. The survey results overwhelmingly show that my students do not think that what we spend our time on during class matches with what they are being asked to do on assessments. Although I see the

connection and value of building the concepts, as the expert, the connection is not clear to the students. The first big lesson I learned from working on this Scholarship of Assessment project was to **collect specific feedback from students on the learning activities completed during class**. If students do not see the benefit of what we are spending our class time on, they will feel as though I am wasting their time and will not continue to make the effort to learn.

The next lesson I learned by working with the OAA on my Scholarship of Assessment project was that **students need a framework to help them make sense of and organize the topics** as we discuss them throughout the semester. Elise helped me understand that the instructor should provide the framework for the students and not expect novices to develop the framework the first time through the material. I was charged with writing course-level learning objectives that could be used as the framework to provide to students. The course-level learning objectives could then be referred back to as we build knowledge and skills during the semester. Writing the course-level learning objectives was challenging for me as it made me think about what knowledge and skills do students need to gain from the course and not just what topics do I need to cover because they are what we always cover in this course. Elise shared a few resources with me that gave me the tools needed to write the course-level learning objectives that require higher order thinking and then provided feedback on my first draft of these objectives. Having these critical conversations with OAA help me think through this course-level perspective stage.

The course-level learning objectives build on the daily class lesson learning objectives that I had previously written. By showing how the learning objectives we

are meeting daily tie into the course-level framework, students' will hopefully see the relevancy of spending instructional time on developing the conceptual knowledge needed to apply it to solving chemical problems.

The next phase of my Scholarship of Assessment project re-introduced me to backward design. I was introduced to backward design several years ago (~10 years) but never followed through with using this design process in my instructional planning. I found it confusing and too difficult to work through on my own after having a one-day workshop on it. Elise re-introduced me to backward design now that I had the course-level learning objectives written. I learned **how to complete the backward design process** and had support from an expert while completing the steps. I am currently working on analyzing past assessments (homework assignments, quizzes, and exams) in the course to see if these assessments align with the course-level learning objectives. I will need to ensure future assessments align with the objectives or write a different objective that matches the assessment if it is an essential topic. Finally, the POGIL method I've been using during instructional time will be re-evaluated and adapted to provide students with the practice they need to develop their learning so that they will succeed when their learning is measured on the assessments.

Several changes will be made to my instructional practice as a result of this Scholarship of Assessment project. The course-level learning objectives will be provided in the course syllabus and continuously referenced throughout the course so that students realize what we do each day during class connects to the overarching learning goals for the course. I will continue to work on aligning instructional time and methods with student assessments and learning objectives.

The survey showed a huge disconnect from the students' perspectives. Students want more instructional time spent on the application of the chemical concepts to problem-solving than on developing the underlying concept. Both are important to learning the essential knowledge and skills students need to succeed but I realize I need to be more intentional about using class time for students to practice applying the concepts.

The anticipated impact from this project is an improvement in student learning and critical thinking skills, which will be measured through assessments. An increase in the number of students that are successful (earn a grade of A, B, or C) in the course is predicted as a result of improving student learning.

The next steps are to finish evaluating my past assessments to see how I may need to change instructional time to better align with the assessments we use to measure student learning. The results of this evaluation will direct the teaching strategies I use in the future. I anticipate that I will need to adjust my instructional time to include more application problems where students can get feedback as they solve them during class.

Future goals will be to apply the backward design process to the other courses I teach. I plan to write course-level learning objectives for students to use as a framework into which the knowledge and skills they gain during the semester will fit. I will review the assessments I have used in the past to evaluate how well the assessments match the learning objectives. Instructional time will be adjusted to provide students with the practice they need to be successful on assessments.