An Assessment Success Story in Chemistry

As a result of the assessment process, the chemistry faculty learned something significant about our program that has had profound and positive effects on our chemistry program.

In FY 2005 and 2006 we assessed the ability of students to come up with a workable procedure to identify components of an analgesic tablet. We expected students to write their own procedures, carry out their procedures, identify the components of the tablet, and write their conclusions in a concise and convincing manner. We found that students were having significant difficulty supporting their conclusions with the data they had available. This was a great disappointment to us and we began to ask why this aspect of the assessment was showing such poor results. We realized, somewhat to our chagrin, that there was simply nowhere in our program course sequence where we were really teaching students how to support their conclusions with data gathered from an experiment.

This important realization, made early in the Fall 2007 semester as we prepared our FY 2006 assessment report, has affected every aspect of our chemistry program ever since. We changed our list of student learning outcomes in our assessment plans to more clearly emphasize that we as a program felt that writing good conclusions supported by data was important. We modified lab exercises in CHEM 1115 and CHEM 1215 to begin including practice in writing conclusions supported by data early in the curriculum. We changed the formal report exercises in CHEM 1115 and CHEM 1215 labs, providing students with model paragraphs of how conclusions should be supported by data, to provide further practice. We started assessing one of the formal lab exercises in CHEM 1215 to monitor this skill early in the program. We started emphasizing writing conclusions more in organic chemistry labs and, when we modified our curriculum and wrote an in-house lab manual at the start of this year, we emphasized conclusion writing even more in the organic chemistry lab. Finally, we started measuring this outcome every year.

We saw a big drop in our success rate in 2007 for this outcome as we refined what our expectations were and communicated those to all full time and part-time chemistry faculty involved in the assessment of this outcome. We have since seen improvement over time as we have implemented changes to our curriculum to emphasize this important skill (please see the table below). We are refining our rubric and our expectations again for FY 2010 since we have realized that our definition of "completely supported" only includes students who are meeting our expectations perfectly and thereby fails to capture the students who are only missing one or two minor details but are otherwise meeting our expectations.

	% of Students			
Conclusions – Correctly identified unknown	2009	2008	2007	2006
Completely supported	45	25.3	11.8	45.5

Below is an excerpt from the FY 2006 assessment report for the chemistry program where we made our initial recommendation to include conclusion writing exercises throughout our curriculum.

Outcome 2: Ability to apply lab techniques

One of the major problems uncovered during the CHEM 2115 lab practical was the inability of the students to write a conclusion that provided clear and convincing evidence that the unknown had been identified correctly. Upon reflection, this difficulty is, perhaps, not surprising since the program curriculum does not emphasize this skill in earlier courses. In order to improve performance in this area, students must be taught to write such conclusion statements. This must begin during experiments conducted during both CHEM 1115 and CHEM 1215. Such conclusion statements must be modeled for the students and then students must have the opportunity to practice this skill repeatedly. This skill should then be reinforced during all CHEM 2115 laboratory experiments. Repeated emphasis during CHEM 2115 experiments appears to have met with some success in one section where it was tried during 2006. In that section, 40% of the students wrote a compelling conclusion statement after being required to write such conclusions repeatedly during the semester compared to only 16.7% in a section taught by the same faculty member when it was not emphasized.

(Submitted by Dr. Steven Shore, Professor of Chemistry)