

The **chemistry program** in the Department of Chemistry & Physics was selected to participate in Western Carolina University's pilot *Quality Enhancement Plan* (QEP) beginning fall 2008. The overall goal of our program is to provide pre-doctoral scientists in chemistry with rigorous classroom education, practical laboratory training, and opportunities for participating in original research projects, so that these graduates may be successful in a broad spectrum of careers such as the health professions, as well as academic, governmental, and industrial research. These goals aligned very nicely with the five learning outcomes that define the WCU QEP. With these goals in mind, I will discuss some of the activities and the assessment of those activities of **Outcomes 2 and 3** with respect to collaborative research projects and the communication of science in a variety of venues.

Outcome 2: *Solve complex problems*

Problem solving is an essential component of the research experience and we consider engagement of undergraduates in collaborative research projects with faculty as one of our core strengths. CHEM 380 (Research in chemistry) is perhaps the best avenue for our students to synthesize their curricular experiences and apply it to new situations. Most students elect to participate in research beginning in their junior year. In the fall 2009 semester, there were **19** students enrolled in CHEM 380 out of all 78 chemistry majors, including freshman and sophomores. During the fall 2011 semester, **27** students out of 95 majors participated in research. Over the past few years, the chemistry program has averaged approximately a **25%** participation rate of students working on undergraduate research projects.

A few select students spend the summer doing *paid* research at other universities through the National Science Foundation's Research Experiences for Undergraduates (REU) program. In the summer of 2011, two chemistry majors from our department participated in REU programs at the University of Michigan and the Johns Hopkins University. In addition, another student spent the summer at Oak Ridge National Lab in a Department of Homeland Security sponsored Nuclear Forensics summer fellowship; he was one of three students nationwide selected for this program and is now enrolled in the Nuclear Forensics doctoral program at the University of Tennessee/Oak Ridge National Lab. In the summer of 2012, two of our majors participated in REU programs at UNC-Charlotte and the University of California at Davis. Another student, who is interested in the field of prosthetics, did an internship at a medical facility that specializes in the development of prosthetic devices.

Assessment of **Outcome 2:** During the past few years the number of chemistry majors has steadily increased and, consistent with that trend, the number of students engaged in collaborative research projects has also increased. In addition, during the last two years **5** students have made research presentations at chemistry specific conferences, **4** have presented at NCUR, and **3** students have been co-authors in a peer-reviewed journal. Exit interviews of graduating chemistry majors indicate that a student's research experience is among the most rewarding of their undergraduate career and, in response to feedback from those surveys, we have made changes to how we promote research projects to our undergraduate majors. However, the current series of questions on the exit interviews does not reflect the format of the QEP; we will address this inconsistency in the next series of exit interviews. In addition, we do not currently collect information on about the experiences of our students that participate in research programs during the summer, but the department can potentially learn a great deal from them and will begin surveying these participants.

Outcome 3: *Communicate effectively and responsibly*

CHEM 272 (Organic chemistry lab) is a writing-intensive laboratory course which meets 6 hours/week. Students are assessed in this lab course not only by the outcome of their experiment, but also by their ability to communicate the results of that experiment. There are 9 lab experiments throughout the semester and 5 of those experiments have formal lab reports formatted using a peer-reviewed chemistry journal template. All instructors of the course use the journal template as a way to standardize the appearance of the report so that the emphasis is shifted to the writing and content. Anecdotal evidence and student comments in CoursEval suggest that the use of the journal template has indeed improved the quality of student writing.

Another approach aimed at improving student writing in this lab course is the use of a grading rubric. The hypothesis of this approach is that when rubrics are given to the students before they complete their work, they have a better understanding of how they will be assessed. The rubric is quite detailed and has point values associated with each level of performance. Once again, anecdotal evidence suggests that the use of a rubric to establish a clear set of expectations indicates that this approach is successful. However, no real assessment data is available.

Assessment of **Outcome 3:** *CoursEval* provides limited feedback to the instructor about strategies or activities used in the classroom. Thus, in order to evaluate the effectiveness of the grading rubric, Robert Crow in the *Coulter Faculty Commons* will be consulted to assist in designing a survey/questionnaire that will provide the instructors of CHEM 272 constructive feedback about the writing component of the course.