

**To: Sharon Calhoon**  
**From: NIMS Chemistry Faculty**  
**Subject: Chemistry Degree Assessment Report**  
**Period Covered: Spring 2005-Fall 2006**  
**Date: October 23, 2006**

## **I. Brief Summary of Assessment Plan**

We have decided to select Goal I: Students earning a Bachelor of Arts degree in Chemistry will demonstrate knowledge and understanding of the theoretical basis for descriptive chemistry. We will test CHEM-C 106 students using a multiple choice examination prepared by Dr. Kasem and reviewed by the other chemistry faculty. We will test the CHEM-C 211 students using an examination prepared by Dr. Gillette. To continue the pattern established by Dr. Haffley prior to his retirement in Spring 2004, we will use the organic chemistry examination prepared by the American Chemical Society to assess CHEM-C 343 students.

The benchmarks we have selected are:

- CHEM-C 106: Because this examination has not been tested previously, the only valid benchmark we can anticipate is a strong correlation between the success of students on this examination and their final grades in the course.
- CHEM-C 211: Based on our previous experiences with this examination, slight changes have been made to better test the desired outcome. Because enrollment is so low in this course (one student last year) it is difficult to set a benchmark. We would expect to see a strong correlation between the score and student's final course grade.
- CHEM-C 343: Studies made by Dr. Haffley prior to his retirement in Spring 2004 regarding the performance of his organic chemistry students (CHEM-C 342/344) since 2000 indicated a close correlation between their earned course grade(s) and their performance on the nationally-normed American Chemical Society organic chemistry examination. We expect this correlation to continue, and Dr. Xie has set performance at the national average as a benchmark for this examination.

## **II. Assessment Methods**

- CHEM-C 106: Historically, standardized, nationally-normed tests written by representatives of the American Chemical Society Examinations Institute for students completing first year chemistry courses have been administered. The department decided not to continue using the ACS exam for C-106. Instead, Dr. Kasem prepared a one hundred-point exam that was reviewed by department members and was given in May, 2006. This examination was worth 100 of the 500 available points upon which the grades were based. We have nothing concrete with which to compare student results on this examination. Further, because he will be on Sabbatical leave in Spring 2007, the department examination given at the end of CHEM-C 106 in Spring 2007 will change.
- CHEM-C 211: Student(s) demonstrated their understanding of the course material by completing a two-problem, open book, written examination. Each problem involved a scenario in which the student, working in a commercial analysis laboratory, is contracted to analyze a hypothetical sample for a specific substance. Students must design an analytical method based on the equipment and reagents present in their

“analytical business” and prepare a complete procedure for each analysis, including standardization of reagents. They present this information to the instructor, who then generates data appropriate for the analysis. Using these data, students determine the outcome of the analysis and write a formal report to the person requesting the analysis. This examination, which counts for 200 points of a possible 800 points in the course, was last given by Dr. Gillette in December, 2005.

- CHEM-C 434: Dr. Xie gave the American Chemical Society organic chemistry examination in May, 2005. Students are accountable for their performance on this examination because it is worth 200 points towards the total of 600 available points upon which their final grade is based.

### **III. Description of Assessment Results**

Only very limited data have been collected since the assessment document was prepared because the number of chemistry majors is small.

- CHEM-C 106: Dr. Kasem’s analysis of the department exam, completed by twenty students, data appears as Appendix I at the end of this report.
- CHEM-C 211: The one student who took the CHEM-C211 exam did extremely well, producing a nearly perfect exam. Because he is a strong student, it’s difficult to tell whether his success is a measure of program improvements or whether he is someone who has a command over the material because of his experiences in prerequisite courses.
- Dr. Xie’s students also took the nationally-normed American Chemical Society organic chemistry examination last year, and the average of the class (40.09/70) was higher than the national average (39.22/70). The data also indicate a correlation between their earned course grade(s) and their performance on the exam.

### **IV. Using Assessment for Program Improvement**

The addition of Dr. Xie to our department has brought expertise in new areas of chemistry, particularly Green Chemistry. Taking advantage of her areas of expertise, we have added several new courses to the chemistry offerings. These changes have caused us to reconsider the requirements for our BA degree in Chemistry. Dr. Xie is examining the requirements for a similar degree on our peer campuses, and the department members are currently in the process of discussing possible degree requirement changes. Once we have completed our examination of our degree requirements, then we will decide whether making changes in our assessment plan is appropriate.

### **V. Dissemination of Results**

Students learn of the assessment results because, in each case, the grades they earn on the exams count heavily into their final course grades. Faculty/staff learn of the results when the department members meet to consider program changes and/or modifications. To date there have been no relevant responses to report.

### **Appendix 1: Learning Assessments Report, C106 (Spring 2006)**

Instructor: Kasem K. Kasem

Test Used: Departmental test composed by Dr. Kasem and reviewed by the Chemistry faculty

Time allowed: 120 minutes

Participating students: 20 (including five declared Chemistry majors)

Statistics: Highest number of correct answers within the given time is 48 out of 60

Average number of correct answers is 35

Average number for chemistry students is 37

Comments:

- The test is at the same or little above the level of difficulty as ACS exams.
- Taking the above point into consideration, only less than 1% of students' nations' wide answer 52/60 ACS exam questions correctly. The results of this test are very consistent with the level of IUK students. The average score in this test is within the national average of national test.
- Scores of this test are also consistent with the final grades which the students got in the non-multiple choice exams given during the spring semester. Table 1 illustrates this point.
- Students scores less than expected in questions that requires application of exponents or logarithms.
- Because of the nature of multiple choice tests, more testing is needed to have enough information that we can use to judge our students comprehension and learning style.

**Table 1** Comparison between final comprehensive Department test and the Final student's grade

Final grade	Correct answers out of 60 questions
B	41
B+	35
D+	24
W	W
C	31
A-	44
A-	44
D+	20
A-	44
B	33
ZZ (B)	39
C	24
C+	33
B-	34
C-	27
C+	33
W	W
B+	39
D+	26
C	32
C+	24
A-	48