

## **Assessment Plan for the Department of Chemistry: Graduate Program**

### **I. Mission**

The University of South Dakota is the comprehensive university within the South Dakota System of Higher Education. The university's mission is to provide graduate and undergraduate programs in the liberal arts and sciences and in professional education; to promote excellence in teaching and learning; to support research, scholarly and creative activities; and to provide service to the State of South Dakota and the region.

Consistent with the university's mission to provide graduate programs in the sciences, the department of chemistry seeks to provide rigorous graduate training at the Master's level, primarily for students seeking careers as a professional chemists. The Department of Chemistry recognizes the importance of research as the primary scholarly activity at the post-graduate level of chemical education and requires a research-based thesis of all Master's candidates.

### **II. Goals**

The mission of the department is to provide Master's-level education and professional training for post-baccalaureate students who either hold degrees in chemistry or have a strong undergraduate science background. Our graduates, more than half of which will go on to complete Ph.D. programs, usually become professional chemists. Pursuant to our mission, the department has set for itself the following broadly defined goals:

1. To teach students the 'structure' of modern chemistry, which includes the guiding principles and methodology of chemistry and how these are applied to the description of chemical systems and to the solution of chemical problems. This goal is the one most closely tied to the pure classroom component of our curriculum, and includes the 'book knowledge' which is essential to the practice of chemistry. The classroom curriculum ensures that there are no serious gaps in the students' understanding of the most essential principles of chemistry, and builds upon their undergraduate foundation to the extent that they can effectively use these principles in the modern research laboratory.
2. To provide practical training for our students within the context of the modern research laboratory. Students join the research program of the faculty member of their choice, and, under that faculty member's guidance, become active participants in solving standing problems in chemical research. Students should develop the ability to fuse their classroom and laboratory experiences to become independent problem solvers.

### **III. Objectives**

#### Objectives Related to Goal 1:

1. Students will perform competently on national standardized examinations which are developed and distributed by the American Chemical Society (ACS).

Objectives Related to Goal 2:

2. Students will demonstrate competence in independently gathering, interpreting and communicating the results of modern chemical research, and be able to independently design an experimental or theoretical strategy to solve a defined problem in chemistry.

#### **IV. Assessment Techniques: Methodology for Assessment of Student Achievement of Objectives Listed in Section III.**

Objective 1: Students will perform competently on national standardized examinations which are developed and distributed by the American Chemical Society (ACS)

Subject-specific standardized examinations distributed by the American Chemical Society (ACS) will be administered as 'Exit Exams' for all Master's candidates. Each student is required to show competency in the four major areas of chemistry (organic, inorganic, analytical, and physical) by passing ACS standardized exams in each area. The standardized exams are offered twice yearly, and students are allowed two attempts at each test. Students who fail to perform satisfactorily after two attempts are assigned a remediation program of study in the area of deficiency, after which they are allowed a third attempt. Different versions of the exam are given at each attempt. Students typically sit for the exams in their second year, but may also take tests in their first year. Each student must achieve two 'high passes,' which corresponds to the 60<sup>th</sup> percentile or better compared to the national norms for all undergraduates taking the same test. The minimum score for a 'low pass' is 40<sup>th</sup> percentile.

Objective 2: Students will demonstrate competence in independently gathering, interpreting and communicating the results of modern chemical research, and be able to independently design an experimental and/or theoretical strategy to solve a defined problem in chemistry.

Students will, in their first year, present a public seminar on a topic of current interest in chemical research. Students are required to research their topic in the literature and organize the presentation such that the chemical principles and important conclusions are communicated in an effective manner. All faculty and graduate students are required to attend these seminars (which are also announced to the public). Each person in attendance completes an evaluation form, the results of which are compiled and provided to the student presenter.

Students will submit a thesis outlining the background, methodology, and results of their research project and defend their conclusions before faculty and peers. The Master's thesis is the culmination of the student's graduate education and is the principle tool used for assessing student performance. Prior to the actual defense of the thesis, the Master's candidate gives a seminar on their research project, which is attended by the faculty and peers. Following the seminar, the student defends the thesis to two chemistry faculty and one faculty chosen from outside the department.

#### **V. Review of Results**

The department holds an annual retreat prior to the start of the Fall semester, the purpose of which is, in part, to evaluate the effectiveness of the department in terms of meeting our goals and objectives, and to formulate strategies to improve the program.

For Objective 1, the faculty will review our students' ACS scores and determine collectively whether or not the results are satisfactory. The appropriateness of the ACS tests for each majors' course will also be re-evaluated.

For Objective 2, the department will review the effectiveness of our graduate students in producing work which is publishable in peer-reviewed journals, and on the general quality of the student thesis. The department will also consider the record of success of graduates who continue on to Ph.D. programs.

## **VI. Communication of Results and Interpretations**

Results of ACS standardized exams are communicated to the faculty members and to the individual student.

The student seminars are open to the public, and copies of the student thesis are available in the Library and in our department.

Copies of the department assessment plan and assessment report will be made available on the Web as PDF files, which can be read using Adobe Reader freeware.

## **VII. Responsibilities and Involvement**

The departmental Assessment Committee, presently consisting of Joe Vitt, Miles Koppang, and Stanley May, will have the responsibility of coordinating our assessment efforts and assimilating our assessment results. Review and interpretation of the results will be the responsibility of the entire department.