Assessment report for the 2014/2015 academic year

Department of Chemistry and Biochemistry

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September 15, 2015

During the 2014/2015 academic year, the assessment that was performed in the Department of Chemistry and Biochemistry was focused on learning outcomes 1, 2, 3, 5, 6, 7, and 8. For learning outcomes 1, 2, and 6, the students’ proficiencies were evaluated during their CHMY 494 and BCH 494 capstone seminar courses. For learning outcomes 3, 5, and 7, the American Chemical Society (ACS) standardized subject exams in organic, analytical, and physical chemistry were administered. Learning outcome 4 and part of learning outcome 3 were not assessed during the 2014/2015 academic year. Learning outcome 8 was assessed using the endorsement data for high school teacher certifications.

**Overall Summary**

All of the learning objectives are being met programmatically, indicating that this is a strong and successfully program for chemistry and biochemistry majors when compared to other programs in the United States.

**(1) Learning Outcome 1**

Professional, biochemistry, and teaching options: Students will be able to clearly communicate research findings in an oral presentation and poster session format.

Assessment for Learning Outcome 1

Fourteen senior-level undergraduate students were evaluated for clarity and depth of oral presentation during a 25 minute PowerPoint presentation to their peers in CHMY 494 and BCH 494 senior capstone seminar during the spring semester of 2015. All of the students successfully communicated their research findings in both formats.

**(2) Learning Outcome 2**

Professional, biochemistry, and teaching options: Students will be able to solve problems related to chemistry and biochemistry.

Assessment for Learning Outcome 2

The ability of fourteen senior-level undergraduate students to comprehensively solve problems related to chemistry and biochemistry were evaluated during their 25 minute oral PowerPoint presentations to their peers in CHMY 494 and BCH 494 senior capstone seminar during the spring semester of 2015. All students mastered the problem solving learning objective as demonstrated by their presentation of the progress that they were able to make and then describe for their research projects.

**(3 and 7) Learning Outcomes 3 and 7**

Professional and teaching options:

Students will have a broad knowledge required in organic, inorganic, physicaland analytical chemistryas well as in biochemistry.

Assessment for Learning Outcomes 3 and 7

Organic and Analytical areas were assessed for all majors. Physical chemistry was assessed for the teaching major.

Nineteen majors in CHMY 323 took the ACS organic subject exam (2012) as the final exam for their course. The average score for this cohort placed them at the 25th percentile nationally, with a median score at the 30th percentile. Eight of the majors completed the honors organic chemistry sequence, which is not scheduled to be assessed until spring of 2016. After assessment of both CHMY 323 and CHMY 333 during the spring semester of 2016, we will determine whether any changes need to be made so that this learning objective can be met in future years. The spring 2015 outcomes were very high compared to the national norms, indicating that this year’s performance is an anomaly.

Twenty-eight majors in CHMY 311 took the ACS analytical chemistry subject exam (2001 or 2013) as the final exam for their course. The average score that ACS reports for the 2013 exam is 26/50 questions, and the average score for the six MSU students who took this exam was 40.5! The average for the twenty-two students who took the 2001 version of the exam was 33.4, while the national average was 28 for this exam. For analytical chemistry, our students are well above the national average overall. This course was taught in the TEAL classroom.

The physical chemistry component of this learning outcome was not assessed during the 2014/2015 academic year for the professional option. The biochemistry component was not assessed during the 2014/2015 academic year for the teaching or professional option.

**(4) Learning Outcome 4**

Biochemistry option:

Students will have a solid foundation in all aspects of biochemistry.

Assessment for Learning Outcome 4

This Learning Outcome was not assessed during the 2014/2015 academic year.

**(5) Learning Outcome 5**

Biochemistry option:

Students will be able to apply mathematical tools and computational methods to biochemical problems.

Assessment for Learning Outcome 5

Nine majors with the biochemistry option took the ACS physical chemistry comprehensive subject exam during CHMY 361. The average score for this cohort placed them at the 55th percentile nationally, with a median score at the 48th percentile. Since this exam is meant for professional option students who have had two courses in physical chemistry (CHMY 371 and CHMY 373), and is meant to be given during 110 minutes rather than 50 minutes, these scores indicate that this learning objective is being met very well by our curriculum. Even with only one semester and with less than half of the recommended time for test taking, the average for the MSU students beat the national average!

**(6) Learning Outcome 6**

Biochemistry option:

Students will understand the problems in another biological science (e.g., microbiology, cell biology, neuroscience, plant or animal science) that biochemical techniques help solve.

Assessment for Learning Outcome 6

Twenty-five senior undergraduate students were evaluated for clarity and depth of oral presentation during a 25 minute PowerPoint presentation to their peers in CHMY 494 and BCH 494 senior capstone seminar during the spring semester of 2015. All of the students demonstrated extremely high mastery of this learning option.

**(8) Learning Outcome 8**

Teaching option:

Students will develop instructional and pedagological competence such that they meet state certification standards.

Assessment for Learning Outcome 8

According to the Field Placement Office's data on endorsements as provided by Bill Freese ([iedbf@montana.edu](mailto:iedbf@montana.edu)), between September 1, 2014 and August 31, 2015, four candidates graduated and were endorsed to teach chemistry. One was an undergraduate chemistry teaching major endorsed to teach in Montana. Three were Northern Plains Transition to Teaching masters in Curriculum and Instruction graduates, one endorsed to teach in Montana, one in Idaho and one in Wyoming. There were no new chemistry teaching endorsements during AY 14/15 for candidates who graduated in earlier years. There were no unendorsed undergraduate chemistry teaching graduates who graduated during AY 14/15.

**Overall Summary**

All of the learning objectives that were tested during the 2014/2015 academic year were met programmatically except for the organic chemistry learning outcome (which has been repeatedly met in previous years), indicating that this is a strong and successfully program for chemistry and biochemistry majors when compared to other programs in the United States.