

## Form E-1-A for Boston College Core Curriculum

### Department/Program Chemistry 2024

- 1) **Have formal learning outcomes for the department's Core courses been developed? What are they?** (What specific sets of skills and knowledge does the department expect students completing its Core courses to have acquired?)

The department has developed learning outcomes for chemistry core courses which are consistent with those established by the University Core Committee for all core courses in natural sciences.

*Students completing chemistry core courses will:*

1. Expand their understanding of the principles, body of knowledge, and investigative strategies that comprise chemistry and its applications
2. Develop a chemical and scientific literacy that will promote curiosity, respect for the scientific method, and general awareness of the limitations of scientific conclusions
3. Recognize the role of scientific discovery, past, present and future, in interrelated concerns such as human health, societal well-being, and planetary sustainability
4. Appreciate the role of science and chemistry in defining their relationship with the natural world and their position within the cosmos

- 2) **Where are these learning outcomes published? Be specific.** (Where are the department's expected learning outcomes for its Core courses accessible: on the web, in the catalog, or in your department handouts?)

Department website: <https://www.bc.edu/content/bc-web/schools/morrissey/departments/chemistry/academics/undergraduate.html>

- 3) **Other than GPA, what data/evidence is used to determine whether students have achieved the stated outcomes for the Core requirement?** (What evidence and analytical approaches do you use to assess which of the student learning outcomes have been achieved more or less well?)

Professor Daniel Fox is the instructor for two core courses, CHEM1115 Fundamentals of Chemistry and CHEM1109 General Chemistry I. Fundamentals of Chemistry was created in 2021 to provide a foundation in chemistry concepts and problem-solving skills for entering students who are under-prepared in STEM subjects. It was approved to fulfill a natural science core requirement in 2023. While General Chemistry I is a course primarily taken by science majors and students interested in applying to post-graduate healthcare programs, it also satisfies a natural science core requirement. In 2023-24, Professor Fox administered assessment surveys to the students in both of these courses. For the Fundamentals of Chemistry course, surveys were administered at the beginning and end of the semester. For General Chemistry, a survey was administered at the end of the semester. The surveys were a combination of Likert-type and open-ended questions.

- 4) **Who interprets the evidence? What is the process?** (Who in the department is responsible for interpreting the data and making recommendations for curriculum or assignment changes if appropriate? When does this occur?)

The instructor for Fundamentals of Chemistry and General Chemistry I, Prof. Dan Fox, and the Chair of Undergraduate Studies in Chemistry, Prof. Lynne O'Connell, interpret the evidence together. Prof. Fox compiles the results, and then he and Prof. O'Connell analyze and interpret the data and discuss changes to the curriculum. This occurs during the summer.

- 5) **What were the assessment results and what changes have been made as a result of using this data/evidence?** (What were the major assessment findings? Have there been any recent changes to your curriculum or program? How did the assessment data contribute to those changes?)

In the Fundamentals of Chemistry course, students' confidence in chemistry on a five-point scale increased from an average rating of 2.6 at the beginning of the semester to 4.0 at the end. Students also reported an increase in how often they thought about chemistry in their everyday life (from 2.3 to 2.9). Students felt the course prepared them well for General Chemistry (an average of 4.3 on a 5-point scale). An open-ended question asked them to share other comments. Students referred to positive feelings about how the course was organized, namely that it focused on learning basic concepts in chemistry and that a large portion of the time was spent applying those concepts to solving problems. In the future, the instructor will incorporate more real-life examples into the problem solving exercises.

In the General Chemistry I course, students reported that their chemistry knowledge had increased significantly over the course of the semester (3.9 rating out of 5 where 5 indicates that their knowledge increased a great deal). Students rated their frequency of thinking about chemistry in their everyday life at 2.8 on the five-point scale where 5 indicates that they think about chemistry "all the time". Students rated the course as rather difficult (3.5 out of 5) with exams and quizzes rated with a difficulty of 3.8 out of 5 (note however that the class average on exams was near 80%). An open-ended question asked what worked well about the class. Students commented that having regular homework assignments due (as well as optional homework problems) in order to ensure that they worked on learning concepts through problem-solving was a highlight. Regular quizzes were similarly appreciated for helping to keep students current on the material. Students also appreciated having time to work on some problems in class. Another open-ended question asked what could be improved. Some students felt that the pace of the class was too fast and that practice problems were not as challenging as the exam questions.

- 6) **Date of the most recent program review.** (Your latest comprehensive departmental self-study and external review.)

A Periodic Report is required by the American Chemical Society (ACS) for certification of our majors program every 5 years. Our most recent report was filed in July 2022, and we received notification in August 2022 that our program meets all the requirements of the ACS Guidelines. Several items were cited as strengths, such as our up-to-date instrumentation, robust curricular offerings and laboratory safety training for students. The most significant issue cited was a lack of racial/ethnic and gender diversity at the faculty level.