Form E-1-A for Boston College Core Curriculum

Department/Program Chemistry 2025

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#tab-core_courses

   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?)

   In 2024-25 Professor Clarissa Keen, instructor for CHEM1105-6 Chemistry and Society I-II, added the following question to the final quiz: What has been your biggest takeaway or leaning outcome from this semester of Chemistry and Society? In addition, a series of "reflection" questions of her own design allowed students to provide feedback about their learning and progress in the course. She also utilizes course evaluation forms developed by the Boston College administration to assess her courses.

3) **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 Chemistry and Society, Prof. Clarissa Keen, and the Chair of Undergraduate Chemistry Studies, Prof. Lynne O'Connell, interpret the evidence together. Prof. Keen reads the student responses to the question on the final quiz and codes them thematically through inductive analysis. She then

deductively matches these themes to the learning objectives listed in item 1 above. She compiles this information along with student reflections and course evaluation results, and then she and Prof. O'Connell analyze and interpret the data and discuss changes to the curriculum. This occurs during the summer.

4) **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?

Student responses to the question on the last quiz indicated that all the learning outcomes were achieved to some extent. Responses from both the fall and spring semesters matched the third (*recognize the role of scientific discovery, past, present and future, in interrelated concerns such as human health, societal well-being, and planetary sustainability*) and first (*expand their understanding of the principles, body of knowledge, and investigative strategies that comprise chemistry and its applications*) outcomes most frequently. Responses from the first semester course (CHEM1105) were also indicative of the fourth learning outcome (*appreciate the role of science and chemistry in defining their relationship with the natural world and their position within the cosmos*) while those from the second semester (CHEM1106) favored the second outcome (*develop a chemical and scientific literacy that will promote curiosity, respect for the scientific method, and general awareness of the limitations of scientific conclusions*).

When responses to the reflection questions were analyzed, it was found that a majority of students felt the course increased their appreciation for the interconnectedness of chemistry with societal issues and also increased their understanding of environmental and public health concerns using a chemistry framework. Many students felt enabled to educate others and to take action based on their new knowledge.

In the past, students commented that there was a lack of connection from one topic to the next (see E-1-A from 2023). The instructor is now presenting the material in a different order and has noticed significantly fewer comments regarding this lack of connection. Recently, students have asked for more support when learning fundamental chemical concepts, specifically that the instructor should provide additional practice problems. They also asked for more feedback from the instructor on an assigned project.

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.