

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

### Department/Program: Chemistry 2018

- 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's learning outcomes for chemistry core courses are in line with those that are established by the University Core Committee for the natural science core requirements. The Core Requirement Rationale can be found on the natural science core curriculum website via the following link: [https://www.bc.edu/bc-web/schools/mcas/undergraduate/core-curriculum/core-requirements.html#2\\_courses\\_in\\_natural\\_science](https://www.bc.edu/bc-web/schools/mcas/undergraduate/core-curriculum/core-requirements.html#2_courses_in_natural_science)

- 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?)

The learning outcomes can be found on the chemistry department website from a link to Core Courses in Chemistry on the Undergraduate Studies page:

<https://www.bc.edu/bc-web/schools/mcas/departments/chemistry/academics/undergraduate/core-courses.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?)

For *Intersection of Science and Painting* (CHEM 1102), a final term paper of 2000 words is required in which each student discusses a color from a scientific perspective, describing the chemistry of pigments that exhibit that color, the experimental spectroscopic methods of analysis used to study the pigments, and examples of published studies where those methods have been used to study art objects. In addition, an anonymous learning outcome survey is submitted by each student at the end of the final exam that asks four questions, requiring a response of Strongly Agree (4), Agree (3), Disagree (2), or Strongly Disagree (1). The 2018 summary scores of these four questions are listed below:

1. This course expanded my understanding of the underlying scientific principles, body of scientific knowledge, and methods of scientific analysis that underlie the human experience and scientific investigation of color in Nature and in works of art. **[Summary score: 3.42 out of 4]**
2. This course has helped to develop my sense of curiosity about how things work in nature, my respect for the value of science in the world of art, as well as an awareness that science has limitations and cannot tell us why things work the way they do. **[Summary score: 3.63 out of 4]**

3. In this course, I came to recognize more fully the role that scientific discovery has played and increasingly will play in the fields of art appreciation, art history, art conservation and art authentication. **[Summary score: 3.45 out of 4]**
4. This course has taught me to look at things in the natural world with a new appreciation for the scientific method that asks: What is the science behind this phenomenon? **[Summary score: 3.32 out of 4]**

For the relatively new core course entitled *Living in the Material World* (CHEM1701), pre- and post-tests were administered to the students that contained chemical equations. The tests asked students to balance the equations and identify which ones represent redox reactions.

- 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?)

Professor David McFadden, instructor of *Intersection of Science and Painting*, reads all the papers and summarizes the statistics from the anonymous surveys. He evaluates how effectively the students are able to express themselves from a scientific perspective in their term papers. He looks for responses in the survey that would indicate the goals of the core curriculum are not effectively being met. The professor makes changes to the course from year to year as his teaching of science to non-science students evolves and improves.

Professor Dunwei Wang, instructor of *Living in the Material World*, analyzed the data from the pre- and post-tests for that course.

- 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?)

The 2018 findings for *Intersection of Science and Painting* were very gratifying and indicate a significant improvement in the course since the first time it was offered 12 years ago. The course will indeed evolve but there are no specific changes that are indicated by the assessment process in 2018.

The pre-test results for *Living in the Material World* show that most students are not able to balance chemical equations and identify redox reactions at the beginning of the course, and the post-test results support that they have mastered these skills afterwards.

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

A Periodic Report is required by the ACS for certification of our majors program every 5 years. A report was filed in May of 2015, and notification was received in June of 2016 that all the requirements of the ACS Guidelines are being met by the department's program for the major, with several items being cited as "commendable" (support for renovations, high quality of instrumentation, vast array of in-depth course selection and outstanding student research).