

## 2018 Annual Assessment Report- Chemistry

### I. Assessment Meetings.

Professors Bailey and Burwell met formally on May 23, 2018, to talk about Chemistry assessment. In addition, there were multiple formal and informal discussions held throughout the academic year.

### II. Closing the Loop.

The 2017 Chemistry Assessment Report examined data focusing on the single Program Goal 3, to “*Train students to communicate scientific work in a clear, coherent manner in both written and oral form.*” As a follow-up we can report on the work of students in Chemistry 327L (Instrumental Methods), a course required of all Chemistry majors and taken also by Biology, Biochemistry & Molecular Biology, and Biology: Health Science Majors. For this course, each student was required to research, write, and present a paper on an instrumental technique. The specific topic was selected within the first two weeks of the semester and an initial outline and a bibliography were due early in the semester. A penultimate draft of the paper was due about 2 weeks before the end of the semester. Oral reports were presented during the last week of classes and a final draft was due before final exams. The students were initially told that the paper was to be 5 pages single-spaced *minimum* (not including figures). However, when the penultimate drafts were returned to the students, they were informed that the paper could be *no longer* than 4 pages (including figures). This was done to make sure that students revised their papers wisely and thought about what was worthy of inclusion and what could be modified. In all cases the final drafts were significantly different (and in most cases significantly better) than the penultimate draft.

For the oral presentations, 12 students earned an “A”, 1 student a “B”, and 1 student a “C”. An additional student failed to show up for their presentation. That is, 93% of the students earned 70% or better, our success criteria. The quality of the presentations was consistently better than for previous groups in this course and from these students in other courses. For the final papers, 9 students earned an “A”, 4 earned a “B”, 1 earned a “C”, and one earned an “F”. Again, 93% of the students met our success criteria. Such was the quality of the final drafts that we put them together and “published” them as “The Wells College Journal of Instrumental Methods”.

### III. Examination of Assessment Data.

In the 2017 Chemistry Assessment Report we indicated a concern about the use (or lack thereof) of the textbook by students in the Introductory Chemistry sequence (Chem107 and Chem108). The textbook itself is quite large and often found its primary use as that of a doorstop. The action plan for the 2017-2018 academic year included having students purchase a loose-leaf version of the text, which would allow them to bring individual chapters to class. The goal of this was to address objective 1a, “*Has a working knowledge of the concepts and principles presented in class.*” We indicated the use of exams, quizzes, problem sets, and specifically designed exercises to assess whether students were better gaining this knowledge. Our success criteria was 70% of students

scoring at or above the C level. In addition to the loose-leaf textbook, the student's syllabus included for each class period specific readings from the textbook to be completed prior to each respective class meeting. In addition, specific questions from the end of chapter exercises were assigned to be done following each class period.

TABLE 1.	Chemistry 107L		Chemistry 108L	
	Fall 2016 ( <i>n</i> =41)	Fall 2017 ( <i>n</i> =37)	Spring 2017 ( <i>n</i> =32)	Spring 2018 ( <i>n</i> =25)
TEXTBOOK	Hard Cover	Loose-Leaf	Hard Cover	Loose-Leaf
QUIZES				
Average/10	7.2	7.1	<i>no quizzes</i>	8.0
% C or better	64.9%	73.2%	<i>given</i>	84.0%
HOMEWORK				
Average/10	9.2	9.2	8.8	8.9
% C or better	91.9%	87.9%	96.8	96.0
EXAMS				
Average/100	64.4	60.6	69.5	67.5
% C or better	43.2%	41.5%	43.8%	52.0%
FINAL GRADE				
Average/100	80.0	73.8	80.6	80.2
% C or better	83.8%	75.6%	89.2%	87.0%

Table 1 includes data collected from the General Chemistry course (Chem 107L) from Fall 2016 (hardcover book) and Fall 2017 (loose-leaf book), and from the Chemical Analysis course (Chem 108L) from Spring 2017 (hardcover book) and Spring 2018 (loose-leaf book). For each category (Quizzes, Homework, Exams, and Final Grade) the average student grade for all of that type of assignment is given, followed by the percentage of students whose average grade was above 70%, our success criteria. The syllabus indicated that Quizzes might be given during any course meeting and so the number and nature of the set of quizzes may be different for each semester; in fact, in Spring 2017 no quizzes were given. Homework was based on the OWL (Online Web-based Learning) system provided by Cengage, the textbook publisher; 26-28 assignments were given each semester. Exams were written by the faculty member; two were given during the fall semester (mid-term and final) and three during the spring semester. The Final Grades for the course are based on the quizzes, exams, and homework examined here, plus lab grades and other work.

As can be seen, the success criteria was met in all areas except exams, although some improvement is seen in Spring 2018. There was an improvement in the success criteria for quizzes between Fall 2016 and Fall 2017, but other than that the introduction of the loose-leaf textbook did not appear to have a significant impact on student success. However, we did encounter several "snags" in fully implementing the plan.

First, we had planned to develop specific exercises which would have required students to utilize the textbook in class. In an attempt to not "reinvent the wheel," we spoke to several different individuals at Cengage Learning and asked them about pre-existing exercises designed to get students more involved in the textbook itself. In each case

the individual from Cengage replied, “That’s a great idea. I’m sure we have something. Let me get back to you.” Unfortunately, in no case did they get back to us and by the time we realized that nothing was forthcoming the school year had begun.

Second, about five weeks into the Fall 2017 course we recognized that a large number of students had failing grades for the course. This was, in large part, because they were not doing the on-line homework, which is accessed through the Cengage portal, OWL. When we spoke with those students they each indicated that they had not, even at that late date, purchased the textbook. The lack of a book and access code would have, after the first two weeks of the semester, prevented those students from accessing their OWL homework and earning points for completing it. When asked why they had not purchased the textbook, the response from all but one student was that “the bookstore had run out”. When then asked whether they had had the bookstore order them a copy they each looked very confused, like they were hearing a foreign language and didn’t understand the words. It is our conclusion that we have come to a generation of students who may have never been inside an actual brick-and-mortar bookstore and so didn’t know that ordering out-of-stock books is something a bookstore just does.

Third, at the end of the first semester, a couple students approached the instructor to indicate that they were disappointed that we “hadn’t used the textbook more for the class”. These students were shown a copy of the syllabus, which indicated that for every class period there were a number of specified pages in the book that they were to have read beforehand, plus the assigned problems from the end of each respective chapter. Even though this information had been presented by the instructor at the beginning of the semester, appeared on the syllabus, appeared on the calendar for Moodle, and was referenced multiple times during the semester, these students never got the connection between their syllabus and work required of them through use of the textbook. Several indicated that their primary means of gathering information outside the classroom was through on-line videos.

#### **IV. Program Changes for the Upcoming Year.**

Based on the results reported above, we need to find better ways of getting students to engage more with their assigned textbooks, particularly at the freshman level. However, we do not feel that this requires any programmatic changes at this time.

#### **V. Action Plan for the Upcoming Year.**

Because the current action plan did not bear fruit this year, we intend to continue to work on *getting students more engaged with their textbook* for the following year. It is clear that specific exercises which require the students to utilize their textbook directly are needed at the freshman level. We intend to develop these exercises during the summer so that they can be implemented starting this fall. In addition, we will expand on this assessment by looking into the upper division courses, for example Organic Chemistry and Biochemistry, to see how the same cohorts of students examined in Table 1 above have engaged with their textbooks beyond the freshman year in order to gain *a working knowledge of the concepts and principles presented in class*.