Assessment of Chemistry First Level Exam

Goals

The goal of the first level exam is to provide evidence of a broad solid foundation in the chemical sciences and assure core competencies in the discipline for subsequent advanced work in Chemistry.

Description of First Level Exam

Students take an entrance Qualifying Exam that provides a measure of their preparedness for the doctoral program work in the three principal branches (or subdisciplines) of Chemistry: Inorganic, Organic and Physical Chemistry. They are standard American Chemical Society (ACS) tests that measure mastery of undergraduate subject content. Obtaining an A+ in the Qualifying Exam can serve as the First Level Examination. Obtaining an F in the Qualifying Exam is an indication of significant deficiencies in the preparation of the students in that area, and usually results in students being advised to take undergraduate level remedial courses (as audit).

The students that don’t obtain an A+ in the Qualifying exam are required to take three First Level courses during their first semester: Advanced Inorganic (Chem 71000), Advanced Organic (Chem 75000) and Quantum Chemistry (Chem 76000). For these students the First level Examination consists of taking those three courses and passing the final exam in each of the courses. All the students, except the Polymer subdiscipline students, follow this sequence. The polymer students take only two out of these three courses, and have a required First Level Course in Polymer Chemistry (Chem 73000). The exams are graded by the course instructor and a second grader selected by the subdiscipline chair. Prior to giving the exam, the exam content is reviewed by the subdiscipline chair to ensure that it reflects the key concepts as described in the approved First Level courses syllabi. Students can receive grades of High Pass (HP), Pass (P), Conditional Pass (CP), and Fail (F) in the final exam. If a student obtains an F grade in the final exam, the course must be repeated. Students must get a grade of P or HP in the three courses to pass the First Level Exam. However, they can pass the First Level Exam if they have a CP in one of the subjects as long as it is not in their major. Students are required to pass the First level Examination within two attempts. Students that do not pass the First level exam after the second try are placed on probation for possible dismissal.

Assessment of the First Level Exam

For assessment of the First Level Exam, we examined the Pass rates for the First Level Exam in each course at the end of the first semester (fall of each year) and compared it to the Qualifying Exam performance by the same students at the beginning of the first semester. The students from each entering class that passed the full First Level Exam in the first attempt and in second attempt are also listed. Data was collected over the past three years.

The data are summarized in Table 1:
Table 1: Summary of First Level Exam Assessment

<table>
<thead>
<tr>
<th>Year</th>
<th>Qualifying Exam (QE)</th>
<th>First Level Exam</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of F's/total grades</td>
<td># of A+'s/total grades</td>
<td># of F's/total grades</td>
</tr>
<tr>
<td>F2011</td>
<td>12/59</td>
<td>1/59</td>
<td>3/59</td>
</tr>
<tr>
<td>F2012</td>
<td>9/54</td>
<td>2/54</td>
<td>2/54</td>
</tr>
<tr>
<td>F2013</td>
<td>10/52</td>
<td>1/52</td>
<td>2/52</td>
</tr>
</tbody>
</table>

It should be noted that the total number of grades being considered for comparison in the table (the denominator in the first four columns) is not the same as three times the total number of students that entered each year. The reason for this is that only students who took both the Qualifying Exam and the First Level Course were included in the statistics. Those students that withdrew from the course during the semester were not included in the data. Another reason for the lower number of total grades considered is that the polymer subdiscipline students only take two out of the three First level courses in the topics that correspond to the Qualifying Exams. Finally, in F2011, four students withdrew from the program before completing the first year and in F2012 one student withdrew before completing the first year. The results from the second attempt for the students entering in F2013 are not yet available (N/A).

Conclusions

The results summarized in Table 1 indicate that:

1. Very few students pass the First Level Exam (i.e., obtain A+) in any specific subject at the Qualifying Exam level.
2. A significant number of students obtain a grade of F in the Qualifying Exam indicating that they have significant deficiencies in that particular area when they enter the program.
3. After taking the First Level courses, the majority of the students pass the First Level Exam in the first attempt.
4. Only two students in the F2011 cohort did not pass the First level Exam in two attempts.

We interpret these observations to mean that the First Level Exam is accomplishing its goal, that is, it is assuring and assessing the student’s preparedness in core competencies in the discipline after the three First Level courses are completed, and that they pass the First Level Exam in each course, even when they were not well prepared for the subject matter before they take the First Level course. The numbers of students passing the First Level Exam within two attempts assures the Program that the students are acquiring the core Chemistry competency in their First Level courses even when many of them came to the Program with significant deficiencies.