General Education Assessment Report
Natural Sciences
Spring, 2019
The University at Albany, SUNY

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Office of Institutional Research, Planning & Effectiveness
General Education Assessment
2018-19

Categories Assessed: Foreign Languages, Natural Sciences, US History

Background

During the spring semester of the 2018-19 academic year, the University at Albany assessed the degree to which students were achieving the student learning objectives in General Education courses in Natural Sciences, Foreign Languages, and US History. As has been the case with other recent General Education assessment activities, the sample was chosen to be generally representative of the categories rather than completely random, and instructors who had completed assessments in other General Education categories within the past 5 years were exempted. In the Natural Sciences category, 46 course sections met the General Education requirement, with a total enrollment of 35021. 45 of these sections originate from departments in the College of Arts and Sciences, 1 section was offered by the School of Public Health.

After assuring that no instructor would be sampled more than once, and eliminating courses with enrollment that was potentially below the Registrar’s enrollment cancellation number, there was a remaining pool of 23 sections that were eligible for sampling. Using a random number generator, 12 of those sections were chosen for the sample. Those twelve sections sampled represented offerings from 6 unique departments, with student enrollment at the time of sampling N=1310. At the time of sampling, the enrollments in individual course sections ranged from 9 to 315.

Of the 12 classes that remained in the sample, 10 instructors submitted at least some materials, and 6 submitted completed forms at the end of the semester. Data collected represents a maximum N=422, which is 32% of the sample, and 12% of the population.

The instructor participation rate on this administration of the General Education assessment is similar to prior iterations of the Natural Sciences General Education assessment. In the 2011-12AY, “Six of thirteen instructors sampled responded. The sample consisted of 1,964 students, and the number of students assessed is 1,028 (52.3% of the sample, 21.7% of the population)—with no instructors from one department participating. This prompted the GEAC to request that the assessment be re-administered

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1 Sampling is conducted prior to the start of the semester, and figures represented for both the sample N and individual course enrollments reflect enrollment at the time of sampling—and thus is not necessarily reflective of the number of students who were actually assessed as part of the administration of this General Education assessment.

2 Four instructors submitted complete results. One did not submit results for the Learning Objective 3, one did not submit results for learning objectives 3 or 4.

3 The N represented here is based on actual enrollments in the course at the start of the semester.

4 This figure could be slightly misleading, as the numerator reflects actual enrollment, and the denominator reflects enrollment at the time of initial sampling. Enrollment in courses that were not selected for the sample were not recalculated ex-post-facto to reflect changes in enrollment.
in 2013-14AY. In that administration of the assessment, “Of the 12 classes sampled, 5 instructors submitted correctly completed forms at the end of the semester. Four instructors submitted partial data or forms that were either incomplete or filled out in a manner that precluded their use.”

Despite extensive efforts for better communication from IRPE and a concerted effort on the part of the Associate Dean for General Education, who sent several follow-ups and reminders in an effort to improve both the rate and quality of responses, participation remains poor.

Learning Objectives and Course Embedded Assessment

The Learning Objectives Natural Sciences courses enable students to demonstrate:

1. an understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence.
2. an understanding of the application of scientific data, concepts, and models in the natural sciences.
3. understanding of the major principles and concepts that form the basis of the knowledge covered in the course and a command of the relevant terminology appropriate for basic discourse in the particular discipline or disciplines of the course.
4. that they have become more knowledgeable consumers of scientific information and are prepared to make informed decisions on contemporary issues involving scientific information acquired in the course.

Natural Sciences assessment results indicate that the majority of students “Exceeded” or “Met” expectations - as shown in the composite graph below, as well as graphs for each of the individual learning objectives on the following pages.

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5 See Figure 6 on page 6 for an additional, combined, visual representation of this.
Figure 1: Summary of Natural Sciences General Education Results

Figure 2: Natural Sciences Learning Objective 1

1) Students will demonstrate: an understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence.
2) Students will demonstrate: an understanding of the application of scientific data, concepts, and models in the natural sciences.

![Pie chart showing distribution of achievement levels for objective 2.](image)

- Exceeded: 52%
- Met: 22%
- Approached: 14%
- Did not meet: 12%

Due to rounding, values may not equal 100%

Figure 3: Natural Sciences Learning Objective 2

3) Students will demonstrate: understanding of the major principles and concepts that form the basis of the knowledge covered in the course and a command of the relevant terminology appropriate for basic discourse in the particular discipline or disciplines.

![Pie chart showing distribution of achievement levels for objective 3.](image)

- Exceeded: 55%
- Met: 21%
- Approached: 14%
- Did not meet: 11%

Due to rounding, values may not equal 100%

Figure 4: Natural Sciences Learning Objective 3
Comparison to results of prior Natural Sciences assessments:

When looking at combined “Exceeded” and “Met” data for 2019, when compared to 2014 results there is:

- a decrease of 3 percentage points on the first learning objective
- a decrease of 2 percentage points on the second learning objective
- a decrease of 1 percentage point on the third learning objective
- no difference of percentage points on the fourth learning objective

When looking at combined “Exceeded” and “Met” data for 2019, when compared to 2009 results there is:

- a decrease of 12 percentage points on the first learning objective
- an increase of 1 percentage point on the second learning objective
- a decrease of 6 percentage points on the third learning objective
- a decrease of 9 percentage points on the fourth learning objective
Figure 6: Combined “Exceeded” and “Met” 2019, 2014, 2009 by Learning Objective

Figures 7-10 on the following pages compare 2019 data to 2014 and 2009 results in each of the 4 Learning Objectives.
Learning Objective 1 Through Three Assessment Cycles

Students will demonstrate: an understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence.

Figure 7: Learning Objective 1, 2019, 2014, 2009

Learning Objective 2 Through Three Assessment Cycles

Students will demonstrate: an understanding of the application of scientific data, concepts, and models in the natural sciences.

Figure 8: Learning Objective 2, 2019, 2014, 2009
Learning Objective 3 Through Three Assessment Cycles
Students will demonstrate: understanding of the major principles and concepts that form the basis of the knowledge covered in the course and a command of the relevant terminology appropriate for basic discourse in the particular discipline or disciplines.

![Bar chart showing data for Learning Objective 3 across 2019, 2014, and 2009]

Figure 9: Learning Objective 3, 2019, 2014, 2009

Learning Objective 4 Through Three Assessment Cycles
Students will demonstrate: that they have become more knowledgeable consumers of scientific information and are prepared to make informed decisions on contemporary issues involving scientific information acquired in the course.

![Bar chart showing data for Learning Objective 4 across 2019, 2014, and 2009]

Figure 10: Learning Objective 4, 2019, 2014, 2009
Comparison between UHS and On-campus Student Populations

In the Natural Sciences category, comparisons of performance between the UHS and on-campus populations appear dramatically skewed. While this is not uncommon when looking at the “Exceeded” and “Met” numbers separately, in this particular case the numbers remain skewed even when the “Exceeded” and “Met” numbers are combined. In all cases, the UAlbany students trail UHS students by 23 to 29 percentage points.

![Graph: Combined "Exceeded" and "Met" by Learning Objective]

Figure 11: Comparison of Combined “Exceeded” and “Met” Results, by Learning Objective

Amongst UHS students, between 1% and 3% of students “Did not meet” the respective learning objectives. In comparison, the number of on-campus students who “Did not meet” is between 20%- 22% for each of the learning objectives.

Amongst on-campus students between 20% and 22% of students “Did Not Meet” the respective learning objectives. By comparison, between 1% and 3% of UHS students, “Did Not Meet” the respective learning objectives.
Figure 12: Comparison of Results for UHS and On-campus Populations on Natural Sciences Learning Objective 1

Figure 13: Comparison of Results for UHS and On-campus Populations on Natural Sciences Learning Objective 2
It is important to note that the majority of students who enroll in University in the High School courses tend to be highly motivated and high performing. In fact, only juniors and seniors with an overall average of B or better are allowed to enroll in UHS classes. One could reasonably expect students who
have a high overall average to perform well in these classes. Additionally, on-campus students taking courses meeting this General Education requirement may be doing so only to fulfill the General Education requirement and that is a potential explanation of differences in performance that appear to exist across these populations. We also recognize that the UHS courses cover the same material as the on-campus offerings, but typically do so in a year-long format rather than the standard semester format. Additionally, the typical UHS course meets every day, not a few times a week. Both of these could be contributing factors to explain the high performance of UHS students relative to their on-campus counterparts.

**Inclusion of graduate students and contingent faculty**

Since the Spring of 2009, we have made a concerted effort to include courses taught by graduate student instructors, contingent faculty (typically under the title of “Lecturer”), and professionals teaching on a part time basis in the general education assessment sample. As shown in Figure 16 below, contingent faculty teach a majority of the introductory undergraduate courses that meet the General Education requirements in this category. 15 of the 46 courses meeting the Natural Sciences general education requirement during this assessment period were taught by tenured or tenure track faculty (33%), while 30 (65%) were taught by lecturers. One remaining course (2%) was taught by an individual in a title other than lecturer, but not on the academic tenure track (ie: Visiting Assistant Professor, teaching assistant, or professional faculty lines). While this result is not entirely surprising, it does demonstrate why any valid assessment in this category would need to include non-tenure-related instructors. We will also point out that while we often receive requests to exempt graduate students from participating in these assessments, most of the individuals teaching in the “lecturer” title are graduate students, and therefore we are unable to accommodate those requests. With rare exception (and none in this cycle) we have allowed a tenured faculty member who had not been selected to participate, to voluntarily replace a graduate student who had been selected.
Time required to complete assessment:

The general education assessment forms that instructors complete as part of this assessment process asks them to record the length of time it took them to compile the data and complete the beginning and end of semester assessment forms (Please refer to Appendix C for the further detail). The average for the required preparation time of the data and the completion of the forms was 83 minutes at the beginning of the semester, and 81 minutes at the end of the semester. As is often the case, some respondents did not provide responses to this question on the end of semester form, and thus we are missing data for those individuals (respondents 1 & 3 did not supply information for either data point, and respondents 5 & 7 did not provide this data for the end of the semester).

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6 Note that “responded” indicates that the instructor submitted either the beginning of semester forms, the end of semester forms, or both. It is not an indication of the completeness or “correctness” of their submission.

7 Note that due to emergency circumstances, there was a change of instructor in one course mid-semester. The individual sampled was an Assistant Professor, and submitted the beginning of semester materials, syllabus, etc. The end of semester materials were submitted by the full Professor who took over the course. That submission is reflected here under the rank of the original submitter.
Recommendations:

The Office of Assessment is pleased with both the response rate and quality of the assessment materials submitted in this cycle. We offer a self-recommendation to continue to work closely with the Associate Dean for General Education, as the extra efforts have paid dividends in improving response rate and submission quality. We commend and thank the faculty who participated in this assessment for their hard work in striving to meet the goals of the General Education learning objectives.
Appendix A: Student Learning Objectives – Natural Sciences

Natural Sciences courses enable students to demonstrate:

1. an understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence;

2. an understanding of the application of scientific data, concepts, and models in the natural sciences;

3. an understanding of the major principles and concepts that form the basis of the knowledge covered in the course and a command of the relevant terminology appropriate for basic discourse in the particular discipline or disciplines of the course;

4. that they have become more knowledgeable consumers of scientific information and are prepared to make informed decisions on contemporary issues involving scientific information acquired in the course.
<table>
<thead>
<tr>
<th>Respondent #</th>
<th>Learning Objective #</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>1) being very approachable, extensive use of web assign, making myself very (too much) available, homework given each class to make sure the students worked on physics a little bit everyday. And giving a practice exam before each exam. Engaging the students was also very important. 2) I would start doing mini-exams. Students were afraid of the midterms and felt the weight of them. Adding 2 mini-exams to prepare them may be beneficial while also making the midterms and final not count for as much. In addition, change format of exam, and give the students the numerical solution to each question, to help guide them in solving the problem, because what matters is the reasoning not the final answer.</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1) same as for prior objective 2) same as for prior objective + try to have the labs taught at the same time to give them hands on experience, and a more real “feel” for what's going on, which I just dont have the time to do in class. Although having labs offered at the same time is completely outside my control.</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>1) the class became more and more active as time passed, and students more and more engaged. Asked a lot of questions not directly from the class but showing interest in th concepts and how to take them further. Made them think a lot. Asked a lot of questions. 2) I wouldn’t change anything. this worked well.</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Overall the planned strategy worked fine. Give more emphasis to attendance</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>More interaction with the students needed. Lack of motivation was noticed. They must be motivated to achieve a better results</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Should be offered more interaction and motivation.</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>In area #4 (the extra credit project), this is a new feature I’m adding to the class this semester, based on success I’ve had with a similar opportunity provided to students in my course.</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>It is clear that the students who attend class regularly and who do suggested practice problems, perform better on exams. There is an ongoing discussion in the Dept on how best to attain these goals and we have been trying different approaches. Review sessions might be helpful as well, but voluntary ones are poorly attended and we are maxed out on credits.</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>See objective #1.</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>See objective #1.</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>See objective #1.</td>
</tr>
</tbody>
</table>
## Appendix C: Time to Completion and Comments

<table>
<thead>
<tr>
<th>Respondent #</th>
<th>Beginning of Semester (in minutes)</th>
<th>End of Semester (in minutes)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>90</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>No response</td>
<td>No response</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>240</td>
<td>60</td>
<td>3h for an assessment is way too much time. And this form is really hard to navigate and doesn’t translate well on different OS, which means it takes some times to figure out. The objectives and different sections are badly labeled and its not obvious to understand what you're asking. And some of the objectives are really redundant.</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>No response</td>
<td>This form is hard to work with, and I would prefer to use an excel spreadsheet. Once the cells have been expanded with answers, it becomes very difficult to maneuver within the form.</td>
</tr>
<tr>
<td>6</td>
<td>60</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>90</td>
<td>No response</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>60</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>50</td>
<td>35</td>
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</tr>
<tr>
<td>10</td>
<td>10</td>
<td>90</td>
<td></td>
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