Arapahoe Community College

2014-2015

CHEMISTRY

CHEMISTRY COMPETENCY: STUDENTS WILL DEMONSTRATE MASTERY OF CONCEPTS FROM THE CHE112 COMPETENCY BASED SYLLABUS BY PERFORMING ON A STANDARDIZED NATIONAL EXAM.

<table>
<thead>
<tr>
<th>Assessment Author(s)</th>
<th>Kim Stasiewicz</th>
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</thead>
<tbody>
<tr>
<td>Measure 1 Type:</td>
<td>Direct</td>
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<td>Measure 1 Type:</td>
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<tr>
<td>Score and pass rates on a standardized test</td>
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<tr>
<td>Measure 1 Description:</td>
<td>Students take the American Chemical Society general chemistry exam, and their scores are compared to the national average.</td>
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<tr>
<td>Measure 1 Sample Size:</td>
<td>53</td>
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<tr>
<td>1) Describe the benchmark for this measure.</td>
<td>Students will score at or above the national average (41 out of 70) on the ACS General Chemistry Exam.</td>
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<tr>
<td>2) What is the rationale for choosing this benchmark?</td>
<td>The ACS exam is a nationally accepted measure of student understanding in chemistry. Students are required to understand concepts and solve quantitative problems in order to succeed on this exam. If students can perform well on the ACS exam, they are prepared for future chemistry courses as they transfer to four year schools.</td>
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Please select

This Discipline Outcome was: Surpassed benchmark

Measure 1
Results:
The department's average score was 42.5 out of 70, while the national average was 41 out of 70. The benchmark was surpassed.

1) How did unit/department performance compare to the benchmark?
The department exceeded the benchmark. The benchmark was 41 out of 70, while the average department score was 42.5 out of 70.

2) How does the data compare to the previous year, if applicable?
This year's score exceeds that of the previous year (42.5 this year compared to 44.1 for the 2013-2014 assessment year).

1) Based on the findings, how does the unit/department rate performance in regards to this outcome (strong – exceeds benchmark, neutral – meets benchmark, or weak – misses benchmark)?
Surpassed benchmark

2) How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative and educational support unit planning, and assessment planning?
The department will continue to assess this outcome in order to ensure that we are adequately preparing students for future science courses, and for transfer to a four-year institution. We will also track results across sections of CHE112 to promote consistency within the department.

3) How will your... We will use the results of this assessment to improve instruction in...
**Assessment results enable you to improve institutional processes or academic instruction in order to support, facilitate and/or stimulate student learning?**

Further Action: Further Action Unnecessary

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**LABORATORY TECHNIQUE: STUDENTS WILL DEMONSTRATE THE ABILITY TO USE TYPICAL LABORATORY EQUIPMENT PROPERLY AND SAFELY TO PERFORM AN ACID/BASE TITRATION.**

<table>
<thead>
<tr>
<th>Assessment Author(s)</th>
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<tbody>
<tr>
<td>Measure 1 Type:</td>
<td>Direct</td>
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<tr>
<td>Measure 1 Description:</td>
<td>This assessment is a practical demonstration of students' lab abilities, given at approximately the midpoint of the first semester of general chemistry. Students first standardize a solution of sodium hydroxide by titrating it with a standard KHP solution which they prepare. Then, they use the standardized sodium hydroxide solution to determine the concentration of an unknown acid solution, using acid-base titration techniques.</td>
</tr>
<tr>
<td>Measure 1 Sample Size:</td>
<td>115</td>
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1) Describe the benchmark for this measure.

At least 50% of CHE111 students will determine their unknown acid concentration to within 1%.

At least 75% of CHE111 students will determine their unknown acid concentrations to within 2%.

2) What is the rationale for choosing this benchmark?

Based on past experience with this assessment, the benchmarks have been found to be reasonable expectations for students who have had half a semester of laboratory instruction. Students should have mastered sufficient laboratory technique and sufficient quantitative reasoning/calculation skills to reach these benchmarks.

Please select

This Discipline Outcome was: Missed benchmark

Measure 1 Results: For this assessment, 47.0% of students determined the amount of
unknown acid to within 1% of the true value, and 64.3% of students came within 2%.

1) How did unit/department performance compare to the benchmark?

The department missed the benchmark. For this assessment, 47.0% of students determined the amount of unknown acid to within 1% of the true value (benchmark = 50%), and 64.3% of students came within 2% (benchmark = 75%).

2) How does the data compare to the previous year, if applicable?

This year's results show a significant decrease in performance compared with that in previous years.
1) Based on the findings, how does the unit/department rate performance in regards to this outcome (strong – exceeds benchmark, neutral – meets benchmark, or weak – misses benchmark)?

Missed benchmark

2) How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative and educational support unit planning, and assessment planning?

The department will continue to assess this outcome after providing more training for instructors. It is crucial that students receive adequate instruction in lab as well as in lecture, so we will continue to monitor this outcome to ensure that the benchmark is met in the future.

3) How will your assessment results enable you to improve institutional processes or academic instruction in order to support, facilitate and/or stimulate student learning?

Based on this year’s results, it is clear that a large percentage of students did not achieve the goal of this very important lab assignment; 22.6% of students missed their unknown acid content by more than 4% of the correct value. Specifically, all students in a particular section of CHE111 failed to come within 4% of the true KHP content of their samples. Therefore, the department will offer individual training for the instructor of this section, and will offer more lab training for instructors in general, in order to ensure that students are receiving appropriate instruction in the lab, as well as in the classroom.
**Further Action:** Further Action Planned

**Describe the action plan:** Training will be provided to instructors which focuses on this lab exercise.

**Person/Group responsible for action:** Chemistry Department Faculty

**Target Date for implementation of the action:** 05/07/2015

**Priority:** Medium

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**STUDENT SUCCESS AND PERSISTENCE: THE DEPARTMENT MEASURES STUDENT PERSISTENCE THROUGH FIRST SEMESTER COLLEGE CHEMISTRY.**

**Assessment Author(s):** Kim Stasiewicz

**Measure 1 Type:** Indirect

**Measure 1 Description:** This assessment is a measure of student persistence through first semester general college chemistry.

**Measure 1 Sample Size:** 128

1. **Describe the benchmark for this measure:** 75% of students who complete CHE111 will earn a "C" or better.

2. **What is the** Historically, the department has collected this data in order to track
rationale for choosing this benchmark?  

Please select

This Discipline Outcome was: Surpassed benchmark

Measure 1 Results:

85.2% of students who completed CHE111 succeeded by earning a "C" or higher.

1) How did unit/department performance compare to the benchmark?

The department surpassed the benchmark; 85.2% of completing students succeeded in CHE111, while the benchmark was 75%.

2) How does the data compare to the previous year, if applicable?

This year's success rate surpassed last year's, (85.2% compared to 72.2%). However, there was a slight change in the way the data was analyzed this year. Previously, students who withdrew from the course were counted as "not succeeding". This year, these students were not counted at all. The rationale for this change is that many students who withdrew did so for reasons that have nothing to do with the course. Furthermore, it is impossible from the data collected to determine which students withdrew due to failing grades, and which withdrew early in the course for personal reasons.

1) Based on the findings, how does the unit/department rate performance in regards to this outcome (strong – exceeds benchmark, neutral – meets benchmark, or weak – misses)

Surpassed benchmark

### 2) How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative and educational support unit planning, and assessment planning?

The department will continue to assess this outcome using data from students who complete CHE111, tracking student persistence and success through first semester general college chemistry. We will also monitor trends among sections to ensure consistency throughout the chemistry department.

### 3) How will your assessment results enable you to improve institutional processes or academic instruction in order to support, facilitate and/or stimulate student learning?

The results of this assessment will be used to monitor trends in student persistence throughout different sections of the course, and also to monitor trends from semester to semester. We strive to promote student success while maintaining academic rigor. These assessment results will allow us to note any sections which consistently have unexpectedly high or unexpectedly low success rates.

### Further Action:

Further Action Unnecessary

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**INFORMATION MANAGEMENT: STUDENTS WILL DEMONSTRATE THE ABILITY TO APPLY THE SCIENTIFIC METHOD TO SOLVE A PROBLEM IN THEIR EVERYDAY LIVES.**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Measure 1 Type:</td>
<td>Direct</td>
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<td>Rubric-graded report</td>
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<tr>
<td>Measure 1 Description:</td>
<td>Students will apply the scientific method to an everyday problem. They will clearly state the problem, form and test a hypothesis, collect data, analyze results, and draw a conclusion</td>
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<tr>
<td>Sample Size:</td>
<td>130</td>
</tr>
<tr>
<td>1) Describe the benchmark for this measure.</td>
<td>Students will score an average of 75% or higher on this rubric-graded report.</td>
</tr>
<tr>
<td>2) What is the rationale for choosing this benchmark?</td>
<td>This assignment is given after a chapter detailing the scientific method, so most students should be able to apply what they have learned to a real-world example at this point. To succeed, students must collect, organize, and analyze data using critical thinking skills.</td>
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</tbody>
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**This Learning Outcome was:** Surpassed benchmark

**Measure 1 Results:** The average student score on this rubric-graded assignment was 81%.

| 1) How did unit/department performance compare to the benchmark? | The department performance (81%) exceeded the benchmark (75%). |
| 2) How does the data compare to the previous year, if applicable? | This year's performance (81%) was 6.7% lower than last year's (87.7%). |

| 1) Based on the findings, how does the unit/department rate performance in regards to this outcome (strong – exceeds benchmark, neutral – meets benchmark, or weak – misses benchmark)? | Surpassed benchmark |
| 2) How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative | We plan to assess this outcome in the coming year to compare results with those of previous years. |
and educational support unit planning, and assessment planning?

3) How will your assessment results enable you to improve institutional processes or academic instruction in order to support, facilitate and/or stimulate student learning?

We will use the results of this assessment to improve student instruction. The assessment asks that students take a problem from the "real world" and apply the scientific method in order to solve it. They collect data, analyze it, and use it to formulate a solution to the problem. This real-world application peaks students' interest and stimulates their learning.

Further Action: Further Action Unnecessary

QUANTITATIVE REASONING: STUDENTS WILL DEMONSTRATE THE ABILITY TO USE CRITICAL THINKING AND QUANTITATIVE REASONING TO SOLVE SEVERAL PROBLEMS RELATED TO CHEMISTRY CONCEPTS (DENSITY, MOLARITY, ETC.).

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<tr>
<td>Measure 1 Type:</td>
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<td></td>
<td>Pre-Post tests</td>
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<tr>
<td>Measure 1 Description:</td>
<td>Students will demonstrate the ability to use critical thinking and quantitative reasoning to solve fourteen word problems related to chemistry concepts (density, molarity, etc.).</td>
</tr>
<tr>
<td>Measure 1 Sample Size:</td>
<td>129</td>
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<tr>
<td>1) Describe the benchmark for this measure.</td>
<td>Student scores will show at least a 30% improvement from the beginning of the semester to the end of the semester.</td>
</tr>
<tr>
<td>2) What is the rationale for choosing this benchmark?</td>
<td>The word problems used in this assessment are typical of what a general college chemistry student should be able to do after one semester. They are indicative of the skills the student will need in order to move on to the next level of chemistry. A 30% improvement shows that the department is succeeding in its mission to educate students who wish to pursue further educational or career opportunities about chemical principles.</td>
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This Learning Surpassed benchmark
Outcome was:

Measure 1

Results: Student scores showed a 31.9% increase from the beginning of the semester to the end of the semester.

1) How did unit/department performance compare to the benchmark?

The department surpassed the benchmark by 1.9%.

2) How does the data compare to the previous year, if applicable?

This year's results are almost identical to last year's. This year students showed a 31.9% increase in performance; last year they showed a 32.1% increase.

1) Based on the findings, how does the unit/department rate performance in regards to this outcome (strong – exceeds benchmark, neutral – meets benchmark, or weak – misses benchmark)?

Surpassed benchmark

2) How does this assessment affect plans for this coming year in terms of strategic planning, budget planning, administrative and educational support unit planning, and assessment planning?

We will continue to assess this outcome and compare results from year to year. We will also compare results from section to section in order to ensure consistency within the department.

3) How will your assessment results enable you to improve institutional processes or academic

These results will be used to improve instruction within the chemistry department. Each instructor will be given a detailed item analysis form from the pre- and post-tests used in this assessment. These forms will allow the instructor to determine which concepts were mastered by most students, and which ones were missed by most students. Instructors can use this information to adjust instruction for future classes.
<table>
<thead>
<tr>
<th>instruction in order to support, facilitate and/or stimulate student learning?</th>
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<tr>
<td><strong>Further Action:</strong> Further Action Unnecessary</td>
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