**Discipline Outcome**
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>Measure 1 Type:</th>
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<tbody>
<tr>
<td>Direct</td>
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Scores and pass rates on a standardized test

<table>
<thead>
<tr>
<th>Measure 1 Description:</th>
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<tbody>
<tr>
<td>Students take the American Chemical Society general chemistry exam, and their scores are compared to the national average.</td>
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<table>
<thead>
<tr>
<th>Measure 1 Sample Size:</th>
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<tbody>
<tr>
<td>76</td>
</tr>
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**Measure 1 Benchmark**

1) Describe the benchmark for this measure.
Students will score at or above the national average (41 out of 70) on the ACS General Chemistry Exam.

2) What is the rationale for choosing this benchmark?
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.
Measure 2 Type:

Please select

Measure 2 Description:

Measure 2 Sample Size:

Measure 2 Benchmark

1) Describe the benchmark for this measure.

2) What is the rationale for choosing this benchmark?

Outcomes Met/not met

Surpassed benchmark

Measure 1 Results:

Students' average score was 44.1 out of 70, while the national average was 41 out of 70. The benchmark was surpassed.

Measure 2 Results:

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 44.1 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 (44.1 this year compared to 41.9 last year).
3) If multiple measures were used, how do they compare to each other?

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?

This assessment does not change current curriculum, teaching strategies, or assessment methods. We continue to strive to help students master the content required for a second semester chemistry class, and not “teach to the exam.” The ACS exam will be given in future semesters and the results will continue to be tracked to ensure that we are achieving this goal. We will also track results from section to section, to ensure consistency across the department.

Further Action:

Further Action Unnecessary

Describe the action plan:

Person/ Group responsible for action

Target Date for implementation of the action

Priority
Describe any additional resources needed (Leave blank if no additional resources are needed.)

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**Discipline Outcome**

Information Management: Students will demonstrate the ability to apply the scientific method to solve a problem in their everyday lives.

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**Measure 1 Type:**

Direct

Rubric-graded report

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**Measure 1 Description:**

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.

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**Measure 1 Sample Size:**

105

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**Measure 1 Benchmark**

1) Describe the benchmark for this measure.

Students will score an average of 75% or higher on this rubric-graded report.

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2) What is the rationale for choosing this benchmark?

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.

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**Measure 2 Type:**

Please select

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**Measure 2 Description:**
Measure 2 Sample Size:

Measure 2 Benchmark

1) Describe the benchmark for this measure.

2) What is the rationale for choosing this benchmark?

Outcomes Met/not met
Surpassed benchmark

Measure 1 Results:
Students scored an average of 87.7% on this assignment.

Measure 2 Results:

1) How did unit/department performance compare to the benchmark?
The department performance (87.7%) surpassed the benchmark (75%).

2) How does the data compare to the previous year, if applicable?
This year's data show that the department average was 2.2% higher than last year.

3) If multiple measures were used, how do they compare to each other?

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)?
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 learning outcome. This year, we were able to collect data from 105 students, which is an improvement over the previous year when a miscommunication led to only 37 responses. We will continue to communicate clearly with all instructors to collect the appropriate data.

Further Action:
Further Action Unnecessary

Describe the action plan:

Person/ Group responsible for action

Target Date for implementation of the action

Priority

Describe any additional resources needed (Leave blank if no additional resources are needed.)

Discipline Outcome

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.).

Measure 1 Type:
Direct

Pre-Post tests
Measure 1 Description:
Students will demonstrate the ability to use critical thinking and quantitative reasoning to solve fourteen word problems related to chemistry concepts (density, molarity, etc.).

Measure 1 Sample Size:

Measure 1 Benchmark

1) Describe the benchmark for this measure.
Student scores will show at least a 30% improvement from the beginning of the semester to the end of the semester.

2) What is the rationale for choosing this benchmark?
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.

Measure 2 Type:
Please select

Measure 2 Description:

Measure 2 Sample Size:

Measure 2 Benchmark

1) Describe the benchmark for this measure.

2) What is the rationale for choosing this benchmark?

Outcomes Met/not met
Surpassed benchmark
Measure 1 Results:
Overall, student scores showed a 32.1% increase from the beginning of the semester to the end of the semester.

Measure 2 Results:

1) How did unit/department performance compare to the benchmark?
The department surpassed the benchmark by 2.1%.

2) How does the data compare to the previous year, if applicable?
This year's results showed an improvement of 32.1%, whereas last year's results showed only a 27.5% improvement. However, a direct comparison may not be valid, since there were more questions included in this year's pre- and post-tests than in last year's tests.

3) If multiple measures were used, how do they compare to each other?

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?
This year's data is very robust compared to previous years. In previous years, our results were based on one representative question. This year, the results are summarized from 14 different questions, which were analyzed individually. Each instructor will receive a detailed analysis of his/her student results, which should show what areas of instruction require more emphasis. This allows the department to see differences across sections of the course, and it allows instructors to adjust their teaching strategies for further improvement.
Further Action:

Describe the action plan:

Person/ Group responsible for action

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Priority

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Discipline Outcome

Laboratory Technique: Students will demonstrate the ability to use typical laboratory equipment properly and safely to perform an acid/base titration.

Measure 1 Type:
Direct

Performance comparison

Measure 1 Description:
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.

Measure 1 Sample Size:
97

Measure 1 Benchmark
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.

Measure 2 Type:
Please select

Measure 2 Description:

Measure 2 Sample Size:

Measure 2 Benchmark

1) Describe the benchmark for this measure.

2) What is the rationale for choosing this benchmark?

Outcomes Met/not met
Surpassed benchmark

Measure 1 Results:
For this assessment, 64.4% of students were able to calculate the amount of unknown acid to within 1% of the true value, and 81.2% of students were able to calculate the amount of unknown acid to within 2% of the true value.

Measure 2 Results:
1) How did unit/department performance compare to the benchmark?
Both benchmarks were exceeded. The first was exceeded by 14.4%. The second benchmark was exceeded by 6.2%.

2) How does the data compare to the previous year, if applicable?
This year’s data shows a significant improvement over the previous year’s: (64.4% for this year vs. 52.6% for last year, and (81.2% for this year vs. 59.4% for last year).

![CHE111 Lab Technique Results](chart.png)

3) If multiple measures were used, how do they compare to each other?

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 laboratory skill. In the past, the results of this assessment have varied widely from section to section of the course. We continue to support and train adjunct faculty, and it is hoped that this support will lead to continued improvement in the laboratory portion of our courses.

Further Action:
Further Action Unnecessary

Describe the action plan:

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Target Date for implementation of the action

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 Discipline Outcome

Retention: The department measures student persistence through first semester college chemistry.

Measure 1 Type:

Direct

Data tracking

Measure 1 Description:

This assessment is a measure of student persistence through first semester general college chemistry.

Measure 1 Sample Size:

116

Measure 1 Benchmark

1) Describe the benchmark for this measure.

75% of students who are prepared for CHE111 (as predicted by their scores on the ACS Toledo test of basic skills) will complete CHE111 with a grade of “C“ or better.
2) What is the rationale for choosing this benchmark?

National data on persistence through first semester general college chemistry is difficult to find. The benchmark of a 75% persistence rate has been used for the past seven years; it has been a difficult target to hit and depends very much on the definition of "success". We count only those students who earn a "C" or higher as successful. Students who withdraw are considered unsuccessful, regardless of the reason for the withdrawal, and regardless of the time of the withdrawal. The benchmark may be set too high considering this definition of success. But this assessment is intended to track trends in retention across semesters and across sections moreso than to aim for a particular number of students passing a particular chemistry course.

Measure 2 Type:

Please select

Measure 2 Description:

Measure 2 Sample Size:

Measure 2 Benchmark

1) Describe the benchmark for this measure.

2) What is the rationale for choosing this benchmark?

Outcomes Met/not met
Missed benchmark

Measure 1 Results:

72.2% of students who were prepared for CHE111 succeeded with a grade of "C" or better.
Measure 2 Results:

1) How did unit/department performance compare to the benchmark?
The department did not meet the benchmark. The benchmark was 75% persistence; the department persistence was 72.2%.

2) How does the data compare to the previous year, if applicable?
Last year's success rate was 68.7%, so this year's results were a 3.5% improvement.

3) If multiple measures were used, how do they compare to each other?

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?
This outcome will continue to be assessed, in order to track trends in student retention and success. We strive to improve our student success rate, without lowering the rigorous standards of the course. The benchmark continues to be high; a 75% retention rate in a chemistry course is very high, especially when students who withdraw are factored in as “unsuccessful”. We will also monitor trends among sections, in order to track any sections which consistently have unexpectedly high or unexpectedly low success rates.

Further Action:
Further Action Unnecessary

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