



## New Mexico Common Course Assessment Reports Form

Reporting Institution: Central New Mexico Community College

New Mexico Common Core Area: Area III: Laboratory Science

Competency Number Assessed: (note that *not* all competencies have to be assessed – mark all that apply to this assessment) ([link](#) to list of competencies for each area)

State Competency 1 <input checked="" type="checkbox"/>	State Competency 2 <input checked="" type="checkbox"/>	State Competency 3 <input checked="" type="checkbox"/>
State Competency 4 <input checked="" type="checkbox"/>	State Competency 5 <input checked="" type="checkbox"/>	State Competency 6 <input type="checkbox"/>

Academic Year of Assessment: 2012-2013

Submission Date: 5-22-2014

Institution Course Number: BIO 1092, BIO 1492, BIO 2192, BIO 2292, BIO 2392, BIO 2410/2492, BIO 2510/2592, CHEM 1410/1492, CHEM 1810, NS 1010, PHYS 1592, PHYS 1692, PHYS 1792, PHYS 1892

NM Common Core Number ([link](#) to list of NMCC Numbers): BIOL1111, BIOL3511, BIOL2411, BIOL2423/2421, CHEM1113/1111, CHEM1223, PHYS1111, PHYS1121, PHYS1211, PHYS1221

Submitted by: Ursula Waln, Director of Student Learning Assessment

*Instructions: Fill in the text boxes in the table below for each course, area, or competency on which you are reporting assessment efforts.*

Description of Assessment Procedure:

In Biology, midterm and final exams were used to assess all of the CNM Gen Ed outcomes, which correspond to the transfer core outcomes. All assessment tools were direct and internal. The achievement target was correct responses by 70% of students.

In Chemistry, a lab practical and the American Chemical Society Exam (ACS) were used to assess the CNM Gen Ed outcomes 3 and 4: "Properly operate laboratory equipment to collect relevant and quality data," and "Utilize mathematical techniques to evaluate and solve scientific problems," respectively. CNM outcome 3 has no correlate in the transfer core modules, but CNM outcome 4 has been cross-walked to the transfer core outcomes 2 and 4. Both assessment tools represent direct assessments of student learning. The lab practical is an internal assessment, and the ACS is an external standardized assessment. For CNM outcome 3, the achievement target was to maintain or improve the prior year's level of attainment. However, since the CNM outcome 3 is not reflected in the transfer core outcomes, it will not be reported here. For CNM outcome 4, the goal was to establish a truer baseline for future assessment.

In Natural Science, a research reflection paper, a lab report, and an exam were used to assess the CNM Gen Ed outcomes 1, 2, and 4, which correspond to the transfer core outcomes 1, 2, 4 and 5. All three tools were direct and internal assessment measures with target achievement at 60% mastery for each outcome.

In Physics, to assess the CNM Gen Ed outcome "Communicate effectively about scientific ideas and topics in both oral and written formats," direct, internal measurements were taken by instructors scoring a rubric on certain questions given in the lab manual. This outcome corresponds to transfer core outcome 5.

## Report of Assessment Data and Results:

In Biology, the overall assessment results corresponding most closely to each of the core transfer outcomes (as identified in the CNM Gen Ed crosswalk) were as follows:

1. Describe the process of scientific inquiry.
  - Summer 2012: 71.1%
  - Fall 2012: 69.9%
  - Spring 2013: 71.6%
2. Solve problems scientifically.
  - Summer 2012: 71.1% and 55.0%
  - Fall 2012: 69.9% and 60.0%
  - Spring 2013: 71.6% and 64.3%
3. Communicate scientific information.
  - Summer 2012: 75.5%
  - Fall 2012: 91.8%
  - Spring 2013: 58.4%
4. Apply quantitative analysis to scientific problems.
  - Summer 2012: 55.0%
  - Fall 2012: 60.0%
  - Spring 2013: 64.3%
5. Apply scientific thinking to real world problems.
  - Summer 2012: 69.9% and 71.3%
  - Fall 2012: 88.1% and 87.7%
  - Spring 2013: 78.1% and 82.2%

Detailed breakouts are available in the Biology Gen Ed assessment report.

For Chemistry, on a selection of questions where students needed to utilize mathematical techniques to evaluate and solve scientific problems, 59.5% gave correct responses, 40.5% gave incorrect responses.

In Natural Science, the results were analyzed by CNM outcome, course section, and semester. Using the crosswalk between CNM's Gen Ed outcomes and the transfer core outcomes, the following summarizes the findings:

1. Describe the process of scientific inquiry.
  - Fall 2012: 77% and 94.4%    Spring 2013: 89% and 100%
2. Solve problems scientifically.
  - Fall 2012: 77% and 94.4%    Spring 2013: 89% and 100%    (CNM Outcome 2)
  - Fall 2012: 73% and 88%    Spring 2013: 74.8% and 64.4% (CNM Outcome 4)
4. Apply quantitative analysis to scientific problems.
  - Fall 2012: 73% and 88%    Spring 2013: 74.8% and 64.4%
5. Apply scientific thinking to real world problems.
  - Fall 2012: 40% and 27%    Spring 2013: 56% and 38%

For PHYS 1592, average score was 1.34 with a variance of 0.34 (sample size was 35) 54% of the students were able to meet at least two criteria while 40% of the students were able to meet all three criteria. There were 6% of students who were unable to meet any of the criteria.

For PHYS 1792, average score was 1.35 with a variance of 0.70 (sample size was 17) 58% of the students were able to meet all three criteria while 18 percent of students were able to meet at least two of the criteria given. There were 14% students who were unable to meet any of the criteria.

For PHYS 1892, the average score was 1.47 with a variance of 0.25. (sample size is 38) According to the data, 53% of students occasionally used wrong term for one or two quantities while correctly identifying the rest. A 47% of students consistently used correct terms for corresponding physical quantities. There were no students (0%) who repeatedly used wrong terms for a physical quantity of many different quantities. The faculty felt it would have been better if the percentage of students who scored 2 is more than 50%.

### Analysis and Interpretation/Reflection on Results or Trends:

Biology faculty identified math skills and being the primary challenge for students.

Chemistry faculty found the results to be close to those obtained in a previous analysis. For CHEM 1810 - Data reveals approximately 60 % success rate for students applying math to solving chemical problems. We suspect students are not making the connection between underlying chemical concepts and the application of the math required to solve the problems. We need to determine if the problem is with the math skills of the students, or with their knowledge of chemistry. For CHEM 1492 – Density calculation data shows a 77% success rate for students being able to perform measurements then follow up with density calculation. A look at the density calculation needs to be done to determine if students are not taking the measurements properly or if it is the calculation itself they need assistance with. An assessment of qualitative analysis data shows an 83% success rate. The students were asked to perform various tests to determine the identity of an unknown solution. It is uncertain at this time if the students that did not succeed, struggled with the chemical tests or with the assembling and naming of the chemical compounds they determined from the tests.

In Natural Science, the faculty were very pleased with the data overall. Their findings showed competency rates of 40.25% for scientific analysis, 90.1% for lab reports, and 75.05% for mathematical computation.

The interpretation for Physics is integrated with the data and planning sections of this report.

## Plan for Improving the Assessment Process and/or Student Learning:

In Biology, the following action plans were reported:

## BIO 1092

The action plan developed last cycle focused on enforcing math skills more frequently in lab and with quizzes. The mathematical calculation of % change continues to be an issue with students. The need to provide more assessment of this skill will continue to be shared with the faculty. In addition, the assessment tool used will be redesigned to better determine where the students are struggling (equation set up or mathematical calculation or both).

## BIO 1492

Mathematical skills continue to be the primary challenge for students in BIO 1492. Additional cell size estimate activities will be included in the course to provide more emphasis on this skill. These activities will include contextual (cell size) and non-contextual (cars, elephants, people, squares, etc.) problem activities. The additional activities and need to increase emphasis will be shared with the faculty by the course coordinators.

To address issues related to scientific notation and metric conversion, additional resources such as video demonstrations and practice materials will be provided to the faculty by the course coordinators. Furthermore, faculty will be encouraged to include a weekly assessment of scientific notation and metric conversion in their quizzes.

An additional action plan is to revise the final exam to include all of the assessment tools, rather than splitting assessment between the midterm and final. This action plan will help to optimize the capture of assessment data from all faculty.

## BIO2192

The action plan for BIO2192 over the next cycle includes optimizing data collection from the midterm exam, focusing on the most appropriate assessment tool for Outcomes #3 and #4, and developing a pro-active plan to increase the use of math skills assessment in multiple quizzes. Student performance exceeding the achievement target for the other Gen Ed Outcomes and do not require an action plan.

[1] To address concerns about data collection on the midterm, detailed instructions on which questions will be used for assessment and must not be altered will be provided for each faculty member teaching BIO2192. This will ensure that assessment data are comparable and will help faculty with entry of their assessment data after the midterm.

[2] During the past assessment cycle both the Gram stain and isolation streak technique were used for assessment of Gen Ed Outcome #3. However, there was agreement that the isolation streak technique is more of an "art form" and not truly an assessment of students using microbiology tools. Therefore, the isolation streak will no longer be used for assessment purposes and Gen Ed Outcome #3 will be assessed by student performance on gram-stain technique and microscope use.

[3] For Gen Ed Outcome #4, we implemented our action plan to assess the calculation of cell size and metric conversion as a 4 step process. This approach was very successful and allowed a more precise determination of which step in the process needed more focus in BIO2192. There were two approved action plans related to this outcome. The first was to remove field size calculation from the assessment tool since students do not have time to do this measurement during the midterm. Therefore, the assessment for Gen Ed Outcome #4 will focus on cell size estimate calculation and metric conversion. To enhance the performance of students, faculty will quiz the students on this activity multiple times before the midterm.

#### BIO2292 and BIO2392

The two concerns for these courses were student performance on Gen Ed Outcome #4 and #5. Similar to other courses, students struggle with mathematical skills (Gen Ed #4) and the action plan for this cycle is to increase the resources available to instructors to enhance their focus on math. Question sets will be developed using Respondus within the Blackboard platform to provide more emphasis on dosage problems, cell size estimates, metric conversions, and scientific notation. The action plan for Gen Ed Outcome #5 is to redesign that assessment tool such that it incorporates both Gen Ed Outcome #5 and #6 into a short answer question and to develop a rubric for scoring this assessment question.

Additional action plans for the other Gen Ed outcomes are as follows:

Gen Ed #1: Re-evaluate and redesign the assessment tool to more appropriately address the outcome

Gen Ed #2: Develop a question that involves predictions of muscle movements (BIO 2292) and respiratory volumes (BIO 2392)

Gen Ed #3: Continue collecting data as student performance was near the goal of 70%, but only one term of data collected

Gen Ed #6: Continue collecting data as student performance was near the goal of 70%, but only one term of data collected

#### BIO1610/1692

Pilot assessment data were collected during Fall 2011 to Spring 2012 and were included in the last SAAC II report. However, the assessment tool developed was instructor specific. Due to instructional changes, no assessment data were collected this past cycle. The action plan for this course is to redesign the assessment tool to be more general in approach and usable by all instructors of BIO1610/1692.

#### BIO2410/2492 and BIO2510/2592

No action plan is required to address student performance, as student performance surpassed the achievement target for all outcomes assessed. However, an action plan has been proposed to refine the assessment tools for both courses to make them more general and usable by all instructors of BIO2410/2492 and BIO2510/2592.

Chemistry faculty identified the following plans of action:

For CHEM 1810

1. Meet with chemistry faculty and design a 5 question quiz that uses the math skills required in the learning outcome.
2. See if the students have a greater or less than 60% success rate on the math skills.
3. If the success rate is 60 % or less, we can assume the problem is with math. If the success rate is significantly greater than 60 %, we can assume the problem is with the chemistry instruction.

For CHEM 1492

Either a quiz or final exam question that deals with given data to perform a density calculation would clear up whether students are having issues with taking measurements or the calculation of density. For the qualitative analysis, we currently have questions on the final exam that deal with naming & chemical compounds, perhaps an analysis of success rates on those questions would tell us if students are misinterpreting the chemical test results or failing to assemble that data into a chemical formula and compound name.

In Natural Science, the faculty determined that more work needs to be done on scientific analysis, and they updated their rubric to make it more specific to the assignment in which the outcome is assessed. An instructor also brought in articles and periodicals as examples to go over in class. The faculty also determined that while they had met their target for mathematical computation, there was still room for improvement. Therefore, one instructor generated more practice worksheets to help the students master the formulas and improve their scores.

In Physics, instructors will be encouraged to convey important aspect the rubric throughout the semester. We have chosen an experiment given at the very first lab of lab manual. This selection could have been contributed to a lower percentage of students who were not able to meet any of the criteria given. It would be better if a lab experiment can be chosen after first month of the semester as students are more aware of the experimental procedures and data analysis. This might lead to a higher success on the results.