**CENTRAL NEW MEXICO COMMUNITY COLLEGE**
**ASSESSMENT REPORT**
*Due to SAAC by October 15*

**PART 1: CONTACT & PROGRAM IDENTIFICATION**

| **Report Year and Contact Information:** | | | |
|---|---|---|---|
| 2015-2016 | Philip Lister | plister@cnm.edu | Extension 50325 |
| **Academic Year** | **Contact Person** | **Email** | **Phone Number** |

| **Subject of this Assessment Report:** | | |
|---|---|---|
| **Program:** | **Gen Ed Area:** Lab Science | **Discipline Area**: |
| ☐ Certificate ☐ AA ☐ AS ☐ AAS | Applicable to: ☒ AA/AS ☐ AAS | Biology |

**PART 2: EVIDENCE OF OVERALL PROGRAM EFFECTIVENESS**

**Summary of Program Successes:**

Students achieved the 70% success mark for all assessments related to outcomes GE1, GE3, GE5 and GE6. Although students still struggle with math skills, there were some substantial improvements. Some of the improvements related to refinements of the assessment tools to more specifically focus on the mathematic skills desired.

**Description and Evaluation of Recent Changes Made in Support of Student Learning:**

### GE2 Apply the scientific method to formulate questions, analyze information/data and draw conclusions

The final exam question for BIO 1092 requiring interpretation of genetic cross data has was changed to take emphasis away from differentiating genotype and phenotype, and putting more emphasis on scientific method to analyze information and draw conclusions. Students performed substantially better on this question.

### GE4 Utilize mathematical techniques to evaluate and solve scientific problems.

For BIO 1092, the action plan was to provide the students with the equation within the assessment question. This assesses the ability of the students to put the correct data into the equation and perform the math accurately. Student success on this question increased substantially over previous years.

**PART 3: REPORT ON RECENT ASSESSMENT OF STUDENT LEARNING**

| **Student Learning Outcome(s) Assessed:**<br>*To add rows: right –click in cell below and select "Insert," "Insert Rows Above"* | **Classes/Cohorts Assessed:** |
|---|---|
| **GE1** Employ critical thinking skills to judge the validity of information from a scientific perspective. | **GE1** BIO 2192 |
| **GE2** Apply the scientific method to formulate questions, analyze information/data and draw conclusions | **GE2** BIO 1092, BIO 1492, BIO 2192 |
| **GE3** Properly operate laboratory equipment to collect relevant and quality data | **GE3** BIO 1492, BIO 2192 |
| **GE4** Utilize mathematical techniques to evaluate and solve scientific problems. | **GE4** BIO 1092, BIO 1492, BIO 2192 |
| **GE5** Communicate effectively about scientific ideas and topics, in both oral and written formats | **GE5** BIO 2192 |
| **GE6** Relate science to personal, social or global impact | **GE6** BIO 2192 |

| **Measurement Tool(s) Used:**<br>*To add rows: right –click in cell below and select "Insert," "Insert Rows Above"* | *Enter X's for type of tool* | | | | **Initial Achievement Target or Expectation:** |
|---|---|---|---|---|---|
| | **Internal** | **External** | **Direct** | **Indirect** | |
| Midterm Exam (BIO 2192)<br>Final Exam (BIO 1092, BIO 1492, BIO 2192) | x | | | | 70% correct responses for each question |

**Assessment Findings:**

## GE1 Employ critical thinking skills to judge the validity of information from a scientific perspective.

**BIO 2192:** Do the results of your selective media support your gram stain? Midterm F15=70%; SP16=80%

## GE2 Apply the scientific method to formulate questions, analyze information/data and draw conclusions.

**BIO 1092:** You decide to compare oxygen consumption in two sets of rats. The first group contains normal rats. In the second group of rats, you surgically remove the thyroid gland of each rat (referred to as thyroidectomy). You measure oxygen consumption for one hour each week during the rats' regular activities. You compare oxygen consumption of both groups to determine if the removal of the thyroid gland has any effect on how much oxygen is consumed. Each rat is 2 years old and consumes 6 grams of food and 15 milliliters (ml) of water each day. Answer the following questions about this experiment:

1A. What is the independent variable? F15=59%; SP16=62%

1B. What is the dependent variable? F15=61%; SP16=60%

1C. What is one controlled variable? F15=65%; SP16=68%

**BIO 1092:** Suppose both Mom and Dad are able to roll their tongues. Mom is RR and Dad is Rr. What phenotypes are possible among their offspring? F1=61%; SP16=66%

**BIO 1492:** Interpret DNA fingerprint to determine most likely adult to be parent. F15=95%; S16=93%

**BIO 1492:** Interpret and solve pedigree chart relating to blood types. F15=58%; S16=73%

**BIO 1492:** Draw hypothetical graph for enzyme activity at suboptimum pH. F15=72%; SP16=72%

**BIO 2192:** Based on your Gram stain, formulate a hypothesis about the growth of your organism on MacConkey agar. F15=53%; SP16=66%

## GE3 Properly operate laboratory equipment to collect relevant and quality data.

**BIO 1492:** Use microscope to identify a state of mitosis in cells F15=85%; SP16=89%

**BIO 2192**: Gram Stain Technique F15=72% SP16=83%

## GE4 Utilize mathematical techniques to evaluate and solve scientific problems.

**BIO 1092:** Maria is at Defined Fitness, and she has just finished a 15-minute run on the treadmill. Before she got on the treadmill her heart rate was 77 beats per minute. Now, after 15 minutes of exercise, it is 139 beats per minute. What is the percent change for Maria's heart rate? (Include a plus sign or a minus sign to indicate the direction of the change.) F15=59%; SP16=73%

**BIO 1492:** Scientific conversion F15=42%; SP16=56%

**BIO 1492:** Cell size estimation equation Set-up F15=70%; SP16=69%

**BIO 1492:** Calculation of cell size estimation and convert answer to mm F15=52%; SP16=43%

**BIO 2192:** Estimate the approximate size of your organism in millimeters F15=56%; SP16=84%

### GE5 Communicate effectively about scientific ideas and topics, in both oral and written formats.

**BIO 2192:** Unknown final report discussion (70% minimum score). FINAL EXAM F15=75%; SP16=85%

### GE6 Relate science to personal, social or global impact.

**BIO 2192:** Unknown final report introduction (70% minimum score) F15=83%; SP16=88%

**Analysis and Interpretation of Assessment Findings:**

Students achieved the 70% success mark for all assessments related to outcomes GE1, GE3, GE5 and GE6.

**GE2 Apply the scientific method to formulate questions, analyze information/data and draw conclusions.**

This outcome is being assessed with several tools across all 3 course (BIO 1092, BIO 1492, and BIO 2192). Students surpassed the 70% success mark for most of the assessment tools. The exceptions were identification different variables associated with a scientific experiment and analysis of genetic cross data with BIO 1092, and formulation of hypothesis with BIO 2192. The performance of students with the hypothesis question in BIO 2192 was unusual, as students usually are very successful with this question. One factor could be the number of new faculty that started teaching BIO 2192 last year, as performance improved substantially during Spring 2016. Although students did not achieve the 70% goal for the genetic cross assessment, there was a substantial improvement over last year. This is probably related to restructuring of the question to take emphasis away from differentiating genotype and phenotype, and focusing rather on their success with the genetic cross problem.

**GE4 Utilize mathematical techniques to evaluate and solve scientific problems.**

Math calculations and scientific conversions continue to be a challenge for students in all 3 courses (BIO 1092, BIO 1492, and BIO 2192), but there were some substantial improvements over last year. Student success with calculating percent change of heart rate in BIO 1092 increased from approximately 40% during 2014-2015, to 67% during 2015-2016. Students achieved 73% success on this assessment question in Spring 2016. This most likely reflects a change in the assessment tool that provided the formula for the students so they were being assessed specifically on their ability to successfully perform the calculation. Students in BIO 1492 achieved the 70% success goal for the first time with their set-up of the cell size estimate equation. However, still struggled with performing the calculations. Although BIO 2192 students were below the 70% success goal for cell size estimate calculations during Fall 2016, there was a substantial increase to 84% success during Spring 2016. This may also be related to new faculty becoming more comfortable with teaching BIO 2192.

| **Action Plan in Support of Student Learning:** |
|---|
| One major change for the upcoming year is removing several of the upper level courses from the General Education matrix. These courses will include BIO 1610/1692, BIO 2110/2192, BIO 2410/2492, and BIO 2510/2592. Removal of BIO 2192 will have the biggest impact on assessment since it provided assessment for many of the General Education outcomes. However, development of assessment tools in other more appropriate General Education courses will replace the loss of BIO 2192.<br><br>The development of new tools and incorporation of additional courses in the assessment plan will be delayed until the HED provides their finalized changes to the General Education core.<br><br>Action plans related to current assessment tools that are not meeting the 70% target are the following:<br><br>**GE4 Utilize mathematical techniques to evaluate and solve scientific problems.**<br><br>BIO 1492: The Biology faculty voted to allow the use of calculators on exams. Calculators had been restricted in the past. Allowing the use of calculators and continued assessment of student equation set-up will provide assessment of student skills with and without technology. |

| **Recommendations, Proposals, and/or Funding Requests:** |
|---|
| Not applicable |

**PART 4: EMBEDDED OUTCOMES**

| **Critical Thinking and Life Skills/Teamwork Development within Programs:**<br>a) Please describe how Critical Thinking assessment is embedded within your program assessment.<br>b) Please describe how Life Skills/Teamwork assessment is embedded within your program assessment. |
|---|
| a) Employment of the Scientific Method is a student learning outcome in every Biology course at CNM. The Scientific Method is the embodiment of critical thinking: Observe, Formulate a Hypothesis, Test the Hypothesis, Analyze the Results, Formulate a Conclusion |
| b) All Biology lab courses and many Biology lecture courses incorporate group activities that involve Teamwork, and successful Teamwork is a Life Skill. In addition, students are taught laboratory safety skills and regulations that will translate to their careers in laboratory or clinical settings. |

**PART 5: ASSESSMENT CYCLE PLAN** (Copy and paste from original plan if unchanged)

| Cycle Years: | Plan Description: |
|---|---|
| Fall 2011-Spring 2016 | Below is the cycle plan for Fall 2011-Spring 2016. A new cycle plan for Fall 2016-Spring 2021 has been submitted separated and reflects the removal of Biology 1610 and above from the General Education Matrix.<br>Data from Bio 1610, 1692, 2410, 2492, 2510, and 2592 will not be reported on since they've either already been or are in process of being removed from the matrix. This will be the last report to include data from Bio 2192 as it will soon be removed from the Gen Ed matrix. |

| Student Learning Outcomes: | When Measured: | Where Measured: | How Measured: |
|---|---|---|---|
| 1. **GE1 Employ critical thinking skills to judge the validity of information from a scientific perspective.** | Fall 2011-Spring 2012<br><br>Fall 2012- Spring 2013<br><br>Spring 2013<br><br>Fall 2013-Spring 2017 | BIO 1092, BIO 2192<br><br>BIO 1092, BIO 1492, BIO 2192, BIO2392<br><br>BIO 2292, BIO2410/2492, BIO 2510/2592<br><br>BIO 1092, BIO 1492, BIO1610/1692, BIO 2192, BIO2292, BIO2392, BIO2410/2492, BIO 2510/2592 | Midterm & Final Exam<br><br>Final exam for BIO 1092, BIO 1492, and BIO 2392; Midterm exam and student project for BIO 2192<br><br>Final exam<br><br>Final exam for BIO 1092, BIO 1492, BIO2292, BIO 2392, BIO2410/2492, BIO 2510/2592; Midterm exam and student project for BIO 2192; TBA 1610/1692 |
| 2. **GE2 Apply the scientific method to formulate questions, analyze information/data and draw conclusions.** | Fall 2011-Spring 2012<br><br>Fall 2012<br><br>Fall 2012- Spring 2013 | BIO 1092, BIO 2192<br><br>BIO2410/2492<br><br>BIO 1092, BIO 1492, BIO 2192, BIO2392 | Midterm & Final Exam<br><br>Final exam<br><br>Final exam for BIO 1092, BIO 1492, and BIO 2392; Midterm exam and student project for BIO 2192 |
| 3. **GE3 Properly operate laboratory equipment to** | Fall 2011-Spring 2012 | BIO2192 | Midterm & Final Exam |

| | | | |
|---|---|---|---|
| **collect relevant and quality data.** | Fall 2012- Spring 2013<br><br>Fall 2013-Spring 2017 | BIO 1492, BIO 2192, BIO2392<br><br>BIO 1092, BIO 1492, BIO 2192, BIO2292, BIO2392 | Final exam for BIO 1492, and BIO 2392; Midterm exam and student project for BIO 2192<br><br>Final exam for BIO 1092, BIO 1492, BIO2292, BIO 2392; Midterm exam and student project |
| 4. | Fall 2011-Spring 2012<br><br>Fall 2012<br><br>Fall 2012- Spring 2013<br><br>Spring 2013<br><br>Fall 2013-Spring 2017 | BIO 1092, BIO 2192<br><br>BIO2410/2492<br><br>BIO 1092, BIO 1492, BIO 2192, BIO2292, BIO2392<br><br>BIO 2510/2592<br><br>BIO 1092, BIO 1492, BIO1610/1692, BIO 2192, BIO2292, BIO2392, BIO2410/2492, BIO 2510/2592 | Midterm & Final Exam<br><br>Final exam<br><br>Final exam for BIO 1092, BIO 1492, BIO2292, and BIO 2392; Midterm exam and student project for BIO 2192<br><br>Final exam<br><br>Final exam for BIO 1092, BIO 1492, BIO2292, BIO 2392, BIO2410/2492, BIO 2510/2592; Midterm exam and student project for BIO 2192; TBA 1610/1692 |
| 5. | Fall 2011-Spring 2012<br><br>Fall 2012<br><br>Fall 2012- Spring 2013<br><br>Spring 2013<br><br>Fall 2013-Spring 2017 | BIO2192<br><br>BIO2410/2492<br><br>BIO 2192, BIO2392<br><br>BIO 2510/2592 | Midterm & Final Exam<br><br>Final exam<br><br>Final exam for BIO 2392; Midterm exam and student project for BIO 2192<br><br>Final exam |

| | | | |
|---|---|---|---|
| | | BIO 2192, BIO2292, BIO2392, BIO2410/2492, BIO 2510/2592 | Final exam for BIO2292, BIO 2392, BIO2410/2492, BIO 2510/2592; Midterm exam and student project for BIO 2192; |
| 6. | Fall 2011-Spring 2012<br><br>Fall 2012<br><br>Fall 2012- Spring 2013<br><br>Spring 2013<br><br>Fall 2013-Spring 2017 | BIO 1092, BIO 2192<br><br>BIO2410/2492<br><br>BIO 1092, BIO 1492, BIO 2192, BIO2392<br><br>BIO 2510/2592<br><br>BIO 1092, BIO 1492, BIO1610/1692, BIO 2192, BIO2292, BIO2392, BIO2410/2492, BIO 2510/2592 | Midterm & Final Exam<br><br>Final exam<br><br>Final exam for BIO 1092, BIO 1492, BIO2292, and BIO 2392; Midterm exam and student project for BIO 2192<br><br>Final exam<br><br>Final exam for BIO 1092, BIO 1492, BIO2292, BIO 2392, BIO2410/2492, BIO 2510/2592; Midterm exam and student project for BIO 2192; TBA 1610/1692 |