

## Academic Assessment Report - AY 2013-2014\*

### \*Updated to Include Intermediate Results

College, School/Department, Name of Program: College of Natural, Applied & Health Sciences/School of Natural Sciences/Biology Program

#### Program SLOs:

SLO #1: Acquire Knowledge of fundamental principles (diversity of living organisms/biological fundamentals/evolutionary biology) (KU 1, 2, 4) (GE K1, S5, V1)

SLO #2: Acquire the laboratory and field skills to gather and analyze data related to biological questions (KU 1, 2, 4) (GE K1, S3, S4, S5, V2)

SLO #3: Develop skills in critical thinking, scientific reasoning, and problem solving (KU 1, 2, 4) (GE K2, S1, S3, S4, S5, V1)

SLO #4: Develop the ability to apply biological principles to understand current issues (KU 1, 2, 3, 4) (GE K1, S3, S4, S5, V1, V3)

SLO #5: Develop the ability to effectively find, organize, and use resources from the literature and present results in oral, visual, and written communication (KU 1, 2, 4) (GE K1, S1, S2, S3, S4, S5, V1)

SLO #6: Develop an awareness of careers and professions available in the biological sciences (KU 2, 3, 4) (GE S4, S5, V4, V5)

SLO #7: Acquire adequate preparation to enter health professional programs and/or the work force in related fields (KU 2, 3, 4) (GE K1, K4, S5, V4, V5)

| Program Level<br>Student Learning<br>Outcomes  | Assessment<br>Measure(s)                                    | Assessment Criteria  | Results of Assessment  | Action Taken   |
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| <b>SLO #1</b><br>Acquire Knowledge of fundamental principles (diversity of living organisms/biological fundamentals/evolutionary biology) (KU 1, 2, 4) (GE K1, S5, V1) | <b>Direct Measure #1:</b><br>ETS Biology Comprehensive Exam | <b>BIO 4970, Seminar in Integrative Biology</b> (Capstone);<br><br>Paper Exam Administered by Instructor, mailed to ETS, scored by ETS, and Results Report sent to the program | Results measure student knowledge in content area and provide a comparative benchmark of other colleges in the country<br><b>(Approved by Dean's Office)</b> | ETS assessment was administered in Fall 2013. Once results are obtained a three year review and course of action will be decided during the June 2014 "Close the Loop" Review. |
|  | <b>Direct Measure #2:</b><br>Written Laboratory Assignment  | <b>BIO 2200, Cell Biology</b><br><b>BIO 2400 Genes, Organisms, and Populations, and BIO 3704 Principles of Genetics</b>  | Pre/Post-test comparison to determine remedial focus area for delivery of course content.  | The pre-post test results have been compiled and presented during Research Day.<br><br>In Fall 2013, a pilot pre- and post-test  |

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|   | Faculty Developed Pre-post test survey (hard copy) administered and scored by staff                              | <i>(September 2013)</i>  | <p>study was conducted in BIO 2200 &amp; BIO 3704 for BA Biology program to assess student learning outcomes.</p> <p>A common set of multiple-choice questions was developed and used as the pre-test for BIO 1 (BIO2200 – Cell Biology), BIO2 (BIO2400 – Genes, Organisms and Populations) and BIO3704 (Principles of Genetics). Another common set of multiple-choice questions was used as the post-test.</p> <p>The questions are grouped into three blocks.</p> <p>Block 1 assesses student understanding of principles underlying all branches of the sciences.</p> <p>Block 2 assesses student knowledge of the scientific method, a topic essential for all biological inquiries.</p> <p>Block 3 assesses basic math skills and analytical thinking abilities.</p> <p>To obtain unbiased data, pre- and post-test grades were incorporated into the calculation of the students’ final grade to encourage maximum effort by the students during both tests. The pre-test results provide the benchmark for which instructional efforts and focus will be directed throughout the semester.</p> |
| <b>Direct Measure #3:</b><br>Scientific Method &<br>Quantitative Reasoning<br>Assessment Exercise | <b>BIO 1000: Principles of Biology</b><br>Scientific Method &<br>Quantitative Reasoning<br>Assessment Assignment | In Fall 2013, GE Assessment survey was again used in Biology 1000. Content remained the same but the format was changed to an online format in Spring 2014 to allow quicker access to results. | Results of this Direct Measure have been compiled are presented in the Middle States Interim Report in 2014.   |

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|   | <b>Indirect Measure 1:</b> Kean Graduating Sr. Survey                  | <b>BIO 4970, Seminar in Integrative Biology</b> (Capstone)<br><br>Results will be electronically scored and provided to the Executive Director   | Survey to be emailed to all seniors enrolled in BIO 4970 (Capstone) <b>(Spring 2013;2014)</b>   | There was a 32% response rate for Capstone Biology in 2013. Results of this survey are still pending. Action will be suggested based on data when it becomes available.   |
|   | <b>Indirect: Measure 2:</b> Comparative Analysis of F/S 2013-14 grades | <b>BIO 4970, Seminar in Integrative Biology</b><br>Data obtained from Registrar's Office & analyzed in Excel   | <b>In Progress.</b>   | Awaiting Final Spring 2014 grades to compile with Fall 2013.  |
|   | <b>Direct Measure #1:</b> Written Lab Projects                         | <b>BIO 2200 Cell Biology &amp; BIO 2400 Genes, Organisms, and Populations, and BIO 3704 Principles of Genetics</b><br><br>Faculty Developed Writing rubric scored by instructor for each student – first lab report  | Peer Leadership Training to Administer Rubrics <b>(October 2012;2013)</b><br><b>One lab assistant was available, who oversaw faculty administration of the survey and scoring of the results.</b> | The Lab Report Rubric was developed and approved by faculty in Spring 2013. Instrument was then administered in Spring and Fall 2013 and incorporated into students' final grades. The ongoing use of this instrument for assessment is still being used and should be for active for AY 2014-2015. |
| <b>SLO #2</b><br><b>Acquire the laboratory and field skills to gather and analyze data related to biological questions (KU 1, 2, 4) (GE K1, S3, S4, S5, V2)</b> | <b>Direct Measure #2:</b> Written Laboratory Assignment                | <b>BIO 2200 Cell Biology &amp; BIO 2400 Genes, Organisms, and Populations, and BIO 3704 Principles of Genetics</b><br><br>Faculty Developed Pre-test survey (hard copy) administered by Instructor at the beginning of the course. Post-test questions included in final examination and used to measure learning outcomes | BIO 2200 results will serve as a benchmark for identifying students in need of remedial help in writing <b>(September 2013)</b>   | The pre/post tests were conducted in Spring 2013 and Fall 2013. Results confirmed that students had difficulty with reading graphs.<br><br><b>Results:</b> Analysis of these results are still pending and the use of this instrument is being assessed by the biology program for future use.      |

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| <p style="text-align: center;"><b>SLO #3</b></p> <p><b>Develop skills in critical thinking, scientific reasoning, and problem solving (KU 1, 2, 4) (GE K2, S1, S3, S4, S5, V1)</b></p> | <p><b>Indirect Measure #1:</b><br/>Written Laboratory Assignment</p>    | <p><b>BIO 3400, Zoology, Form, and Function</b></p> <p>NCSU Student Learning Inventory<br/>On-line student learning inventory administered by lab assistant</p>   | <p>Peer Leadership Training on Survey Administration <b>(October 2013)</b></p>   | <p>Zoology results were compiled and reflected the following gains: Peer Leaders were trained and monitored by Dr. James in Fall 2012/Spring 2013. Overall averages from the writing rubrics were added to final scores.</p>           |
|  | <p><b>Indirect Measure #2:</b><br/>Kean Graduating Sr. Survey</p>       | <p><b>BIO 4970, Seminar in Integrative Biology (Capstone)</b></p> <p>Results will be electronically scored and provided to the Executive Director</p>   | <p>Survey emailed to all seniors enrolled in BIO 4970 (Capstone ) <b>Spring 2013. Survey for Spring 2014 is still pending.</b></p> | <p>There was a 32% response rate for the Capstone Biology in Spring 2013. We have not received results yet to determine any actionable items but will combine with Spring 2014 data and develop an action based on pooled results.</p> |
|  | <p><b>Direct Measure #1:</b><br/>Written Lab &amp; Research Reports</p> | <p><b>BIO Core Courses (6) &amp; BIO 4970 (Capstone)</b></p> <p>Faculty Developed Writing rubric scored by instructor for each student – first lab &amp; Research Report</p>  | <p>Peer Leadership Training on Rubric Administration <b>(October 2013)</b></p>   | <p>The Lab Report Rubric was developed and approved by the faculty in Spring 2013. Instrument was pilot-tested in BIO 1000, section 16. Results were incorporated into student’s final grades.</p>                                     |
|  | <p><b>Direct Measure #2:</b><br/>Written Laboratory Assignment</p>      | <p><b>BIO 2200 Cell Biology &amp; BIO 2400 Genes, Organisms, and Populations, and BIO 3704 Principles of Genetics</b></p> <p>Faculty Developed Quantitative Reasoning and Scientific Rubrics administered by Instructor</p> | <p>BIO 2200 results will serve as a benchmark for identifying students in need of remedial help in writing</p>                     | <p>The pre/post tests were conducted in Fall 2012, Spring 2013, and Fall 2013. Results confirmed that students had difficulty with reading graphs.</p> <p><b>Results:</b> Still pending.</p>   |
|  | <p><b>Direct Measure #3:</b><br/>Written Laboratory Assignment</p>      | <p><b>BIO 2200 Cell Biology &amp; BIO 2400 Genes, Organisms, and Populations, and BIO 3704 Principles of Genetics</b></p>   | <p>Pre/Post-test comparison to determine remedial focus area for delivery of course content. <b>(September 2012)</b></p>           | <p>The pre/post tests were conducted in Fall 2012, Spring 2013, and Fall 2013.</p> <p><b>Results:</b> Detailed analysis of the results from one section in Fall 2012 revealed that the average grade for "scientific</p>               |

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|   |   | <p><b>Critical Thinking Values Rubric:</b> Validated Instrument will be used during lab to provide students with the opportunity to comprehensively explore scientific issues that require formulation of opinions and conclusions</p> |  | <p>principles" (block 1) went up from 62.1% on the pre-test to 82.8% on the post-test, the average grade for "scientific method" (block 2) went up from 61.3% to 76.5%, and that for "graphs" (block 3) went down from 48.4% to 34.4%.</p> <p>Analysis for other sections in Fall 2013 and collection of the pre-test data for Spring 2013 semester are currently underway. The pre- and post-test assessment is a standardized instrument that can be easily adopted and quickly quantitated to provide measurable evidence of student learning.</p> |
|   | <p><b>Indirect Measure #1:</b><br/>Kean Graduating Sr. Survey</p>       | <p><b>BIO 4970, Seminar in Integrative Biology (Capstone)</b></p> <p>Results will be electronically scored and provided to the Executive Director</p>  | <p>Survey emailed to all seniors enrolled in BIO 4970 (Capstone ) <b>(Spring 2013). Fall 2014 surveys have yet to be sent to students.</b></p> | <p>There was a 32% response rate for the Capstone Biology in Spring 2013 (awaiting final results for analysis). We will combine results of Spring 2014 with Spring 2013 for aggregate analysis.</p>   |
|   | <p><b>Direct Measure #1:</b><br/>Written Lab &amp; Research Reports</p> | <p><b>BIO Core Courses (6) &amp; BIO 4970 (Capstone)</b></p> <p>Faculty Developed Writing rubric scored by instructor for each student – first lab &amp; Research Report</p>   | <p>Peer Leadership Training on Survey Administration <b>(October 2013)</b></p>   | <p>The Lab Report Rubric was developed, tested and used in Spring 2013. Instrument had been piloted in BIO 1000, section 16 and was incorporated into student's final grades.</p>   |
| <p><b>SLO #4</b><br/><b>Develop the ability to apply biological principles to understand current issues (KU 1, 2, 3, 4) (GE K1, S3, S4, S5, V1, V3)</b></p> | <p><b>Direct Measure #2:</b><br/>Written Laboratory Assignment</p>      | <p><b>BIO 2200 Cell Biology &amp; BIO 2400 Genes, Organisms, and Populations, and BIO 3704 Principles of Genetics</b></p> <p>Faculty Developed Quantitative Reasoning and Scientific Rubrics administered by Instructor</p>            | <p>Pre and post-tests were developed and pilot tested in Fall 2012. Results were presented during the January 2013 Assessment Conference.</p>  | <p>Pre and post-tests were developed and pilot tested in Fall 2012. Results were presented in January 2013 and during Research Day.</p> <p>In Fall 2012, a pilot pre- and post-test study was conducted in BIO 2200 &amp; BIO 3704 for BA Biology program to assess student learning outcomes.</p> <p>A common set of multiple-choice</p>   |

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|  |   |   |  | <p>questions was developed and used as the pre-test for BIO 1 (BIO2200 – Cell Biology), BIO2 (BIO2400 – Genes, Organisms and Populations) and BIO3704 (Principles of Genetics). Another common set of multiple-choice questions was used as the post-test.</p> <p>The questions are grouped into three blocks.</p> <p>Block 1 assesses student understanding of principles underlying all branches of the sciences.</p> <p>Block 2 assesses student knowledge of the scientific method, a topic essential for all biological inquiries.</p> <p>Block 3 assesses basic math skills and analytical thinking abilities.</p> <p>To obtain unbiased data, pre- and post-test grades were incorporated into the calculation of the students’ final grade to encourage maximum effort by the students during both tests. The pre-test results provide the benchmark for which instructional efforts and focus will be directed throughout the semester.</p> |
|  | <p><b>Indirect Measure #1:</b><br/>Kean Graduating Sr. Survey</p>       | <p><b>BIO 4970, Seminar in Integrative Biology (Capstone)</b></p> <p>Results will be electronically scored and provided to the Executive Director</p> | <p>Survey emailed to all seniors enrolled in BIO 4970 (Capstone )<br/><i>(Spring 2013)</i></p>                         | <p>There was a 32% response rate for the Capstone Biology (awaiting final results and final analysis).</p>   |
|  | <p><b>Direct Measure #1:</b><br/>Written Lab &amp; Research Reports</p> | <p><b>BIO Core Courses (6) &amp; BIO 4970 (Capstone)</b></p> <p>Faculty Developed Writing rubric scored by instructor</p>                             | <p>Pre and post-tests were developed and pilot tested in Fall 2012. Results were presented during the January 2013</p> | <p>The pre/post tests were conducted in Fall 2012 and Spring 2013. Results confirmed that students had difficulty with reading graphs. There was a 14% decrease in math skills.</p>  |

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|   |   | for each student – first lab & Research Report   | Assessment Conference.   | <p><b>Results:</b> Detailed analysis of the results from one section in Fall 2012 revealed that the average grade for "scientific principles" (block 1) went up from 62.1% on the pre-test to 82.8% on the post-test, the average grade for "scientific method" (block 2) went up from 61.3% to 76.5%, and that for "graphs" (block 3) went down from 48.4% to 34.4%.</p> <p>Analysis for other sections in Fall 2012 and collection of the pre-test data for Spring 2013 semester are currently underway. The pre- and post-test assessment is a standardized instrument that can be easily adopted and quickly quantitated to provide measurable evidence of student learning.</p>   |
| <p><b>SLO #5</b><br/> <b>Develop the ability to effectively find, organize, and use resources from the literature and present results in oral, visual, and written communication (KU 1, 2, 4) (GE K1, S1, S2, S3, S4, S5, V1)</b></p> | <p><b>Direct Measure #2:</b><br/> Oral Lab &amp; Research Presentations</p> | <p><b>BIO Core Courses (6) &amp; BIO 4970 (Capstone)</b></p> <p>Faculty Developed Presentation rubric scored by instructor for each student – Lab Report &amp; Research Report Presentations</p> | <p>Peer Leadership Training on Rubric Administration (<b>October 2012</b>)</p> | <p>Pre and post-tests were developed and pilot tested in Fall 2012. Results were presented during the January 2013 Assessment Conference.</p> <p>The pre/post tests were conducted in Fall 2012 and Spring 2013. Results confirmed that students had difficulty with reading graphs. There was a 14% decrease in math skills</p> <p><b>Results:</b> Detailed analysis of the results from one section in Fall 2012 revealed that the average grade for "scientific principles" (block 1) went up from 62.1% on the pre-test to 82.8% on the post-test, the average grade for "scientific method" (block 2) went up from 61.3% to 76.5%, and that for "graphs" (block 3) went down from 48.4% to 34.4%.</p> <p>Analysis for other sections in Fall 2012</p> |

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|   |  |   |  | and collection of the pre-test data for Spring 2013 semester are currently underway. The pre- and post-test assessment is a standardized instrument that can be easily adopted and quickly quantitated to provide measurable evidence of student learning.  |
|   | <b>Indirect Measure #1:</b><br>Kean Graduating Sr. Survey      | <b>BIO 4970, Seminar in Integrative Biology (Capstone)</b><br><br>Results will be electronically scored and provided to the Executive Director  | Survey emailed to all seniors enrolled in BIO 4970 (Capstone )<br><b>(Spring 2013)</b>                               | There was a 32% response rate for the Capstone Biology (awaiting final results).  |
|   | <b>Direct Measure #1:</b><br>Written Lab & Research Reports    | <b>BIO Core Courses (6) &amp; BIO 4970 (Capstone)</b><br><br>Faculty Developed Writing rubric scored by instructor for each student – first lab & Research Report                     | Peer Leadership Training on Rubric Administration<br><b>(October 2012)</b>   | The Lab Report Rubric was developed and tested and used by faculty in Spring 2013. Instrument was also piloted in BIO 1000, section 16 and is being incorporated into student's final grades.   |
| <b>SLO #6</b><br><b>Develop an awareness of careers and professions available in the biological sciences (KU 2, 3, 4) (GE S4, S5, V4, V5)</b> | <b>Direct Measure #2:</b><br>Oral Lab & Research Presentations | <b>BIO Core Courses (6) &amp; BIO 4970 (Capstone)</b><br><br>Faculty Developed Presentation rubric scored by instructor for each student – Lab Report & Research Report Presentations | Pre/Post-test comparison to determine remedial focus area for delivery of course content.<br><b>(September 2012)</b> | Pre and post-tests were developed and pilot tested in Fall 2012. Results were presented during the January 2013 Assessment Conference.<br><br>The pre/post tests were conducted in Fall 2012 and Spring 2013. Results confirmed that students had difficulty with reading graphs. There was a 14% decrease in math skills.<br><br><b>Results:</b> Detailed analysis of the results from one section in Fall 2012 revealed that the average grade for "scientific principles" (block 1) went up from 62.1% on the pre-test to 82.8% on the post-test, the average grade for "scientific method" (block 2) went up from 61.3% to 76.5%, and that for "graphs" (block 3) |



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|   |   |   |   | went down from 48.4% to 34.4%.<br><br>Analysis for other sections in Fall 2012 and collection of the pre-test data for Spring 2013 semester are currently underway. The pre- and post-test assessment is a standardized instrument that can be easily adopted and quickly quantitated to provide measurable evidence of student learning.   |
|   | <b>Indirect Measure #1:</b><br>Kean Graduating Sr. Survey   | <b>BIO 4970, Seminar in Integrative Biology (Capstone)</b><br><br>Results will be electronically scored and provided to the Executive Director                    | Survey emailed to all seniors enrolled in BIO 4970 (Capstone )<br><b>(Spring 2013)</b>  | There was a 32% response rate for the Capstone Biology (awaiting final results and analysis).   |
|   | <b>Direct Measure #1:</b><br>ETS Biology Comprehensive Exam | <b>BIO 4970, Seminar in Integrative Biology (Capstone);</b>   | Paper Exam Administered by Instructor, mailed to ETS, scored by ETS, and Results Report sent to the program <b>(Approved by Dean, September 2012)</b> | ETS assessment was administered in Spring 2013. Forty-four students participated in the survey, which yielded a mean score of 134 points. National mean score for test is 153 points.   |
| <b>SLO #7</b><br><br><b>Acquire adequate preparation to enter health professional programs and/or the work force in related fields (KU 2, 3, 4) (GE K1, K4, S5, V4, V5)</b> | <b>Direct Measure #2:</b><br>Written Lab & Research Reports | <b>BIO Core Courses (6) &amp; BIO 4970 (Capstone)</b><br><br>Faculty Developed Writing rubric scored by instructor for each student – first lab & Research Report | Pre/Post-test comparison to determine remedial focus area for delivery of course content.<br><b>(September 2012)</b>                                  | Pre and post-tests were developed and pilot tested in Fall 2012. Results were presented during the January 2013 Assessment Conference.<br><br>The pre/post tests were conducted in Fall 2012 and Spring 2013. Results confirmed that students had difficulty with reading graphs. There was a 14% decrease in math skills.<br><br><b>Results:</b> Detailed analysis of the results from one section in Fall 2012 revealed that the average grade for "scientific principles" (block 1) went up from 62.1% |

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|  |  |  | <p>on the pre-test to 82.8% on the post-test, the average grade for "scientific method" (block 2) went up from 61.3% to 76.5%, and that for "graphs" (block 3) went down from 48.4% to 34.4%.</p> <p>Analysis for other sections in Fall 2012 and collection of the pre-test data for Spring 2013 semester are currently underway. The pre- and post-test assessment is a standardized instrument that can be easily adopted and quickly quantitated to provide measurable evidence of student learning.</p>  |
| <p><b>Direct Measure #3:</b><br/>Oral Lab &amp; Research Presentations</p> | <p><b>BIO Core Courses (6) &amp; BIO 4970 (Capstone)</b></p> <p>Faculty Developed Presentation rubric scored by instructor for each student – Lab Report &amp; Research Report Presentations</p> | <p>Pre/Post-test comparison to determine remedial focus area for delivery of course content.<br/><b>(September 2012)</b></p> | <p>Pre and post-tests were developed and pilot tested in Fall 2012. Results were presented during the January 2013 Assessment Conference.</p> <p>The pre/post tests were conducted in Fall 2012 and Spring 2013 (in progress). Results confirmed that students had difficulty with reading graphs. There was a 14% decrease in math skills.(See below).</p> <p><b>Results:</b> Detailed analysis of the results from one section in Fall 2012 revealed that the average grade for "scientific principles" (block 1) went up from 62.1% on the pre-test to 82.8% on the post-test, the average grade for "scientific method" (block 2) went up from 61.3% to 76.5%, and that for "graphs" (block 3) went down from 48.4% to 34.4%.</p> <p>Analysis for other sections in Fall 2012 and collection of the pre-test data for Spring 2013 semester are currently underway. The pre- and post-test assessment is a standardized instrument</p> |

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|   |   |  | that can be easily adopted and quickly quantitated to provide measurable evidence of student learning. |
| <b>Indirect Measure #1:</b><br>Kean Graduating Sr. Survey | <b>BIO 4970, Seminar in Integrative Biology</b><br>(Capstone)<br><br>Results will be electronically scored and provided to the Executive Director | Survey emailed to all seniors enrolled in BIO 4970 (Capstone )<br><b>(Spring 2013)</b> | There was a 32% response rate for the Capstone Biology (awaiting final results).                       |
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Note 1: The recent reorganization of the School of Natural Sciences has merged one of the B.S. degree programs (Cell & Molecular) into the school while one of the B.S. Biology Degree programs remains in a separate school (School of Environmental and Sustainability Sciences). In order to accurately develop a comprehensive assessment plan for the Biology Degree program- an integrated dialogue and strategy for assessing student learning objectives must be developed between faculty of both schools. Therefore, the assessment plan needs to be reevaluated in both the direct and indirect measures being used to insure consistency in assessing student learning in Biology.

Note 2: We are re-evaluating the need to offer the ETS Biology Subject Exam every year and will probably move to an every 3 year cycle.

Note 3: The BIO 1000 Pre and Post tests and GE exams assessing the scientific method have been converted to a Qualtrics Online Assessment Form for easier student use and rapid result collection. It was implemented Spring 2014.

Note 4: The BA and BS Biology Degree programs are currently going through program review. A large number of courses within the major are going through course content and SLO revisions. The program review should be completed by April 2014.

