

AY 2017 – 2018 Assessment

Program – Bachelor of Science in Biology

College: Arts and Sciences

Prepared by: Francene J Lemoine

Date: 6-6-18

Approved by: Greg Handel:

Date: 6.18.18

Northwestern Mission. Northwestern State University is a responsive, Student-oriented institution that is committed to the creation, dissemination, and acquisition of knowledge through teaching, research, and service. The University maintains as its highest priority excellence in teaching in graduate and undergraduate programs. Northwestern State University prepares its Students to become productive members of society and promotes economic development and improvements in the quality of life of the citizens in its region.

College of Arts and Sciences' Mission. College of Arts and Sciences' Mission. The College of Arts & Sciences, the largest college at Northwestern State University, is a diverse community of scholars, teachers, and students, working collaboratively to acquire, create, and disseminate knowledge through transformational, high-impact experiential learning practices, research, and service. The College strives to produce graduates who are productive members of society equipped with the capability to promote economic and social development and improve the overall quality of life in the region. The College provides an unequaled undergraduate education in the social and behavioral sciences, English, communication, journalism, media arts, biological and physical sciences, and the creative and performing arts, and at the graduate level in the creative and performing arts, English, TESOL, and Homeland Security. Uniquely, the College houses the Louisiana Scholars' College (the State's designated Honors College), the Louisiana Folklife Center, and the Creole Center, demonstrating its commitment to community service, research, and preservation of Louisiana's precious resources.

School of Biological and Physical Sciences. The School of Biological and Physical Sciences will become a reputable leader in public higher education by providing a transformative science educational experience using innovative instructional methods and through the scholarly achievements of our faculty, staff, students, and alumni. The School serves and inspires the students of Northwestern State University and the public through the development of lifelong learners who are excited about science, are disciplined in analytical and critical thinking skills, and are socially, environmentally, and ethically responsible. The School delivers Associate degrees in Veterinary Technology, Bachelor of Science degrees in Biology (with concentrations in Biomedical, Clinical Laboratory Science, Forensic Science, Natural Science, and Veterinary Technology), Applied Microbiology (with concentrations in Environmental and Applied Microbiology and Medical and Health Profession), and Physical Sciences. The School also offers minors in Biology, Microbiology, Wildlife Management, and Chemistry.

AY 2017 – 2018 Assessment

Biology Program Mission Statement. The mission of the Northwestern State University Biology program is to provide a comprehensive education in biology for all of our majors and to create a unique training environment for students wishing to pursue graduate or professional education.

Purpose (optional): The primary goal of the Biology program is to prepare students to enter the job market competitively at the bachelor level or to further their education in either graduate or professional school.

Methodology: The assessment process for the Biology program is as follows:

- (1) Data from assessment tools (both direct – indirect, quantitative and qualitative) are collected and returned to the program coordinator;
- (2) The program coordinator will analyze the data to determine whether students have met measurable outcomes;
- (3) Results from the assessment will be discussed with the program faculty;
- (4) The program coordinator, in consultation with the director of the School of Biological and Physical Sciences as well as the faculty of the School, will propose changes to measurable outcomes and/or assessment tools for the next assessment period and, where needed, curricula and program changes.

Student Learning Outcomes:

SLO 1. Students will explain the basic concepts of the molecular basis of life.

Course Map: BIOL1010 - Biological Principles I. All majors are required to complete BIOL1010.

Measure 1.1. (Direct – knowledge)

Throughout the course, students will learn about the molecular basis of life including macromolecules, cellular structure, enzyme function, gene expression, cellular respiration, photosynthesis, DNA structure and function, genetics, and cellular division. Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target not met.

Analysis: In AY2016-2017, 17.02% (8/47) of biology majors earned $\geq 70\%$ on the assessment. This performance was tremendously reduced (-52.98%) from the goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were unable to demonstrate appropriate knowledge of the molecular basis of life. This poor performance was likely because students have a cursory understanding of these

AY 2017 – 2018 Assessment

topics but not a deep enough understanding to be able to answer application-style questions. A decision was made to change the way in which the relevant information was delivered in the course. Faculty were encouraged to increase the number and frequency of topic assessments to provide additional feedback to students on their understanding.

In AY2017-2018, 21.88% (7/32) of biology majors earned $\geq 70\%$ on the assessment. This performance is far below (-48.12%) our goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were not able to demonstrate appropriate knowledge of the molecular basis of life. This performance was improved (+4.86%) compared to the performance of students from the last AY demonstrating that the informational delivery changes implemented were moderately successful in improving student learning/understanding.

To further analyze the data collected, we examined student performance on individual questions in the assessment. Based on this additional evaluation, it appears that students performed at the lowest levels on questions #6 and #9. These questions pertain to the functionality of the biological pathways photosynthesis (for question #6) and gene expression (for question #9) systems. Such concepts are generally more difficult for students to understand/apply. For the next academic year, the delivery of this type of material will include additional/various teaching methods including active learning/flipped classroom activities and extended classroom/assessment time.

Decision: While implementing the decision/plan of action from AY2016-2017 did result in moderate improvement (+4.86%), the analysis of this AY demonstrates that for the areas of the molecular basis of life, repetition alone was not enough to improve significantly student learning. Additionally, the use of additional testing/feedback may have helped some students make the academic corrections necessary for better performance (hence the moderate improvement), but it wasn't enough to induce significant improvement. For example, above average students may have been impacted but average/below average students did not benefit from the additional assessment/feedback strategy used. Further data analysis indicates that the weakest areas of student performance were in complex biological pathways (photosynthesis and gene expression). Based on this evidence, the faculty will work to change the delivery of course material to improve student comprehension and retention of all material in general but most specifically on biological pathways. This alteration will include implementing active learning techniques and providing students with additional classroom and assessment time on these topics. The School of Biological and Physical Sciences is also working to reduce average class sizes in this course (from an average of 85 students per section to an average of 35 students per section in the Fall 2018 semester). The target of this SLO will be maintained until $\geq 70\%$ of students to attain a final average quiz grade of $\geq 70\%$.

AY 2017 – 2018 Assessment

SLO 2. Students will recognize the basic features of animal and plant structure and physiology.

Course Map: BIOL1020 - Biological Principles II. All majors are required to complete BIOL1020.

Measure 2.1. (Direct – knowledge)

Throughout the course, students will learn about the structure and physiology of plants and animals. The topics covered include transpiration, plant tissues, flower structures, plant reproduction and water movement, primary animal tissues, homeostasis, action potentials, muscle function, and body control (endocrine and nervous system functions). Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target not met.

Analysis: In AY2016-2017, 63.64% (56/88) of biology majors earned $\geq 70\%$ on the assessment. This performance was slightly reduced (-6.36%) from the goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were moderately able to demonstrate appropriate knowledge of the structure and physiology of plants and animals. This is likely a result of students approaching the course material using a memorization approach rather than a concept approach. This would mean that students could answer fact-based questions but not application-based questions. A decision was made to change the way in which the relevant information was delivered in the course. Instructors were asked to focus on creating links between class concepts and to provide students with relevance to how the information covered in class pertains to the biological world.

In AY2017-2018, 51.72% (60/116) of biology majors earned $\geq 70\%$ on the assessment. This performance is far below (-18.28%) our goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were not able to demonstrate appropriate knowledge of the structure and physiology of plants and animals. Furthermore, this performance was reduced (-11.92%) compared to the performance of students from the last AY demonstrating that the informational delivery changes implemented were not successful in improving student learning/understanding.

To further analyze the data collected, we examined student performance on individual questions in the assessment. Based on this additional evaluation, it appears that students performed at the lowest levels on questions #1 and #9. These questions pertain to the functionality of biological pathways in both animal (for question #1) and plant (for question #9) systems. Such concepts are generally more difficult for students to understand/apply. For the next academic year, the delivery of this type of material will include additional/various teaching methods including active learning/flipped classroom activities and extended classroom/assessment time.

AY 2017 – 2018 Assessment

Decision: Implementing the decision/plan of action from AY2016-2017 did not provide evidence of improvement. In fact, there was an 11.92% reduction in student performance on the assessment. The strategy of using concept-based education for these topics was not successful. Perhaps the students do not have enough knowledge/understanding of the topics to recognize how the various topics are linked, thus making application of concepts difficult. The analysis demonstrates that for the areas of animal and plant structure and physiology, repetition alone was not enough to improve student learning. Further data analysis indicates that the weakest areas of student performance were in complex biological pathways. Based on this evidence, the faculty will work to change the delivery of course material to improve student comprehension and retention of all material in general but most specifically on biological pathways. This alteration will include implementing active learning techniques and providing students with additional classroom and assessment time on these topics. The target of this SLO will be maintained until $\geq 70\%$ of students to attain a final average quiz grade of $\geq 70\%$.

Measure 2.2. (Indirect – survey)

At the end of the course, a survey is administered to students to gauge their appraisal of their understanding of the basic concepts covered in the course. The target is to have 70% of the students report an above average or excellent knowledge of the indicated concepts.

Findings: Target not met.

Analysis: In AY2016-2017, 29.55% (26/88) of biology majors reported that they had an above average or excellent understanding of basic plant structure and function. This performance was greatly reduced (-40.45%) from the goal of 70% of students reporting above average or excellent understanding on this assessment meaning that students were not confident in their knowledge of the structure and physiology of plants. In that same year, 46.59% (41/88) of biology majors reported that they had an above average or excellent understanding of basic animal structure and function. This performance was moderately reduced (-23.41%) from the goal of 70% of students reporting above average or excellent understanding on this assessment meaning that students were also not confident in their knowledge of the structure and physiology of animals. A student lacking confidence in their understanding of these areas could be due to their lack of factual knowledge or their lack of understanding how their factual knowledge is relevant to their overall appreciation of the biological world. A decision was made to change the way in which the relevant information was delivered in the course. Instructors were asked to focus on creating links between class concepts and to provide students with relevance to how the information covered in class pertains to the biological world.

In AY2017-2018, 58.33% (21/36) of biology majors reported that they had an above average or excellent understanding of basic plant structure and function. This performance was moderately reduced (-11.67%) from the goal of 70% of students

AY 2017 – 2018 Assessment

reporting above average or excellent understanding on this assessment meaning that students were not confident in their knowledge of the structure and physiology of plants. Furthermore, there was a large increase (+28.78%) in positive student reporting since the previous academic year indicating that students gained confidence in their understanding of plant structure and function. Seventy-five percent (27/36) of biology majors reported that they had an above average or excellent understanding of basic animal structure and function. This performance exceeded (+5.00%) the goal of 70% of students reporting above average or excellent understanding on this assessment meaning that students were quite confident in their knowledge of the structure and physiology of animals. This also represents a large increase (+28.41%) in positive student reporting since the previous academic year indicating that students gained confidence in their understanding of animal structure and function.

Decision: Implementing the decision/plan of action from AY2016-2017 did provide evidence of improvement. Specifically, there was a >28% increase in student reported confidence in their understanding of plant and animal structure and physiology. The analysis demonstrates that our changes in information delivery did improve the perception of student learning/understanding. Having instructors focus on creating links between class concepts and providing students with relevance to how the information covered in class pertains to the biological world appears to have increased student confidence in their knowledge/understanding of plant and animal structure and physiology. However, as above average or excellent understanding in all areas were not reported to the goal of 70%, the target of this SLO will be maintained until $\geq 70\%$ of students reporting above average to excellent understanding in plant and animal structure and physiology.

SLO 3. Students will describe the role of evolution and ecology in the diversity of life.

Course Map: BIOL2020 - Biological Principles III. All majors are required to complete BIOL2020.

Measure 3.1. (Direct – knowledge)

Throughout the course, students will learn about the high level of diversity of organisms. They learn how evolution, populations, ecology, and behavior can influence this diversity. Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target not met.

Analysis: In AY2016-2017, 51.16% (22/43) of biology majors earned $\geq 70\%$ on the assessment. This performance was greatly reduced (-18.84%) from the goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were unable to demonstrate appropriate knowledge of the role of evolution and ecology on the diversity of life. This is likely a result of students approaching the course material

AY 2017 – 2018 Assessment

using a memorization approach rather than a concept approach. This would mean that students could answer fact-based questions but not application-based questions. A decision was made to change the way in which the relevant information was delivered in the course. Instructors were asked to focus on creating links between class concepts and to provide students with relevance to how the information covered in class pertains to the biological world.

In AY2017-2018, 33.33% (16/48) of biology majors earned $\geq 70\%$ on the assessment. This performance is far below (-36.67%) our goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students were not able to evaluate the role of evolution and ecology on the diversity of life. Furthermore, this performance was reduced (-17.83%) compared to the performance of students from the last AY demonstrating that the informational delivery changes implemented were not successful in improving student learning/understanding.

To further analyze the data collected, we examined student performance on individual questions in the assessment. Based on this additional evaluation, it appears that students performed at the lowest levels on questions #3 and #5. These questions pertain to the understanding/application of the theory of evolution. Such concepts are generally more difficult for students to understand/apply. For the next academic year, the delivery of this type of material will include additional/various teaching methods including active learning/flipped classroom activities and extended classroom/assessment time.

Decision: Implementing the decision/plan of action from AY2016-2017 did not provide evidence of improvement. In fact, there was an 17.83% reduction in student performance on the assessment. The analysis demonstrates that for the understanding the role of evolution and ecology on the diversity of life, repetition alone was not enough to improve student learning. The strategy of using concept-based education for these topics was not successful. Perhaps the students do not have enough knowledge/understanding of the topics to recognize how the various topics are linked, thus making application of concepts difficult. Further data analysis indicates that the weakest area of student performance was the application of the theory of evolution. Based on this evidence, the faculty will work to change the delivery of course material to improve student comprehension and retention of all material in general but most specifically on natural selection and evolution. This alteration will include implementing active learning techniques and providing students with additional classroom and assessment time on these topics. The target of this SLO will be maintained until $\geq 70\%$ of students to attain a final average quiz grade of $\geq 70\%$.

Measure 3.2. (Indirect – survey)

At the end of the course, a survey is administered to students to gauge their appraisal of their understanding of the basic concepts covered in the course. The target is to have 70% of the students report an above average or excellent knowledge of the indicated concepts.

AY 2017 – 2018 Assessment

Findings: Target met.

Analysis: In AY2016-2017, 30.23% (13/43) of biology majors reported that they had an above average or excellent understanding of basic concepts in evolution. This performance was greatly reduced (-39.77%) from the goal of 70% of students reporting above average or excellent understanding on this assessment meaning that students were not confident in their knowledge of evolution. In that same year, 30.23%(13/43) of biology majors reported that they had an above average or excellent understanding of basic concepts in ecology. This performance was moderately reduced (-39.77%) from the goal of 70% of students reporting above average or excellent understanding on this assessment meaning that students were also not confident in their knowledge of ecology. A student lacking confidence in their understanding of these areas could be due to their lack of factual knowledge or their lack of understanding how their factual knowledge is relevant to their overall appreciation of the biological world. A decision was made to change the way in which the relevant information was delivered in the course. Instructors were asked to focus on creating links between class concepts and to provide students with relevance to how the information covered in class pertains to the biological world.

In AY2017-2018, 92.86% (26/28) of biology majors reported that they had an above average or excellent understanding of basic concepts in evolution. This performance was much greater (+22.86%) than the goal of 70% of students reporting above average or excellent understanding on this assessment meaning that students were not confident in their knowledge of evolution. Furthermore, there was a very large increase (+62.63%) in positive student reporting since the previous academic year indicating that students gained confidence in their understanding of evolution. Of the biology majors tested, 89.29% (25/28) reported that they had an above average or excellent understanding of basic concepts in ecology. This performance exceeded (+19.29%) the goal of 70% of students reporting above average or excellent understanding on this assessment meaning that students were quite confident in their knowledge of ecology. This also represents a large increase (+59.69%) in positive student reporting since the previous academic year indicating that students gained confidence in their understanding of ecology.

Decision: Implementing the decision/plan of action from AY2016-2017 did provide evidence of improvement. Specifically, there was an approximately 60% increase in student reported confidence in their understanding of basic concepts in evolution and ecology. The analysis demonstrates that our changes in information delivery with special emphasis on linking class concepts to the biological world did improve the perception of student learning/understanding. As above average or excellent understanding in all areas exceeded the goal of 70%, the target of this SLO will be raised in 2018-2019 to $\geq 95\%$ of students reporting above average to excellent understanding in basic concepts in evolution and ecology.

SLO 4: Students will employ critical thinking to interpret scientific literature.

Tied to course: BIOL 4900. All majors are required to complete BIOL 4900.

AY 2017 – 2018 Assessment

Measure 4.1. (Direct - Ability)

Throughout the course, students will read scientific articles from the primary literature and be required to pass quizzes over the material. The target is to have 70% of students attain a final average quiz grade of $\geq 90\%$.

Findings: Target not met.

Analysis: In AY2016-2017, 77.42% (24/31) of biology majors earned $\geq 70\%$ on the assessment. This performance was slightly above (+7.42%) from the goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students could employ critical thinking skills to interpret scientific literature. Instructional techniques used to develop critical analysis of scientific data/writing were successful allowing students to read, analyze, and interpret literature on an appropriate level. A decision was made to increase the target of this SLO to 70% of students attain a final average quiz grade of $\geq 90\%$. To drive improvement in writing about scientific literature, additional time was given to students to read and think about the literature and to write about the literature outside of class rather than in class.

In AY2017-2018, 0% (0/27) of biology majors earned $\geq 90\%$ on the assessment. This performance is far below (-90%) our goal of 70% of students earning the target of $\geq 90\%$ on this assessment meaning that students were not able to evaluate critically primary scientific literature. Furthermore, this performance was greatly reduced (-47.79%) compared to the performance of students from the last AY demonstrating that the informational delivery changes implemented were not successful in improving student critical thinking skills.

Critical thinking skills are an extremely important for scientists as is the ability to evaluate scientific primary literature. Unfortunately, these skills are difficult for students to develop. For the next academic year, the development of such skills will be achieved using additional/various teaching methods including active learning/flipped classroom activities and extended classroom/assessment time.

Decision: Implementing the decision/plan of action from AY2016-2017 of increasing the goal of the SLO to 70% of students attain a final average quiz grade of $\geq 90\%$ was not successful. In fact, there was a 47.79% reduction in student performance on the assessment. Improvement of student critical thinking and evaluation of primary scientific literature was not to the level expected/predicted. Based on this evidence, the faculty will work to change the delivery of course material to improve the development of these important skills in our students. This alteration will include implementing active learning techniques and providing students with additional classroom and assessment time on these topics. The target of this SLO will be maintained until $\geq 70\%$ of students to attain a final average quiz grade of $\geq 90\%$. To drive improvement in students' ability to interpret scientific literature, exposure to literature will be implemented in more courses than just BIOL 4900 and will be implemented earlier in the program.

AY 2017 – 2018 Assessment

Measure 4.2. (Direct – Ability)

Throughout the course, students will read scientific articles from the primary literature and be required to write about their interpretation of the material. The target is to have 70% of students attain a final average written assignment grade of $\geq 90\%$.

Findings: Target not met.

Analysis: In AY2016-2017, 87.10% (27/31) of biology majors earned $\geq 70\%$ on the assessment. This performance was above (+17.10%) from the goal of 70% of students earning the target of $\geq 70\%$ on this assessment meaning that students could employ critical thinking skills to interpret scientific literature and write about their interpretation. Instructional techniques used to develop critical analysis of scientific data/writing were successful allowing students to read, analyze, and interpret literature on an appropriate level and convey that information in an effective written form. A decision was made to increase the goal to 70% of students attain a final average written assignment grade of 90%.

In AY2017-2018, 44.44% (12/27) of biology majors earned $\geq 90\%$ (the new goal) on the assessment. This performance is far below (-45.56%) our goal of 70% of students earning the target of $\geq 90\%$ on this assessment meaning that students were not able to evaluate critically primary scientific literature and write effectively about their interpretations.

Critical thinking skills are an extremely important for scientists as is the ability to evaluate scientific primary literature. Furthermore, effective writing illustrating those skills are even more difficult. Unfortunately, these skills are difficult for students to develop. For the next academic year, the development of such skills will be achieved using additional/various teaching methods including active learning/flipped classroom activities and extended classroom/assessment time.

Decision: Implementing the decision/plan of action from AY2016-2017 did not provide evidence of improvement. In fact, there was a reduction in student performance on the assessment. Improvement of student critical thinking and evaluation of primary scientific literature along with effective written communication was not to the level expected/predicted. Based on this evidence, the faculty will work to change the delivery of course material to improve the development of these important skills in our students. This alteration will include implementing active learning techniques and providing students with additional classroom and assessment time on these topics. The target of this SLO will be maintained until $\geq 70\%$ of students to attain a final average quiz grade of $\geq 90\%$.

SLO 5: Students will demonstrate professional development.

Tied to course: BIOL 4900. All majors are required to complete BIOL 4900.

AY 2017 – 2018 Assessment

Measure 5.1. (Direct - Skill)

Students will be required to formulate a resume that conforms to guidelines set forth in the course. The target is to have 100% of students develop a resume that meets $\geq 90\%$ of the prescribed guidelines.

Findings: Target not met.

Analysis: In AY2016-2017, 72.09% (31/43) of biology majors earned $\geq 90\%$ on the resume assessment. This performance far below (-27.91%) the goal of 100% of students earning the target of $\geq 90\%$ on this assessment meaning that students could not produce an appropriate resume. This was likely due to a lack of understanding of expectations as well as a need for enhanced/improved feedback during the writing process. A decision was made to change the way students prepared their resumes by providing a more comprehensive grading rubric to clarify the expectations of the assignment and demonstrate how the assignment would be graded.

In AY2017-2018, 70.37% (19/27) of biology majors earned $\geq 90\%$ on the resume assessment. This performance is far below (-29.63%) our goal of 100% of students earning the target of $\geq 90\%$ on this assessment meaning that students were not able to produce a quality, professional resume. Furthermore, this performance was slightly reduced (-1.72%) compared to the performance of students from the last AY demonstrating that the feedback changes implemented were not successful in improving student resume creation.

A professional, well-produced resume is an important component in finding gainful employment for anyone, but it is critically important for science college graduates as many jobs are highly competitive. Unfortunately, the skills required to produce such documents are difficult for students to develop. For the next academic year, the development of such skills will be achieved using additional rounds of feedback on this assessment piece as well as the implementation of templates to further clarify expectations of the assignment.

Decision: Implementing the decision/plan of action from AY2016-2017 did not provide evidence of improvement. In fact, there was a 1.72% reduction in student performance on the resume assessment. The analysis demonstrates that increased feedback alone was not enough to improve student resume production. The development of more effective writing skills is likely needed. Based on this evidence, the faculty will work to change the delivery of course material to improve the development of these important skills in our students. This alteration will include implementing active learning techniques and providing students with additional classroom and assessment time on these topics. The target of this SLO will be maintained until 100% of students to attain a final resume assessment score of $\geq 90\%$.

AY 2017 – 2018 Assessment

Measure 5.2. (Direct - Skill)

Students will be required to formulate a cover letter targeted to a specific job listing that conforms to guidelines set forth in the course. The target is to have 100% of students develop a cover letter that meets $\geq 90\%$ of the prescribed guidelines.

Findings: Target not met.

Analysis: In AY2016-2017, 81.08% (30/37) of biology majors earned $\geq 85\%$ on the cover letter assessment. This performance slightly below (-3.92%) the goal of 100% of students earning the target of $\geq 85\%$ on this assessment meaning that students could not produce an appropriate cover letter. This was likely due to a lack of understanding of expectations as well as a need for enhanced/improved feedback during the writing process. A decision was made to change the way students prepared their cover letter providing additional feedback and to offer individual, one-on-one interviews to review draft cover letters to clarify cover letter expectations. Because the findings were so close to the goal, the target was increased to 100% of majors scoring $\geq 90\%$ on their cover letter assessment

In AY2017-2018, 59.26% (16/27) of biology majors earned $\geq 90\%$ on the resume assessment. This performance is far below (-40.74%) our goal of 100% of students earning the target of $\geq 90\%$ on this assessment meaning that students were not able to produce a quality, professional cover letter. Furthermore, this performance was greatly reduced (-21.82%) compared to the performance of students from the last AY demonstrating that the feedback changes implemented were not successful in improving student cover letter creation.

A professional, well-produced cover letter is an important component in finding gainful employment for anyone, but it is critically important for science college graduates as many jobs are highly competitive. Unfortunately, the skills required to produce such documents are difficult for students to develop. For the next academic year, the development of such skills will be achieved using additional rounds of feedback on this assessment piece as well as the implementation of templates to clarify expectations of the assignment.

Decision: Implementing the decision/plan of action from AY2016-2017 did not provide evidence of improvement. In fact, there was a 21.82% reduction in student performance on the cover letter assessment. The analysis demonstrates that increased feedback alone was not enough to improve student cover letter quality. The development of more effective writing skills is likely needed. Based on this evidence, the faculty will work to change the delivery of course material to improve the development of these important skills in our students. This alteration will include implementing active learning techniques and providing students with additional classroom and assessment time on these topics. The target of this SLO will be maintained until 100% of students to attain a final resume assessment score of $\geq 90\%$.

AY 2017 – 2018 Assessment

Comprehensive summary of key evidence of improvements based on analysis of results.

With the analysis of the AY2016-2017 assessment, curriculum changes were made to improve student achievement. The changes involved

- Increasing the frequency and delivery of assessment to provide more and individualized feedback to students.
- Providing additional resources to clarify learning expectations, including a more comprehensive rubric.
- Using concept-based educational techniques to identify links between topics discussed in courses and the general understanding of the biological world.

Unfortunately, the implementation of these changes did not improve student performance in most areas (the one exception was student confidence in understanding of the role of evolution and ecology in the diversity of life). It is likely that alterations in information delivery alone is not enough to ensure greater student success. The School of Biological and Physical Sciences is working to improve student understanding of complex topics (such as the molecular basis of life, the structure and physiology of plant and animals, and the role of evolution and ecology on the diversity of life) using an active learning/flipped classroom approach in our classes. We have secured external funding to create two active learning/fluid classrooms that will allow for greater flexibility in student collaboration/peer learning. Such techniques have been shown to be successful in improving student learning. Additionally, internal funds have been applied for and secured to improve other classrooms (renovation of an auditorium to facilitate greater student collaboration) and laboratories (update safety features such as fume hoods and acquire new, state-of-the-art equipment to facilitate student application of knowledge).

Plan of action moving forward.

For AY2018-2019, curriculum changes will be implemented to improve student understanding/knowledge of complex topics (such as photosynthesis, gene expression, action potentials, and natural selection). Using active learning strategies like flipped classroom instruction and group/peer learning, understanding and application of these concepts are expected to improve. With greater understanding of these concepts, it will be easier to develop critical evaluation of scientific literature and writing. Additionally, efforts are being made to reduce average class size in BIOL1010 (Biological Principles I) from an average of 85 students per section during the Fall 2017 semester to an average of 35 students per section during the Fall 2018 semester to determine if smaller student: instructor ratios improve student performance. For all assessments, the goals will remain as described.