Biology Program Assessment Summary 2011-2015

Assessment summary from 2011

The program goals established as a part of program review in 2011 were the following:

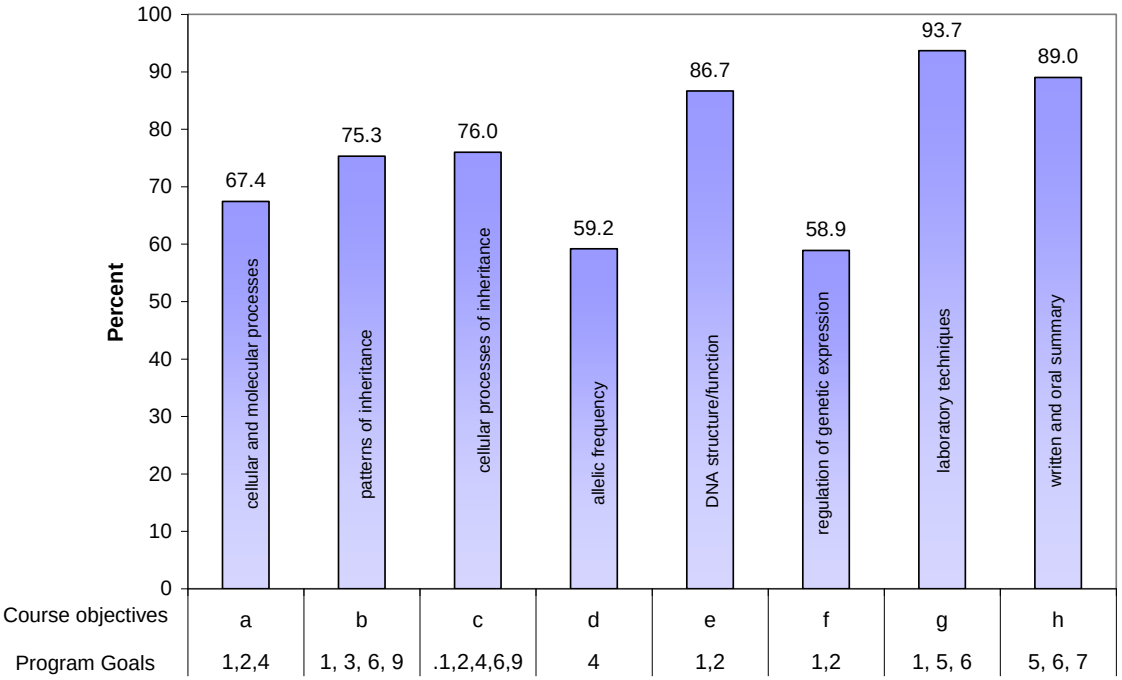
1. Examine fundamental characteristics of living things.
2. Examine the correlations between structure and function.
3. Compare and contrast interactions between organisms, and between organisms and their environment.
4. Study the mechanisms of inheritance, biodiversity, and evolutionary change.
5. Apply the scientific method and laboratory skills to the acquisition of knowledge.
6. Model the collection and critical analysis of data to draw conclusions about biological phenomena.
7. Develop written and oral scientific communication skills.
8. Explore the interfaces between biology and other disciplines in the liberal arts.

Assessment Plan in 2011:
To assess whether biology majors are meeting these objectives outcomes were measured for the following courses: Introductory Genetics (BIOL 241), Cell and Molecular Biology (351) and a senior level microbiology course (General Microbiology (BIOL 441). For this assessment data demonstrate the percentage of students correctly answering exam questions related to each specified objective. To assess laboratory skills, assessment is based on a laboratory report of a laboratory project designed to incorporate multiple technical skills.

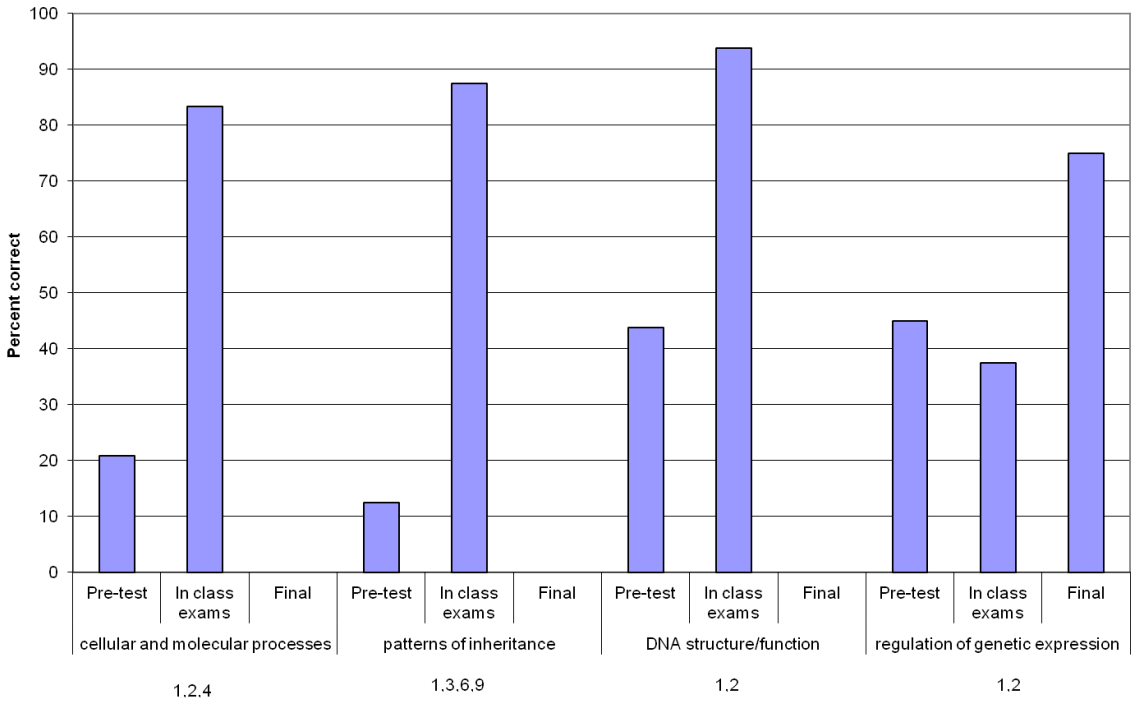
Genetics (BIOL 241)
An average of in-semester exams and lab reports from laboratory activities were analyzed for Genetics (BIOL 241) in 2010 (see figure below). These data indicate that for goals related to inheritance, an average of 75% - 85% of responses were correct. In goals related to cellular and molecular processes, analysis of allelic frequency and regulation of genetic expression, averages of correct responses were less than 70%. Additionally, goals related to laboratory skills and written and oral communication were achieved (89% - 93% of responses were correct). It will be important to continue to track specific subsets within each program goal to determine topics that are particularly challenging for students to master so that the most effective pedagogy for such topics can be assessed as well. Importantly, cell and molecular biology was offered in Spring, 2011 to help improve student learning in these topics of cellular and molecular processes and genetic regulation.

In 2011, a published concept inventory was given at the beginning of the course, as a part of in-class exams and at the final exam. Student learning was demonstrated for all course objectives measured. From this data, the average of correct responses was over 70% for all measured goals (see figure for 2011, below). The topic of genetic regulation is still lower than the other goals and will be addressed with specific pedagogy in this and other classes.

Genetics 241 AVERAGE Data: 2010

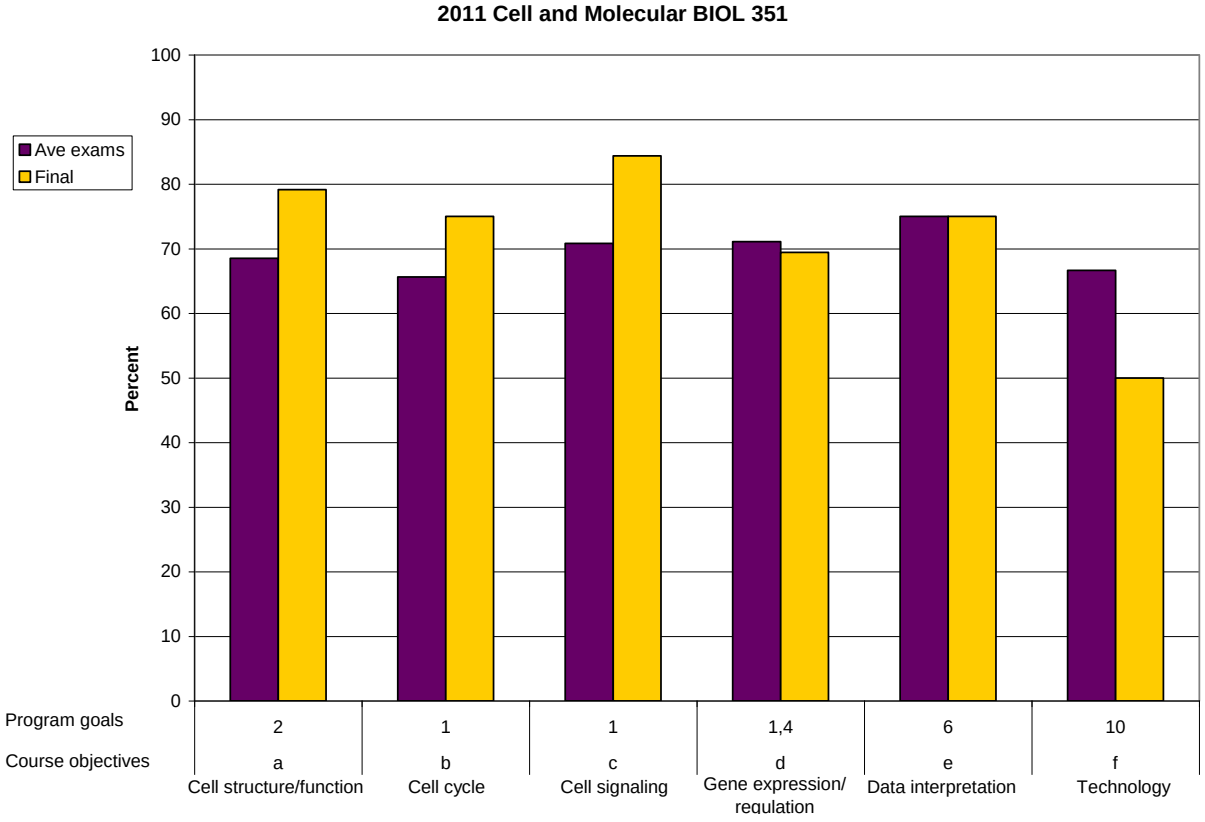


Spring 2011 Genetics 241assessment data from Bowling pre-test and Bowling questions included within exams:



<u>Cell and Molecular</u> (BIOL 351)

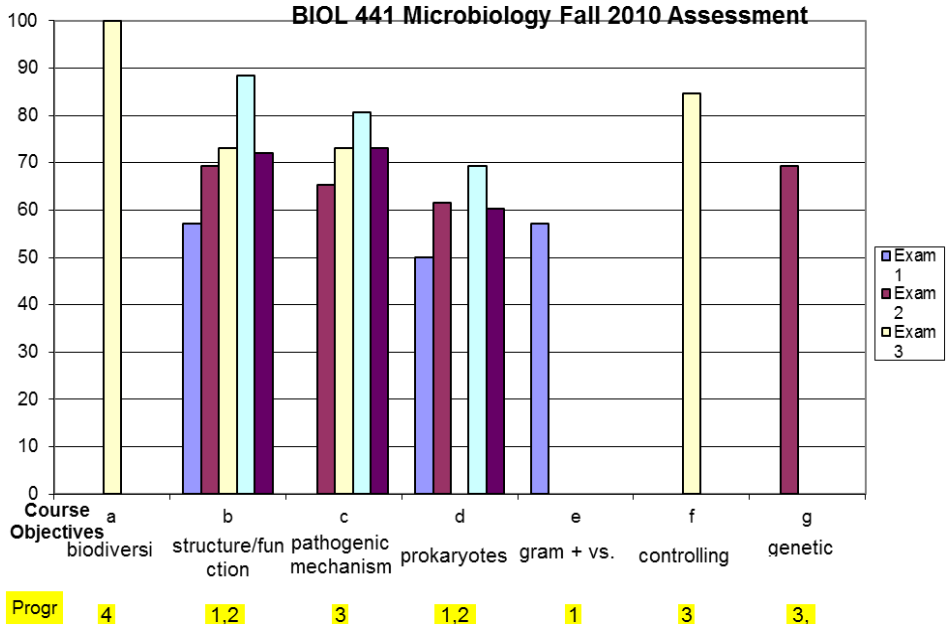
Assessment data averaged from all in-semester exams and compared to the final exam for Cell and Molecular (BIOL 351) suggests that students demonstrate less competency in describing gene regulation compared to other areas. Additionally, it may be worth considering adding a program goal related to biotechnology. The data from this course was collected from very few students, and therefore, future assessments will be necessary.

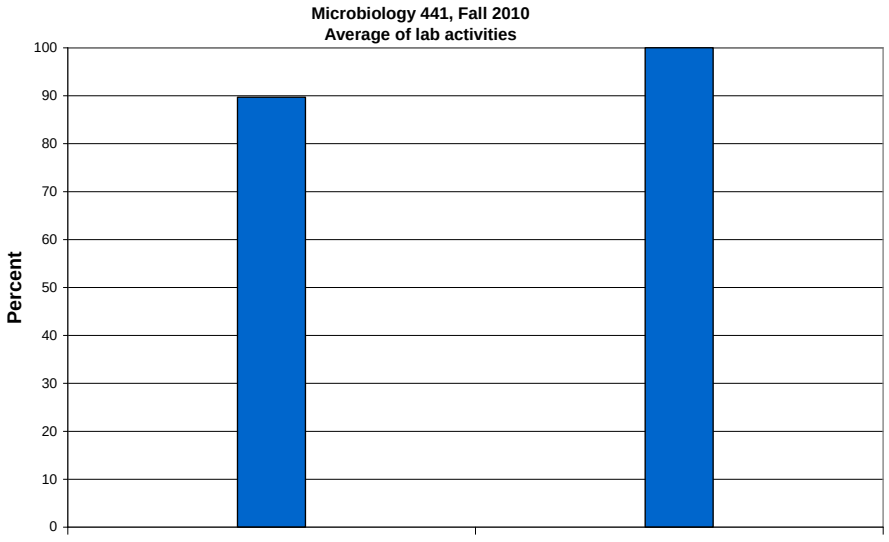


<u>General Microbiology (BIOL 441)</u>

One emphasis of BIOL 441 is to explore biodiversity of microorganisms and interactions among species. In general, student assessment outcomes improved for each exam throughout the semester with the highest performance demonstrated on the final exam. Whiles students demonstrated knowledge of the general diversity among major classifications of living organisms, and general characteristics among organisms, student learning outcomes were lower for making comparisons among specific categories such as between gram positive and gram negative bacteria. Student ability to differentiate between prokaryotes are eukaryotes improved throughout the course, though final exam data demonstrated 70% competency. Future courses should include assessment on student ability to distinguish gram positive vs. gram negative on the final exam.

Assessment data from the final laboratory component of BIOL 441 indicates that through a project in which students use biochemical techniques to indentify an unknown microorganism, they can effectively apply the scientific method, analyze data and write conclusions.

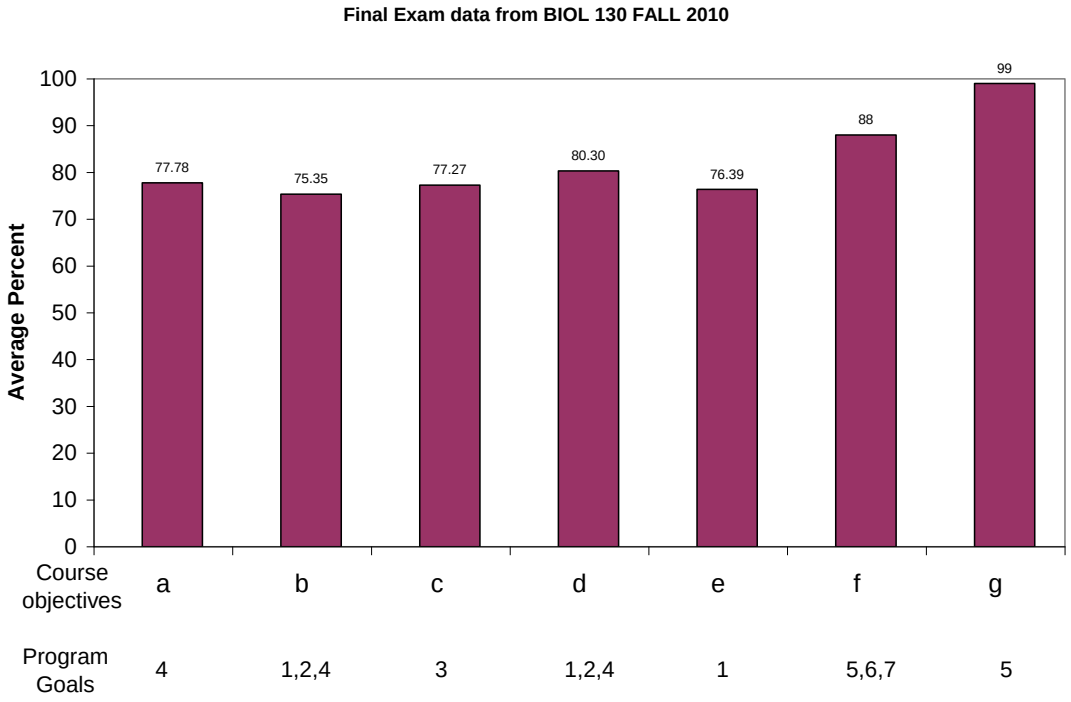




Apply the scientific method and laboratory skills to the acquisition of knowledge.

Microbiology for Health Professions (BIOL 130)

Final exam data from pre-nursing students taking microbiology BIOL130 indicates that students could indentify characteristics and pathogenesis and describe diversity of microorganisms. Pre-nursing students showed particular competence in indentifying genetic variation and the relevance of controlling microorganisms.



Closing the loop from 2011 assessment cycle:

In 2012, three new faculty members were added to the biology department, including an anatomist, biochemist and geneticist and courses were reassigned to faculty members with specific areas of expertise. With the addition of these new faculty members brought the additional emphasis on biotechnology and inquiry based learning into the classrooms and labs. Some minor adjustments were also made to the timing of when courses were offered so that students would take Genetics followed by Cell and molecular biology. Additionally, course objectives for Microbiology courses were revised to reflect national standards presented in a 2011 AAAS Report: "Vision and Change in Undergraduate Biology Education: A Call to Action. The goals and skills presented in the AAAS report were also incorporated into revised program objectives listed below.

Biology Dept. 2014 Assessment Plan:

1. Goals and Objectives

Based on a 2011 "AAAS Report: Vision and Change in Undergraduate Biology Education: A Call to Action" we modified our program goals to be aligned with an external benchmark.

We selected 2 overarching **goals:**

1. Concepts for biological literacy
2. Competencies for the process of science

For each goal we developed program objectives:

Goal 1: Concepts for biological literacy

1. Biodiversity evolved over time through a process of mutation, selection and genetic variation.
2. Examine the correlations between structure and function of living organisms
3. Genetic information flow and exchange: Growth and function of organisms is regulated by the expression of genetic information
4. Energy and matter transformation: Living systems grow and change by processes using chemical transformation pathways that follow the laws of thermodynamics
5. Living systems are interconnected and interacting with other living systems and the environment

Goal 2: Competencies for the process of science:

1. Apply the scientific method and laboratory skills (including knowledge and application of biotechnology) to the acquisition of knowledge.(Observation, experimentation, and hypothesis testing)
2. Apply quantitative analysis and mathematical reasoning to draw conclusions
3. Model the collection and critical analysis of data to draw conclusions about biological phenomena.
4. Develop written and oral scientific communication skills.
5. Explore the interdisciplinary nature within biology and with other liberal arts disciplines.
6. Explore the ethical, cultural, and social implications of scientific inquiry, knowledge, and application

2. **Plan of Action:**
    a. Multiple choice and short answer questions and/or final exams will be used to assess the following components of the curriculum:
        i. Part 1: Biology Major courses: BIOL 111, BIOL 112, BIOL 241, BIOL 231, BIOL 321, BIOL 341 and BIOL 441.
        ii. Part 2: Pre-health professions, BIOL 121 and BIOL 122.
        iii. Part 3:General Education Courses: BIOL 101, BIOL 219
        iv. Part 4. Forensic Science: BIOL 220
    b. A comprehensive exam will involve a senior project to demonstrate students' abilities to apply the critical analysis of data to draw conclusions about biological phenomena and selected core concepts. Students will also demonstrate oral scientific communication skills.
    c. A literature summary written in NSCM 499 will be used to assess students' written communication skills and ability to perform critical analysis of data to draw conclusions about biological phenomena.

3. **Timeline**

Assessment will begin in Spring 2014 – Spring 2015. Data will be analyzed during summer of 2015. Changes based on assessment data will proposed during summer, 2015. Changes will be implemented during Fall, 2015.

4. **Participants in Assessment**

Dr. Patrice Moss will complete assessment for BIOL 111 and BIOL 112
Dr. Karobi Moitra will complete assessment for BIOL 241 and BIOL 341
Dr. Ray will complete assessment for BIOL 231 and BIOL 321.
Dr. Cynthia DeBoy will complete assessment for BIOL 441, NSCM 499 (Senior Seminar) and BIOL 220 (Introductory Forensic Science) and BIOL 219 (Biology of Women).
Dr. Mia Ray, and Dr. Richard Holland will complete assessment for BIOL 121 and BIOL 122 (A&P 1 and 2)
Professor Tayana Kliorina and Dr. Richard Holland will complete assessment for BIOL 101

PART1: BIOL Major assessment data and analysis

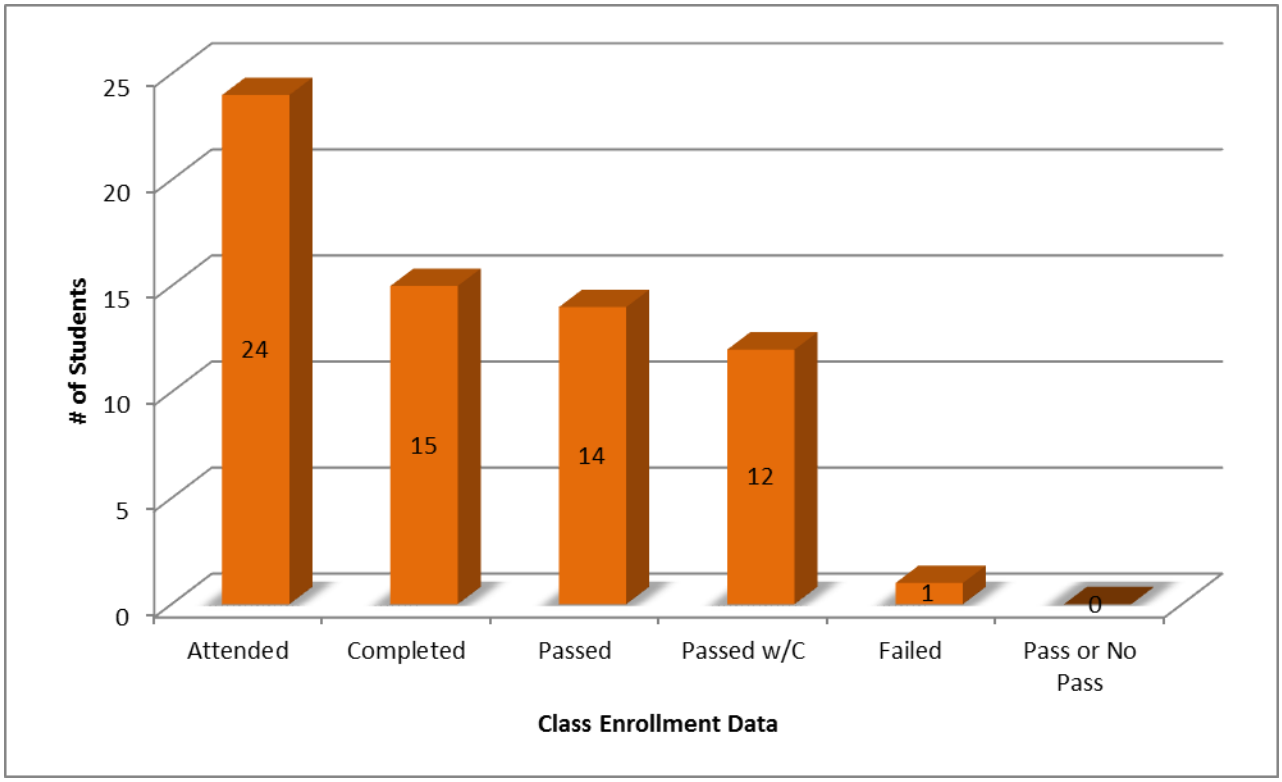
Biology Program Curriculum Map

Goal 1. Concepts for biological literacy	
1. Biodiversity evolved over time through a process of mutation, selection and genetic variation.	BIOL 111, BIOL 241, BIOL 231, BIOL 441, BIOL 451, BIOL 101, BIOL 121, BIOL 122,BIOL 130
2. Examine the correlations between structure and function of living organisms	BIOL 111, BIOL 112, BIOL 231, BIOL 321, BIOL 341, BIOL 441, BIOL 451, NSCM 499 BIOL 101, BIOL 219, BIOL 220 BIOL 121,BIOL 122, BIOL 130, HPNU-210,
3. Genetic information flow and exchange: Growth and function of organisms is regulated by the expression of genetic information	BIOL 112, BIOL 241, BIOL 341, BIOL 441, NSCM 499 BIOL 101, BIOL 219, BIOL 220 BIOL 130
4. Energy and matter transformation: Living systems grow and change by processes using chemical transformation pathways that follow the laws of thermodynamics	BIOL 111, BIOL 231, BIOL 321, BIOL 241, BIOL 341, BIOL 441, NSCM 499 BIOL 101, BIOL 220 BIOL 121,122, BIOL 130
5. Living systems are interconnected and interacting with other living systems and the environment	BIOL 441, BIOL 451 BIOL 101, BIOL 130
Goal 2. Core Competencies	
1. Apply the scientific method and laboratory skills (including knowledge and application of biotechnology) to the acquisition of knowledge.(Observation, experimentation, and hypothesis testing)	BIOL 111, BIOL 112,BIOL 231, BIOL 241, BIOL 321, BIOL 341, BIOL 441, CHEM 431, BIOL 497, BIOL 498, NSCM 499 BIOL 101, BIOL 220 BIOL 130
2. Apply quantitative analysis and mathematical reasoning to draw conclusions	BIOL 241, BIOL 321, BIOL 441 BIOL 101, BIOL 219, BIOL 220 BIOL 130
3. Model the collection and critical analysis of data to draw conclusions	BIOL 111, BIOL 112, BIOL 231, BIOL 241, BIOL 321, BIOL 341, BIOL 441, NSCM 499

about biological phenomena.	BIOL 219, BIOL 220 BIOL 130
4. Develop written and oral scientific communication skills.	BIOL 111, BIOL 112, BIOL 231, BIOL 241, BIOL 321, BIOL 341, BIOL 441, BIOL 451, CHEM 431, BIOL 497, BIOL 498 , NSCM 499 BIOL 101, BIOL 219, BIOL 220 BIOL 121,BIOL 122, HPNU-210
5. Explore the interdisciplinary nature within biology and with other liberal arts disciplines.	BIOL 241, BIOL 101, BIOL 219, BIOL 220
6. Explore the ethical, cultural, and social implications of scientific inquiry, knowledge, and application	BIOL 241, BIOL 451, BIOL 101, BIOL 219, BIOL 220 BIOL 130

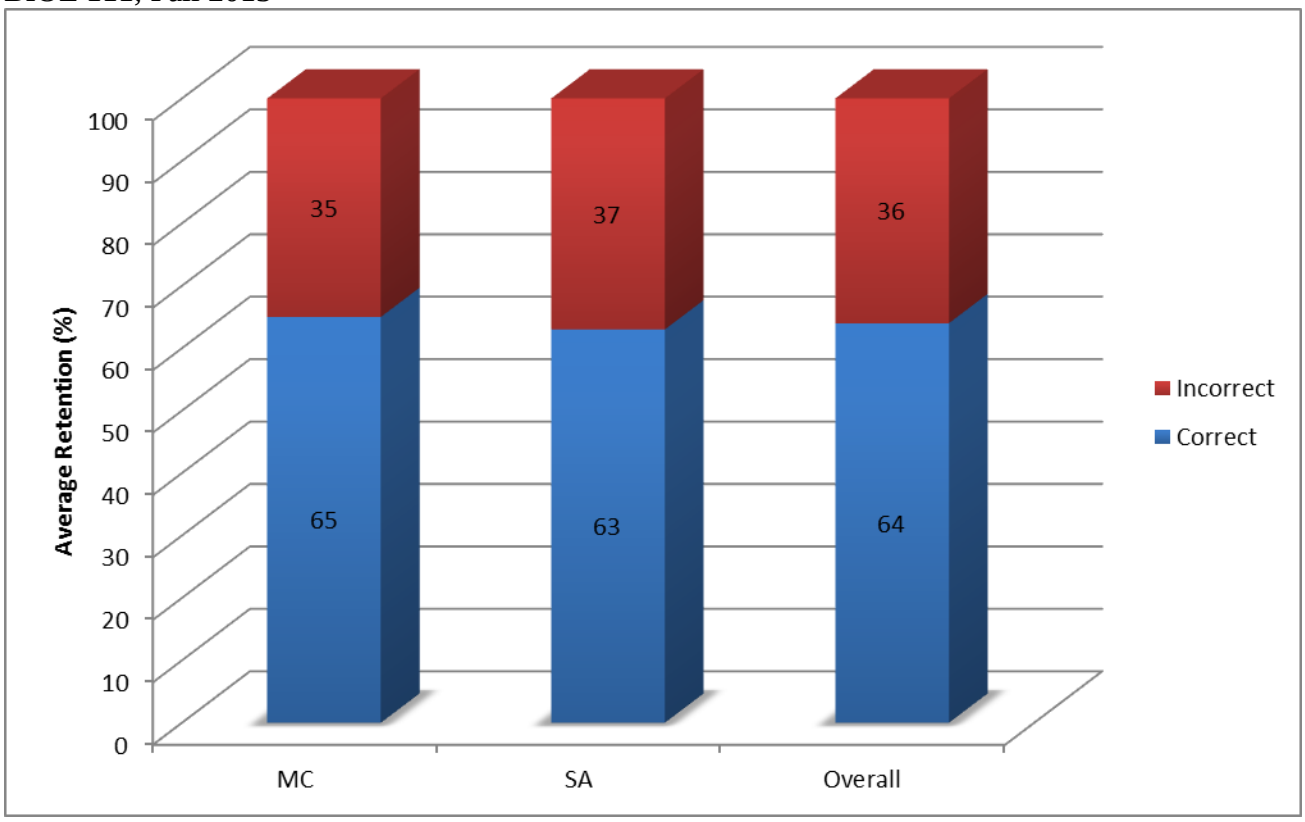
General Biology BIOL 111 FA 2013 (24 students)

The graph below represents the retention of students in BIOL 111: General Biology I during the fall of 2013. The data show that the course initially started with 24 students enrolled. **By the end of the semester, 63% of students completed the course.** The remaining 37% of students either dropped or withdrew from the course. Of the 63%, 93% of the students passed and 86% of those students passed with a grade of C or better. One student failed (received grade of F) the course and no students entered a grade of "pass/no pass".



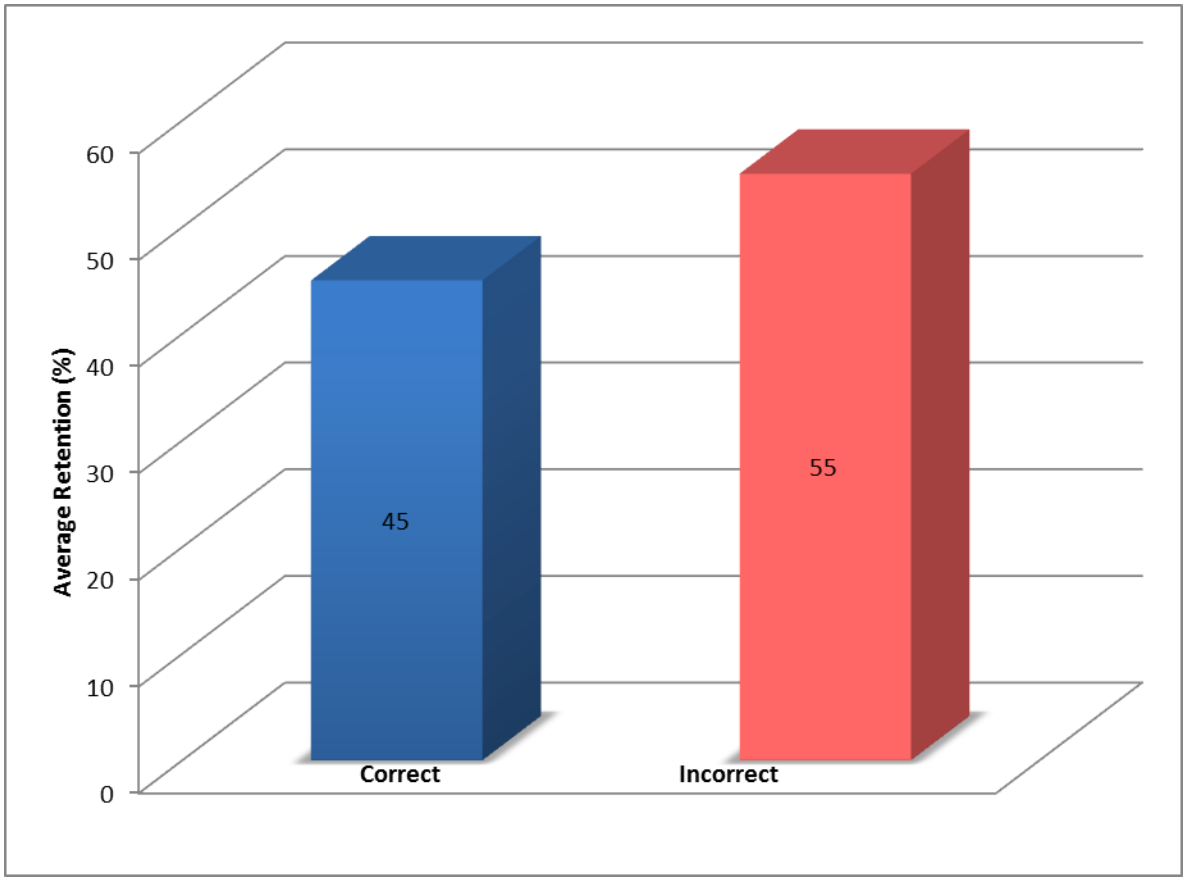
Goal 1. Concepts for Biological Literacy;
#4 Energy and matter transformation: Living systems grow and change by processes using chemical transformation pathways that follow the laws of thermodynamics

BIOL 111, Fall 2013



The graph above represents the retention of information on energy and matter transformation in the BIOL 111 course in Fall, 2013. In the final exam, the content is distributed over two formats: multiple choice (MC) and short answer (SA). These data show that in both the MC and SA portions of the exam, approximately 64% of the students successfully retained information surrounding energy and matter transformation, as demonstrated by answering at least 60% of the question correctly.

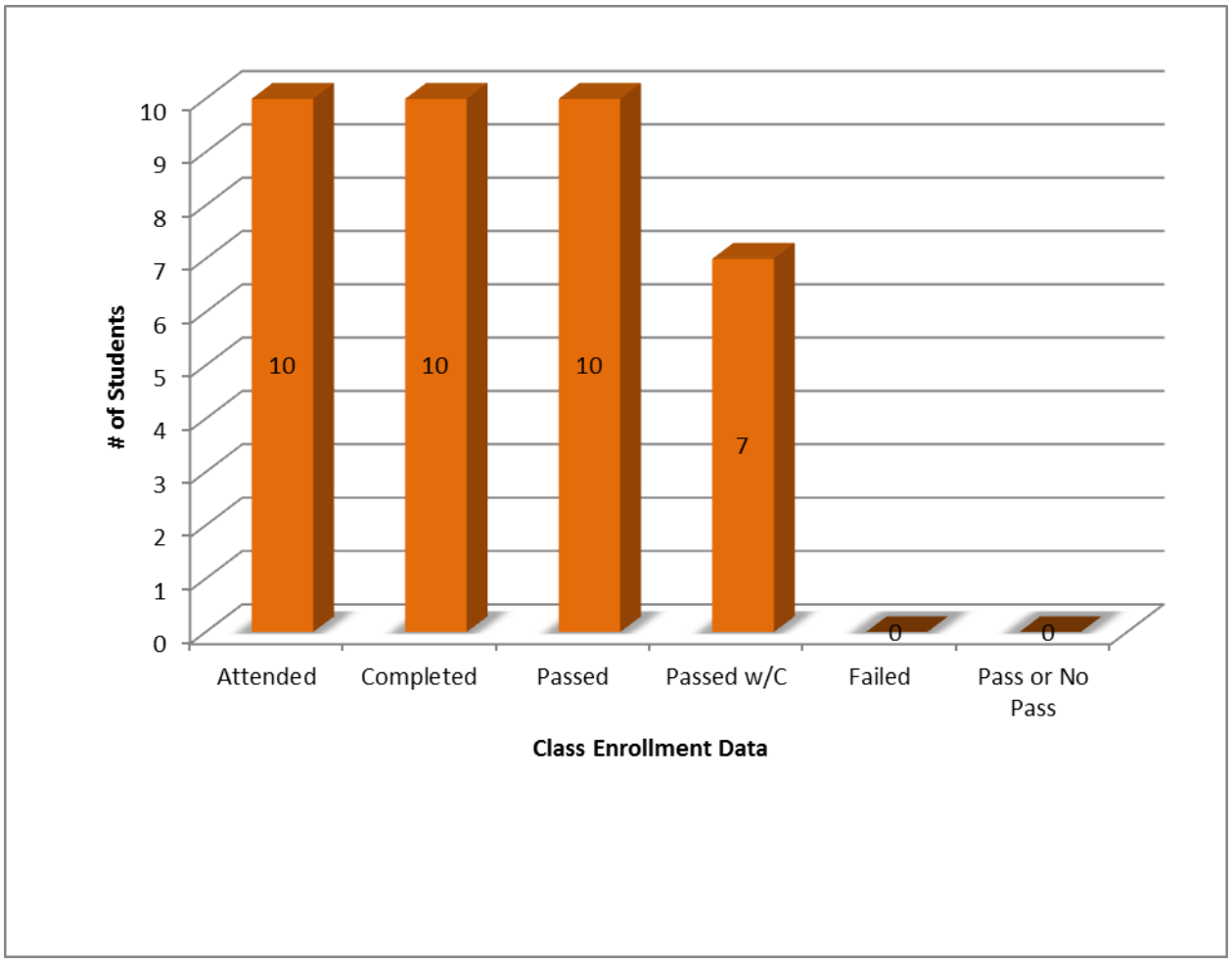
Goal 2. Core Competencies;
#3 Model the collection and critical analysis of data to draw conclusions about biological phenomena.



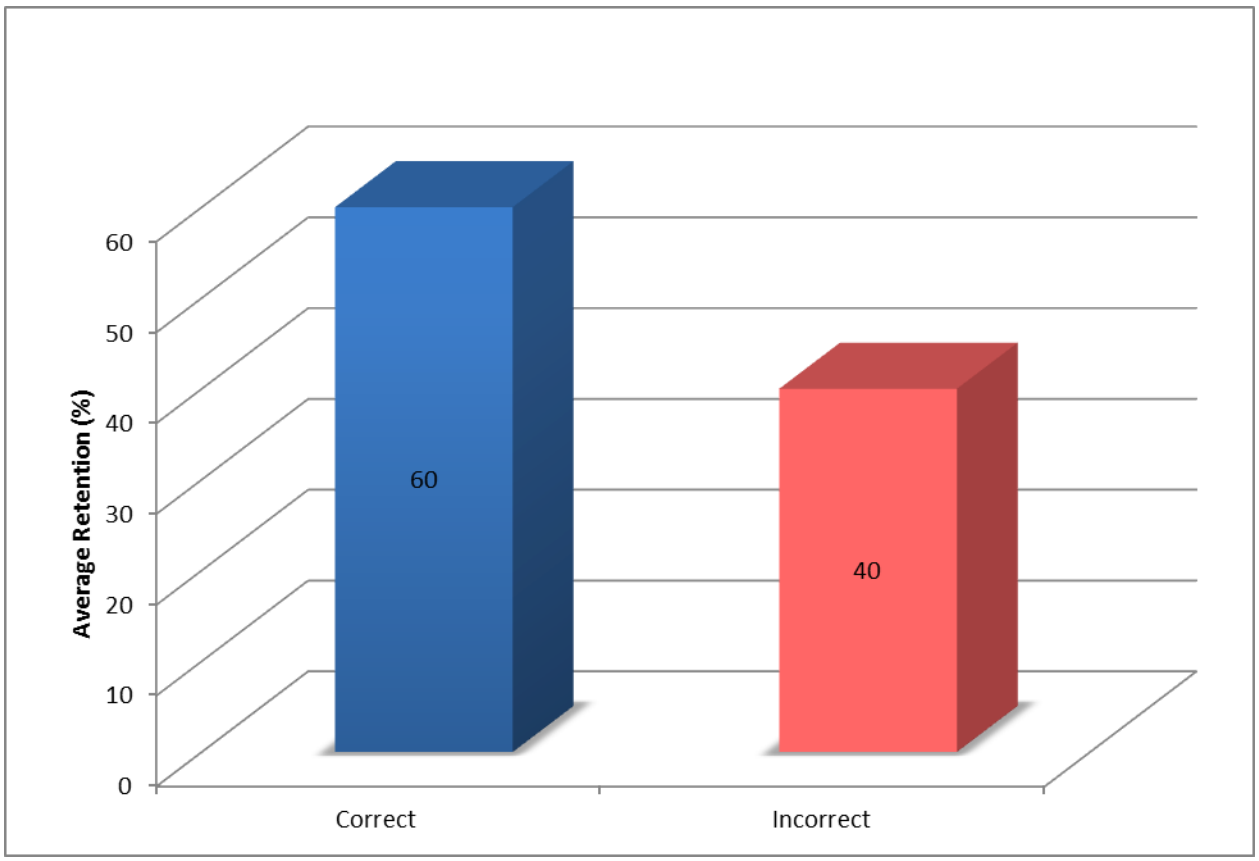
The graph above represents critical and mathematical analysis of data to draw conclusions from 3 final exam questions in the BIOL 111 course in 2013. These data show that approximately 45% of the students learned and retained information pertaining to mathematical biology, as demonstrated by answering at least 60% of the question correctly.

BIOL 112 SP 2014 (10 students)

The graph below represents the retention of students in BIOL 112: General Biology II during the spring of 2014. The data show that the course initially started with 10 students enrolled. By the end of the semester, 100% of students completed the course. Of those students, 100% of the students passed and 70% of those students passed with a grade of C or better. None of the students failed (received grade of F) the course or entered a grade of "pass/no pass".



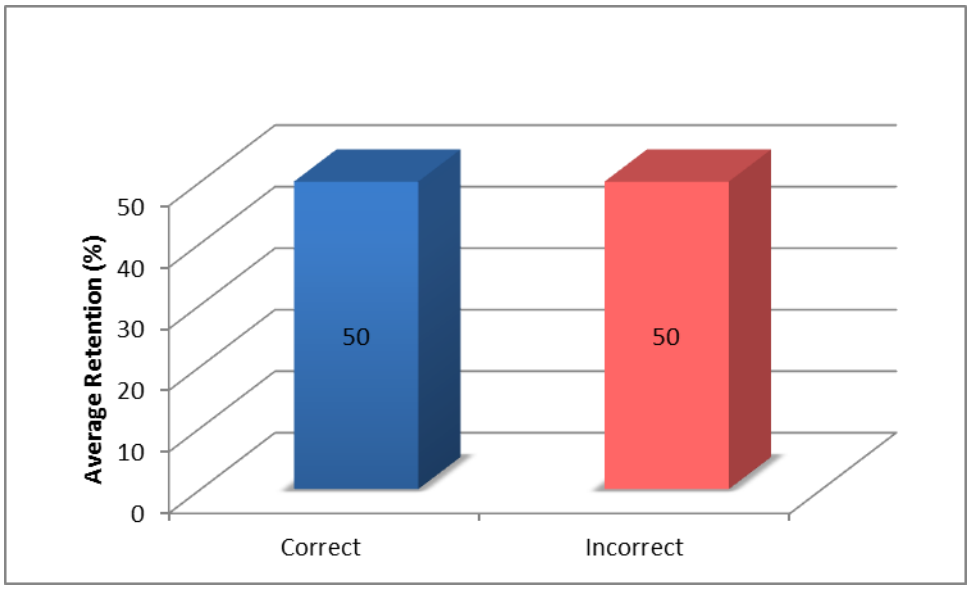
Goal 1. Concepts for Biological Literacy; #3 Genetic information flow and exchange: Growth and function of organisms is regulated by the expression of genetic information



The graph above represents the retention of information presented focused on genetic information flow and exchange from 6 short answer questions on the finale exam in the BIOL 112 course in 2013. These data show that approximately 60% of the students successfully retained information, as demonstrated by answering at least 60% of the question correctly on the short answer format exam.

Goal 2. Core Competencies; # 1 Apply the scientific method and laboratory skills (including knowledge and application of biotechnology) to the acquisition of knowledge.(Observation, experimentation, and hypothesis testing)

Final Exam SA Questions: 16



The graph above represents the retention of information presented focused on scientific method and laboratory skills in the BIOL 112 course. These data show that approximately half of the students learned and retained information regarding scientific method, as demonstrated by answering at least 60% of the question correctly.

BIOL 241 (Introductory Genetics): 2013

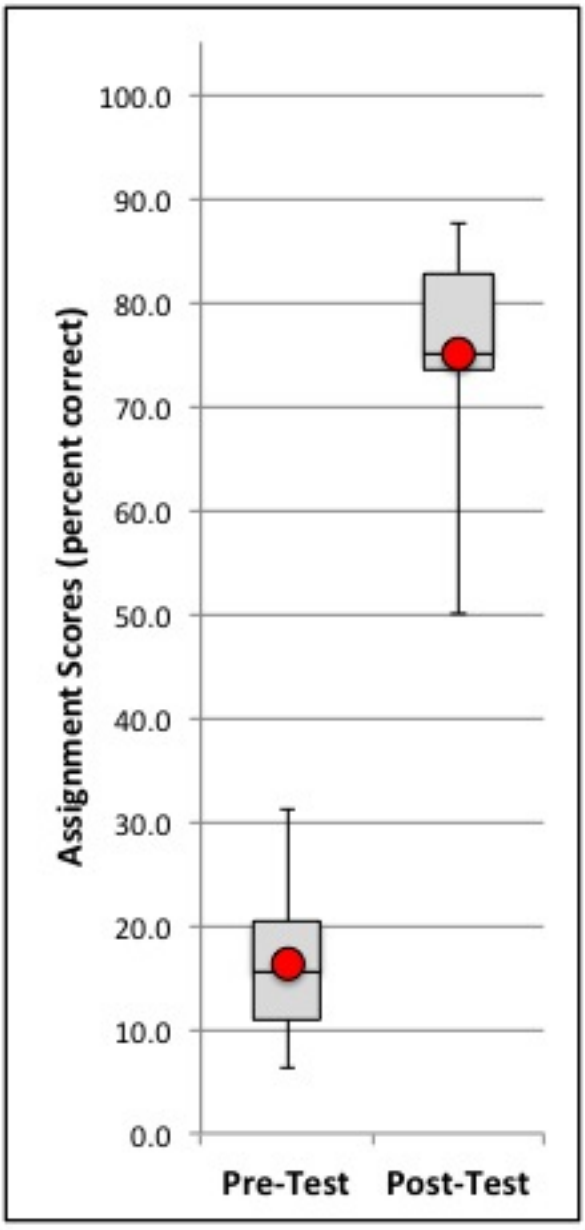
Students conducted high impact, inquiry based learning throughout this course. Please see attached separate document with complete assessment analysis including quantitative and qualitative data demonstrating that students successfully achieved

Goal 2: Competencies for the process of science:

2. Apply quantitative analysis and mathematical reasoning to draw conclusions

3. Model the collection and critical analysis of data to draw conclusions about biological phenomena.

5. Explore the interdisciplinary nature within biology and with other liberal arts disciplines.

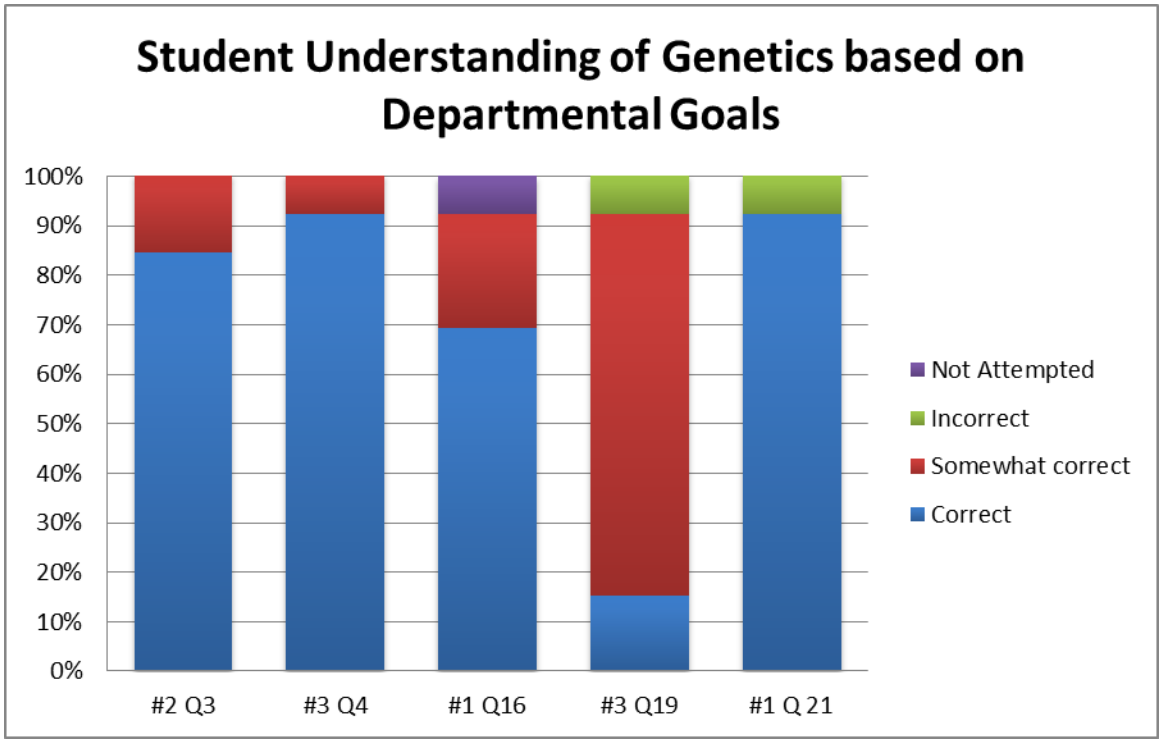


Box and whisker plot depicting pre-course and post-course analysis of the two genome annotation tests. The class average on the pre-test was 16.4% ± 6.1% (mean ± 95% confidence interval). The class average on the post-test was 75% ± 8.3% (mean ± 95% confidence interval). The students did much better on the post-test.

Fall 2014 Introductory Genetics (BIOL 241)

Questions assessed Exam 1

Q3. Draw and label a simple diagram of DNA structure (5pts), Goal #1.2
Q4. Draw a simple diagram and explain the central dogma of molecular biology as we know it today (5pts), Goal #1.3
Q16. Explain the term genetic bottleneck and draw a diagram (4pts), Goal #1.1
Q19. State the function of the following in relation to protein synthesis-t-RNA, m-RNA, Peptidyl Transferase (6pts), Goal #1.3
Q21. Define the term mutation (2pts), Goal#1.1

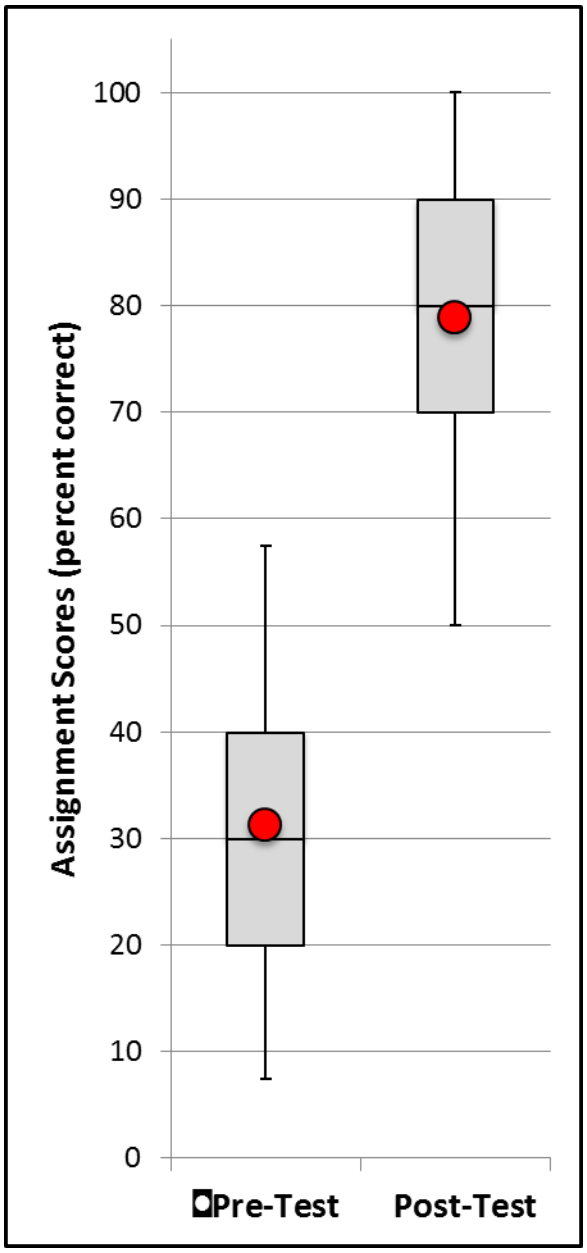


From the graph we can see that 30% of the students were not very clear on concepts regarding Goal #1.1 (the concept of biodiversity developed over time, Q16). It was also found that 75% of the students were unclear about the concepts of protein synthesis (Goal #1.3: Genetic information flow and exchange, Q 19), however, over 90% of the students were clear on the concept of the central dogma which also falls within goal #1.3 (Q4).

From these results we can discern that the areas of focus for future improvement are: *The transfer of genetic information at the translational level (protein synthesis) and also the concepts of biodiversity and genetic bottlenecks.*

2013 and 2014 BIOl 241 Pre and Post test for Goals 1.1, 1.2, and 1.3

1. Biodiversity.
2. Correlations between structure and function
3. Genetic information flow and exchange:



Graph 2. Box ad Whisker Plot of pre and post test scores demonstrating gain in student knowledge.

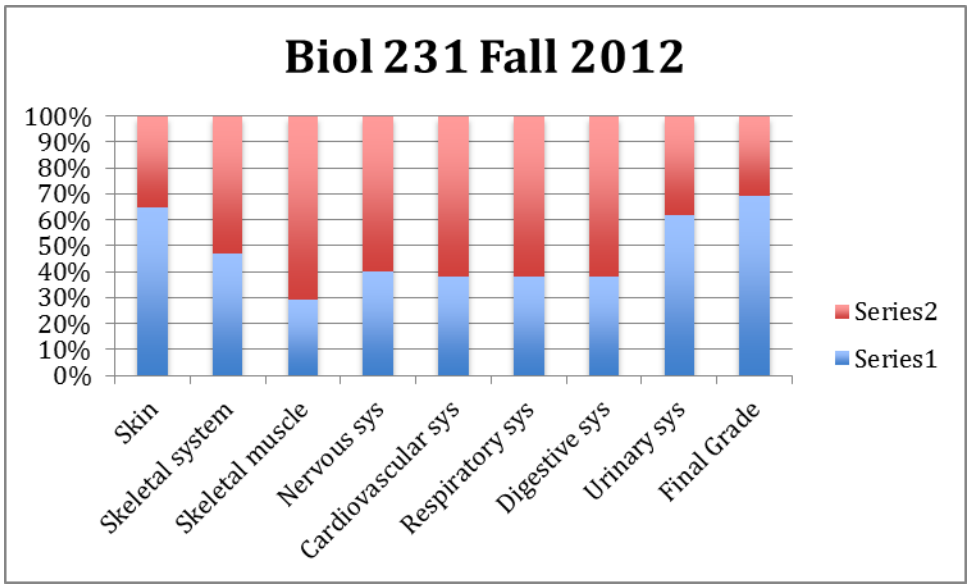
The distribution of scores are plotted above. The black boxes make up the middle half of all scores (the second and third quartiles) with the median score dividing the two middle quartiles. The whiskers represent the range of the upper and lower 25% of all scores. The average scores are indicated with red circles.

Change in ability observed:

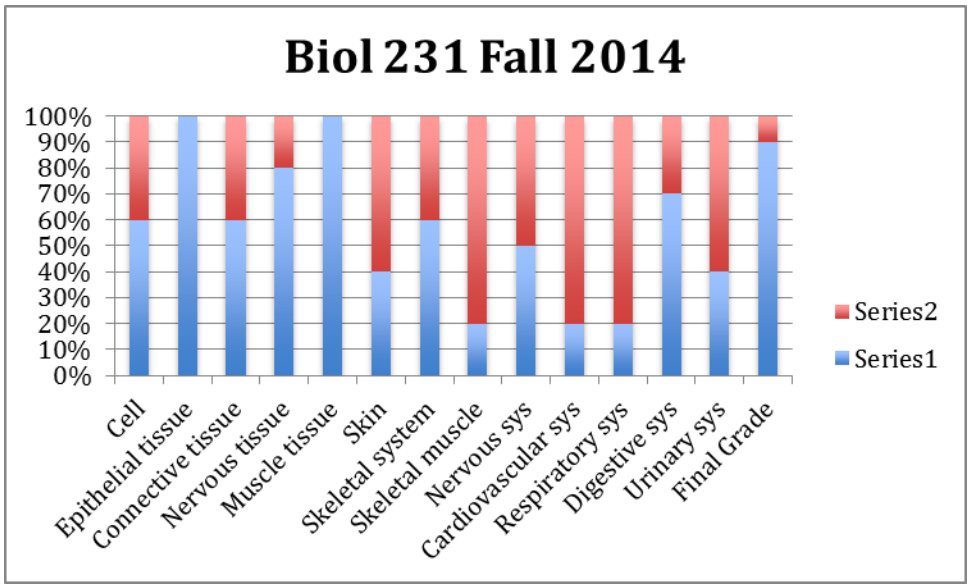
The difference between the pre-test and post-test scores (47.6%) was statistically significant using a two-tailed paired t-test: $t(16)$, $p < 0.001$. The magnitude of this difference has a very large effect size (Cohen's $d = 3.36$). The class did much better on the post-test than they did on the pre-test. There has been a tremendous gain in knowledge over the semester. In all 3 goals.

BIOl 231 Comparative Vertebrate Anatomy
Goal 1.2 Structure/Function

The following graphs for BIOl 231 and BIOl 321 are based on the percentage of questions answered correctly in a given topic area compared to incorrectly answered questions. If a student received a 60% or above, that was considered a passing grade.. The graph demonstrates the percentages of students that pass (correctly answer 60% of the questions – indicated in blue) for given area in anatomy and physiology compared to the percentages of students that correctly answer less than 60% (red).

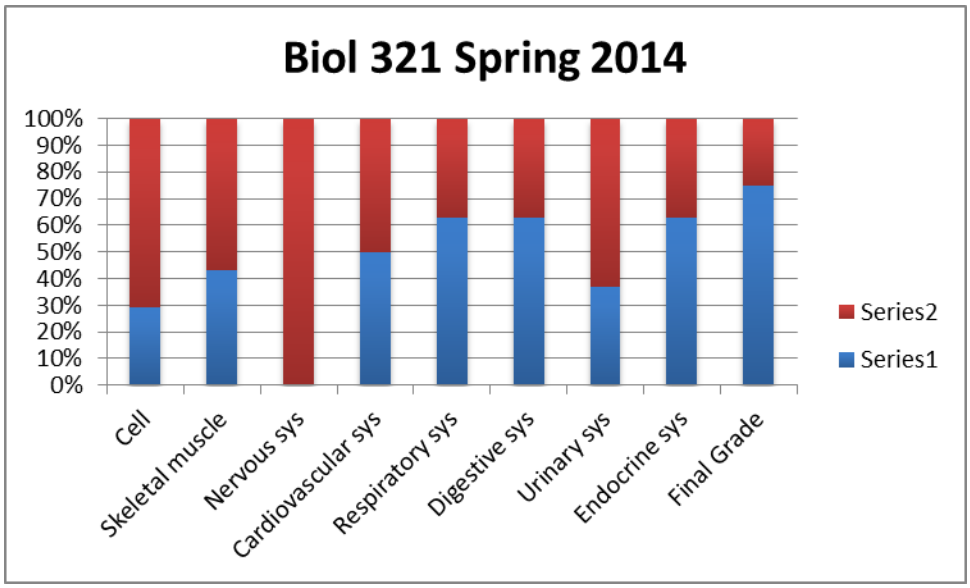


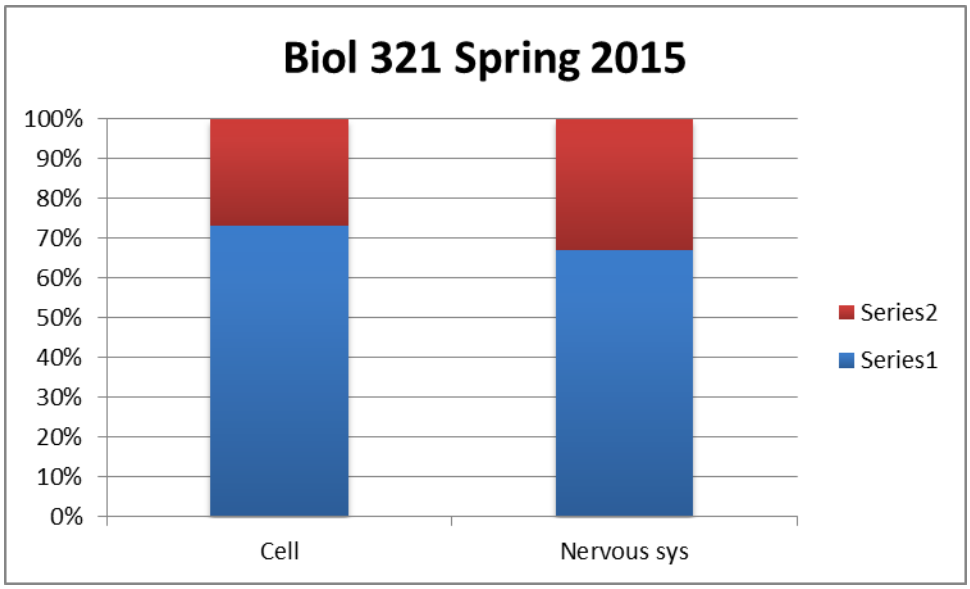
70% of students correctly answered questions related to structure-function (blue) on the final exam. Skeletal muscle is an area with low scores.



Overall student outcomes greatly improved compared to Fall 2012. 90% of students correctly answered questions related to structure-function on the final exam (blue). Skeletal muscle is an area that is still lower than other topics. Areas to focus on in the future include cardiovascular and respiratory systems and skeletal muscles.

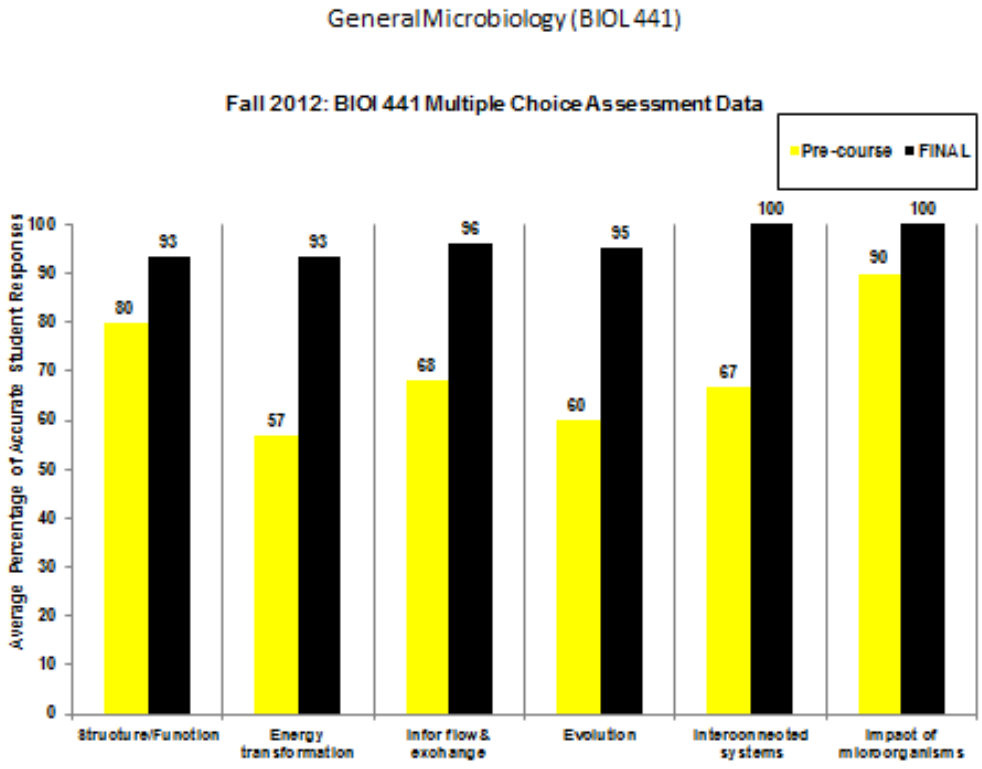
BIOL 321 General Physiology



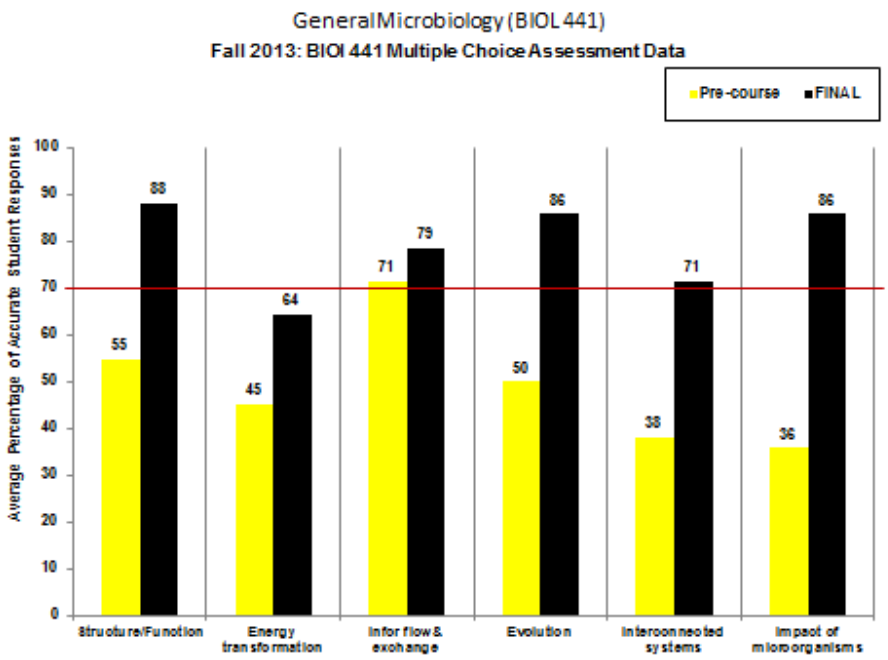


Final outcomes indicate that 75% of students passed in 2014. From 2014 to 2015 student outcomes have increased in areas related to the cell and nervous system.

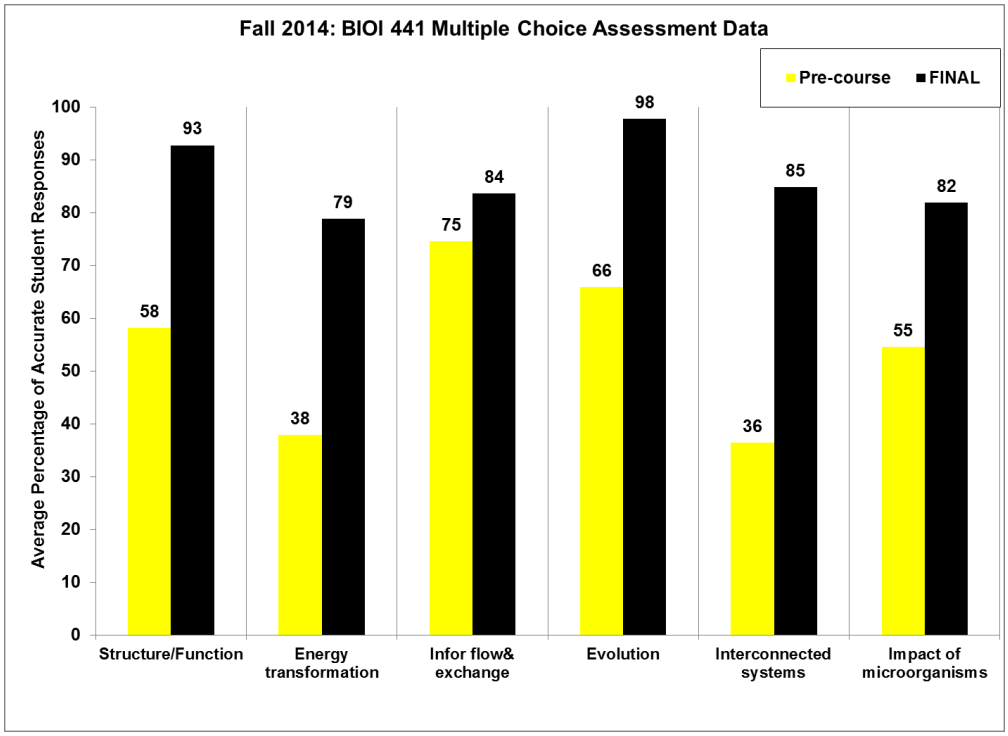
BIOL 441 General Microbiology



5 students



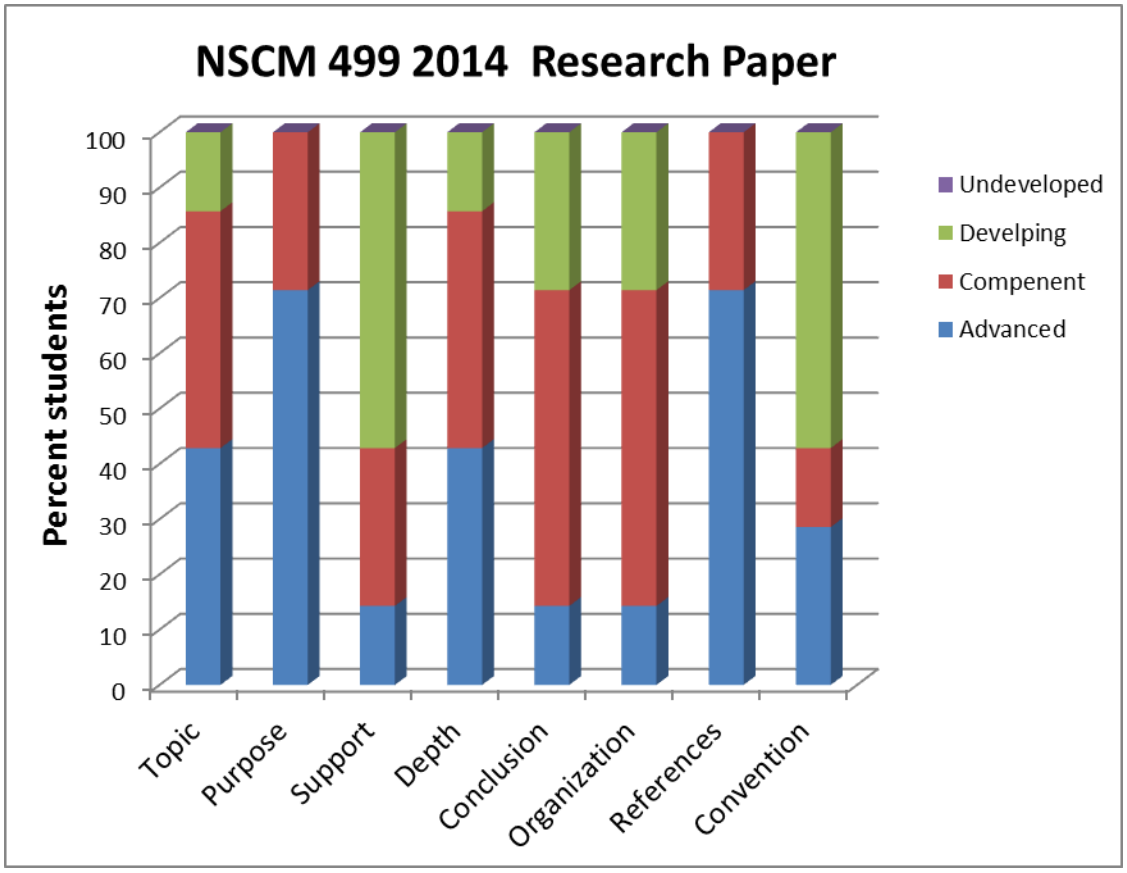
7 students



11 students

Student understanding of all biology core concepts from Goal 1 are assessed in BIOL 441 at the beginning of the class and again during the final exam. Data indicate that students increase understanding of all concepts. Energy transformation is the area in which additional emphasis is most needed.

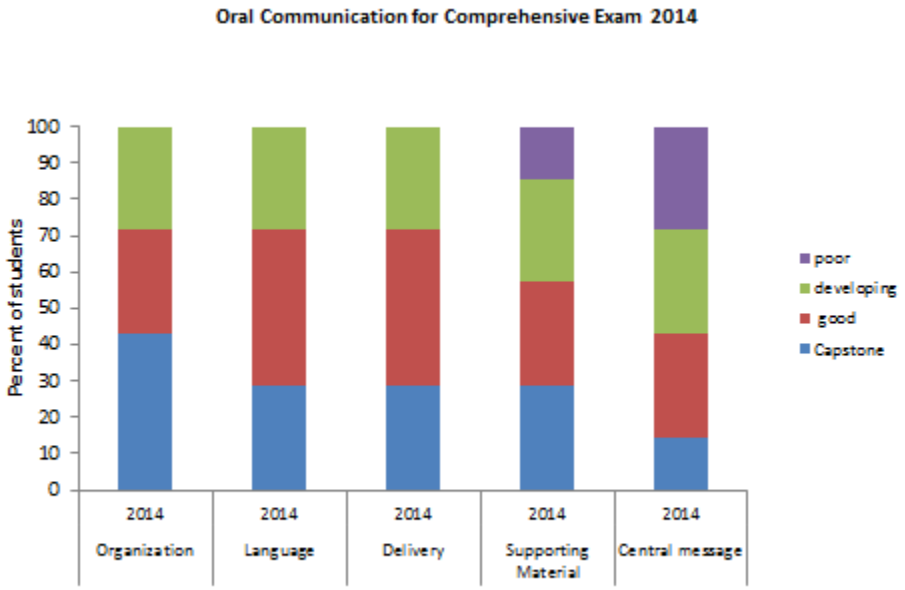
NSCM 499 Divisional Seminar



7 students

70% of students demonstrate competency in all areas assessed in the final research paper except for incorporating support (40%) and writing convention (spelling and grammar). Content knowledge is assessed with depth for which 80% of students demonstrate competency.

2014 Oral comprehensive exam



7 students

Assessment of oral communication for senior biology majors in 2014 indicated that 70% of students demonstrated competency in organization, use of language and delivery, but need improvement in providing support for argument and clear central message.

Based on the outcome of the comprehensive exam, a new format was planned for 2015. For the 2015 comprehensive exam, students will orally present a scientific research proposal as a method to assess application of scientific method. The proposal will have been written as a part of the NSCM 499 course. Additionally, feedback on presentation will be given during the course prior to the exam.

	BIOL 111 2013	BIOL 112 2014	BIOL 241 2013/14	BIO 241 2014	BIOl 231 2012	BIOl 321 2014	BIOL 321 2014	BIOl 441 2012	BIOl 441 2013	BIOL 441 2014	NSCM 499 2014	Comprehensive exam 2014
Completed	63%	100%										
Passed	93%	100%										
Goal 1: Biological literacy											80%	
Biodiversity			80%	80%				95%	86%	98%		
Structure and function			80%	85%	70%	90%	75%	93%	88%	93%		
Genetic information		60%	80%	58%				96%	79%	84%		
Energy and matter transformation:	65%							93%	64%	79%		
Living systems are interconnected								100%	71%	85%		
Goal 2: Competencies for the process of science:												
Apply the scientific method		50%										
Apply quantitative analysis and mathematical reasoning to draw conclusions	45%		75%									
Draw conclusions about biological phenomena.			75%									
Written and oral communication											written: support and conventi	oral: central message and support need improvement
Interdisciplinary			75%									
Ethical, cultural, and social implications												

The table above summarizes assessment data collected from 2013- 2015 for required courses within the biology program. From the overview it is clear that an area that has not been assessed is ethical and social implications of biology. This will be incorporated in the next assessment cycle.

Conclusions and Closing the loop for biology major courses

Assessment of Biological literacy (Goal 1) has been thoroughly incorporated across the curriculum and students demonstrated competency in all 5 areas. This is particularly evident by data showing that 70% of students taking BIOL 441 (taken Fall of senior year) correctly answer questions in all 5 content areas (over a three year time span) with one exception (61%) in the area of energy transformation. Energy transformation is a content area for which additional support can be incorporated throughout the curriculum.

Less assessment data has been presented for Goal 2. Changes to the comprehensive exam format and NSCM 499 project have been made for 2015 to more thoroughly assess scientific method and development of conclusions based on data. These data will be collected in Spring, 2015 and incorporated into a future report.

Changes that will be made as a result of assessment data

1. The area of energy transformation is a content area for which additional support will be incorporated throughout the curriculum.
2. Quantitative reasoning skills will be emphasized throughout the curriculum.
3. Students have demonstrated difficulty applying experimental method to answer questions as noted in assessment of laboratory reports (though not presented in this report). We have recognized a specific challenge students have aligning experimental question, hypothesis, experimental design and conclusion. This will be emphasized by the following ways:
    a. Emphasizing how methods are used to answer questions earlier in the curriculum
    b. Standardizing a lab report rubric across biology and chemistry classes.
    c. Increasing integrated undergraduate research into the curriculum (*see note below)
4. Written and oral communication: The following aspects will need to be addressed across the curriculum. A plan of action will need to be developed to address these areas. Aspects of student writing and oral presentations that are weak:
    a. Effectively incorporating support into an argument
    b. Developing central message in an oral presentation
    c. Writing convention

Based on current assessment data the following will be addressed throughout the next phase of assessment:

1. Comprehensive exam/NSCM 499 data will be used to assess Goal 2: application of scientific method and developing conclusions based on data as well as written and oral communication.
2. Quantitative reasoning proficiency was low in courses offered early in the curriculum. Assessment of quantitative reasoning skills will be included in courses offered later in the curriculum for the next phase of the assessment cycle.
3. Laboratory reports and skills will be incorporated into assessment data as a way to formally assess goal 2 (using standardized rubric mentioned above).
4. Assessment of competency in Ethical and cultural implications will be assessed in the next phase of the assessment cycle as well, since this was omitted during this cycle.

*A future goal of the biology program is to expand integrated undergraduate research into the curriculum. Four biology faculty members attended Council of Undergraduate Research meeting and are working to revise courses to incorporate more opportunities for research. A curriculum map is being developed in which goals for such pedagogy are aligned with courses in which these goals are achieved. This will be an area of future development and assessment.

Part II. Pre-health professions courses
A&P courses

Anatomy and Physiology I (BIOL 121) is the most common first science course taken by students in the College of Arts and Sciences (CAS) Undecided-Nursing (UND-N) curriculum at Trinity Washington University. A passing grade of "C" has been set by the criteria of the nursing program. Assessment data collected between 2009 and 2012 indicated that 65.57% (80 of 122 students) did not pass BIOL 121 the first time it was taken.

An anatomy and physiology placement test was developed and proposed to be used to determine student preparedness prior to enrollment in BIOL 121. This placement test would include content in math, as well as an introductory level of biology and chemistry materials that should have been learned at the high school educational level. It was also proposed that students that do not place into BIOL 121 directly should take BIOL 101 to obtain preparation for BIOL 121.

A study was conducted in 2013 to assess the predictive value of the placement test and to determine the minimum score that should be required for placement into BIOL 121. Assessment data was collected from 2 courses for BIOL 121 with different instructors from a total of 24 students. In both classes, students took the placement test at the beginning of the course and scores from the test for each student were compared to final course performance. The R value was 0.79 and 0.73 for the two courses, suggesting a strong positive correlation between performance on the placement test and performance in BIOL 121.

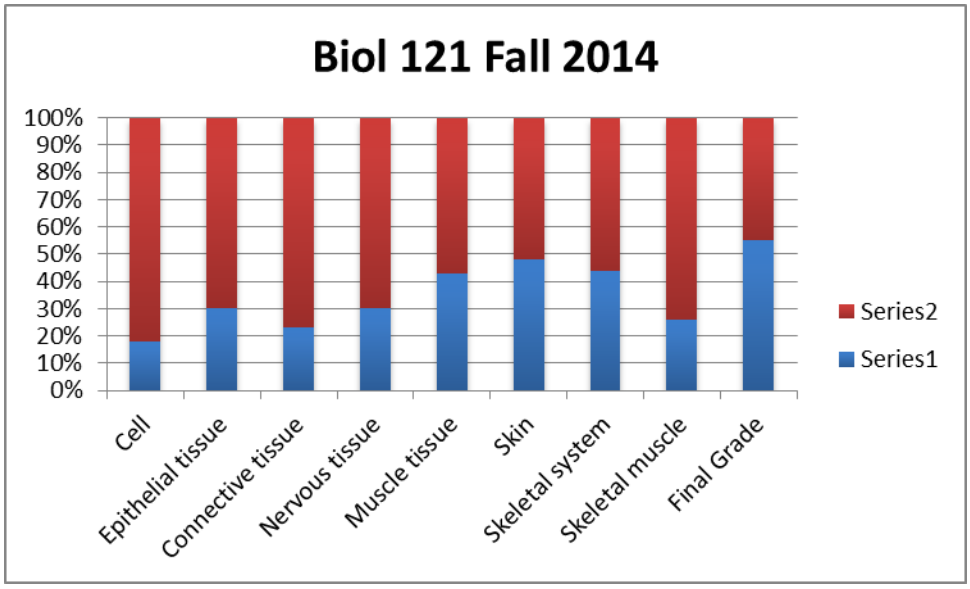
To assess whether student outcomes improved after taking BIOL 101, students took the assessment test at the beginning of BIOL 101 and again at the end of the semester. The average percent improvement was 48%. Only 5% of the students scored above 50% on the exam at the beginning of the semester while 50% of the students scored above 50% at the end of the semester.

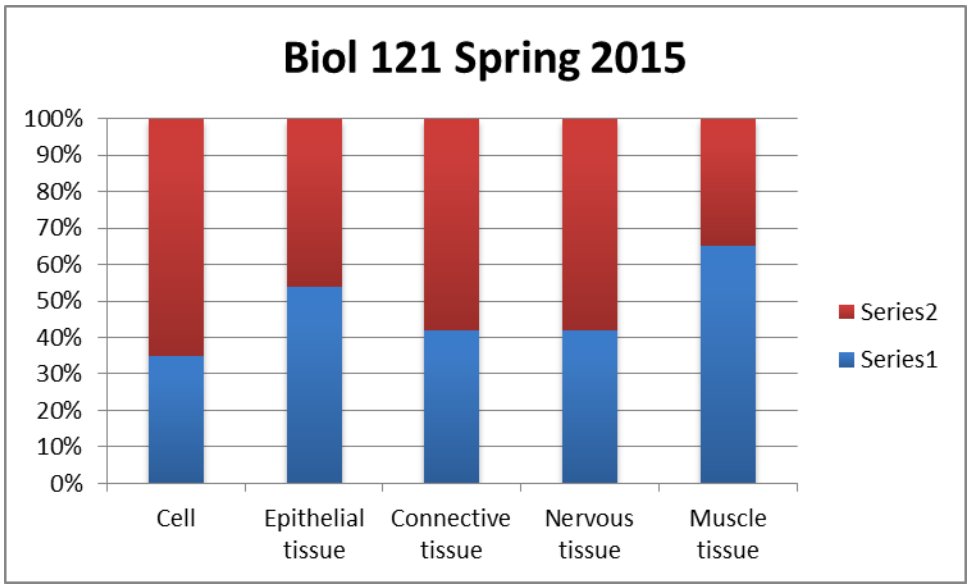
These data collectively suggest that there is a strong positive correlation between performance on the placement exam and performance in BIOL 121, and that students that take BIOL 101 improve performance on the placement exam. Based on these data a **requirement has been implemented such that students must earn a 40% on the placement exam before they may take BIOL 121. If students earn less than a 40% on the placement exam, they will be required to earn a C or better in BIOL 101 prior to taking BIOL 121.**

Continued assessment is ongoing to evaluate pass rates in BIOL 121 and to correlate student pass rates in BIOL 121 after taking BIOL 101.

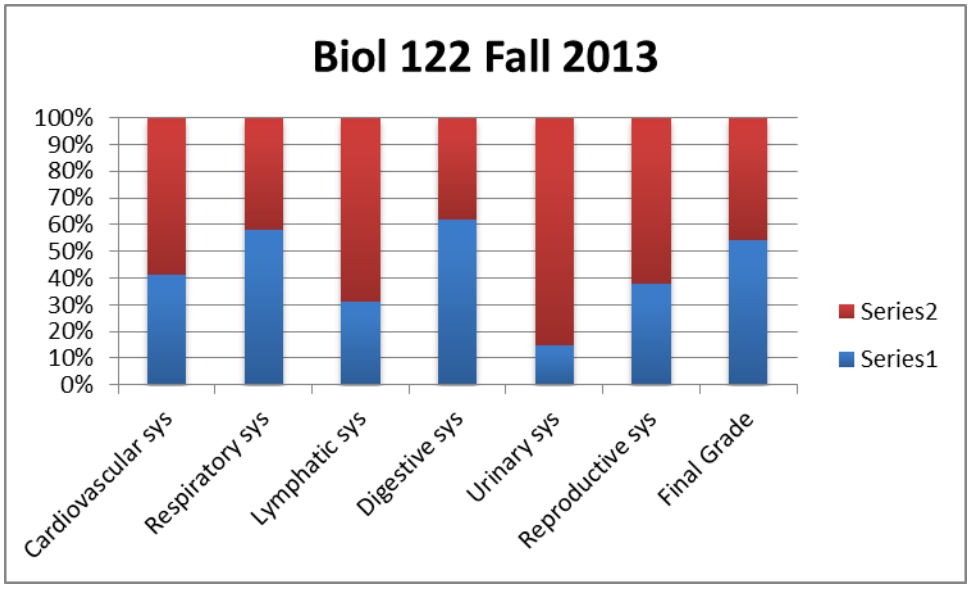
The following data demonstrates learning outcomes for the "Structure/function" concept goal for students taking BIOL 121/122. Although the placement test was in place, the new requirement was only for incoming students. Therefore, we will begin to see the effect of the placement test in Fall 2015.

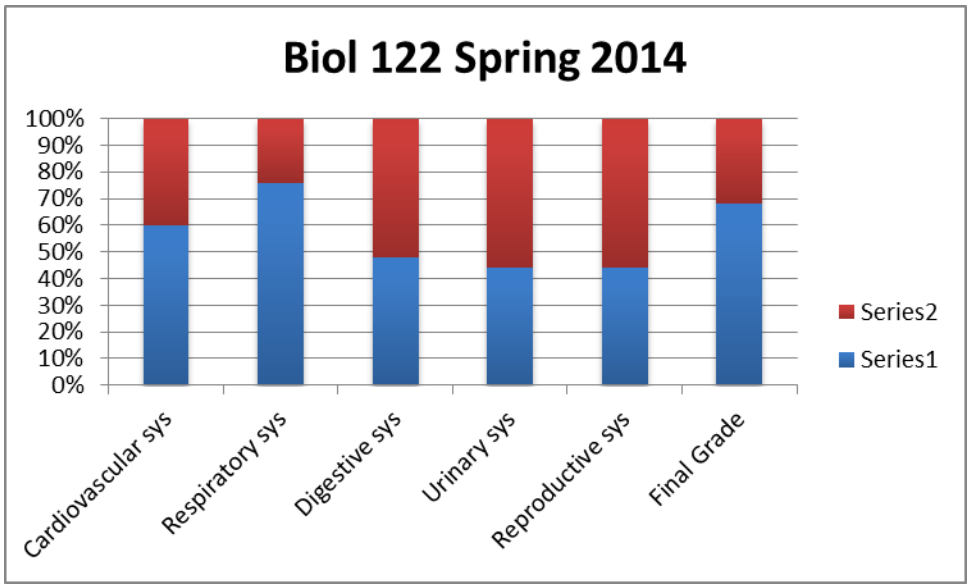
The following graphs for BIOl 121 and BIOl 122 are based on the percentage of questions answered correctly in a given topic area compared to incorrectly answered questions. The graph demonstrates the percentages of students correctly answering greater than or equal to 60% of the questions – indicated in blue) for given topics in anatomy and physiology relative to the percentages of students that correctly answered less than 60% (red).





From 2014 to 2015, percentages of students correctly answering questions increased for all topics assessed.





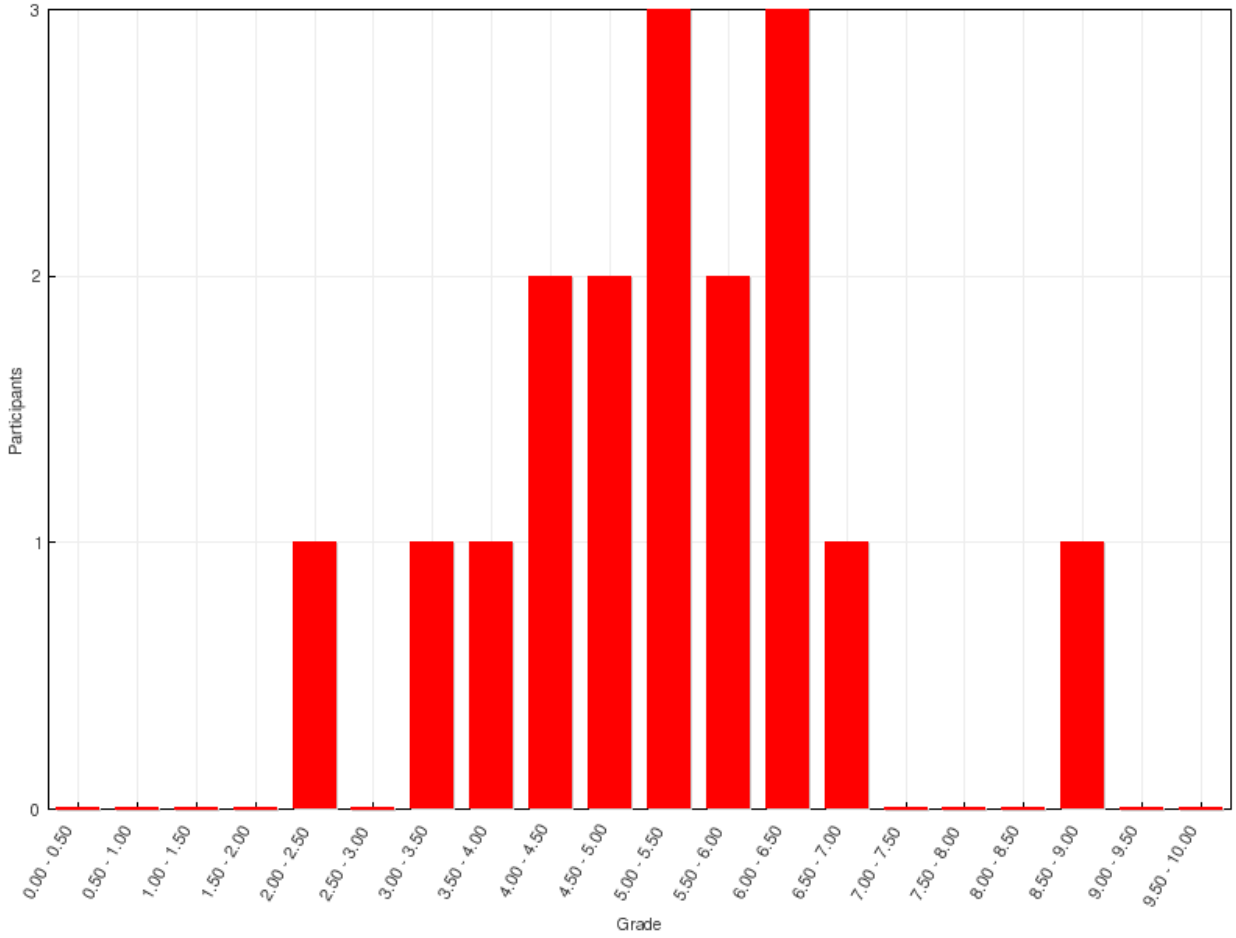
From 2014 to 2015, percentages of students correctly answering questions increased for all topics assessed.

In an effort to improve student learning, a skeletal muscle laboraotry activity was designed in 2015. During this laboratory session, students worked in groups to assemble skeletal models and label bones. Students then used clay to model muscles onto the bone structure. Learning outcomes will be assessed.

Part 3: General Education Courses

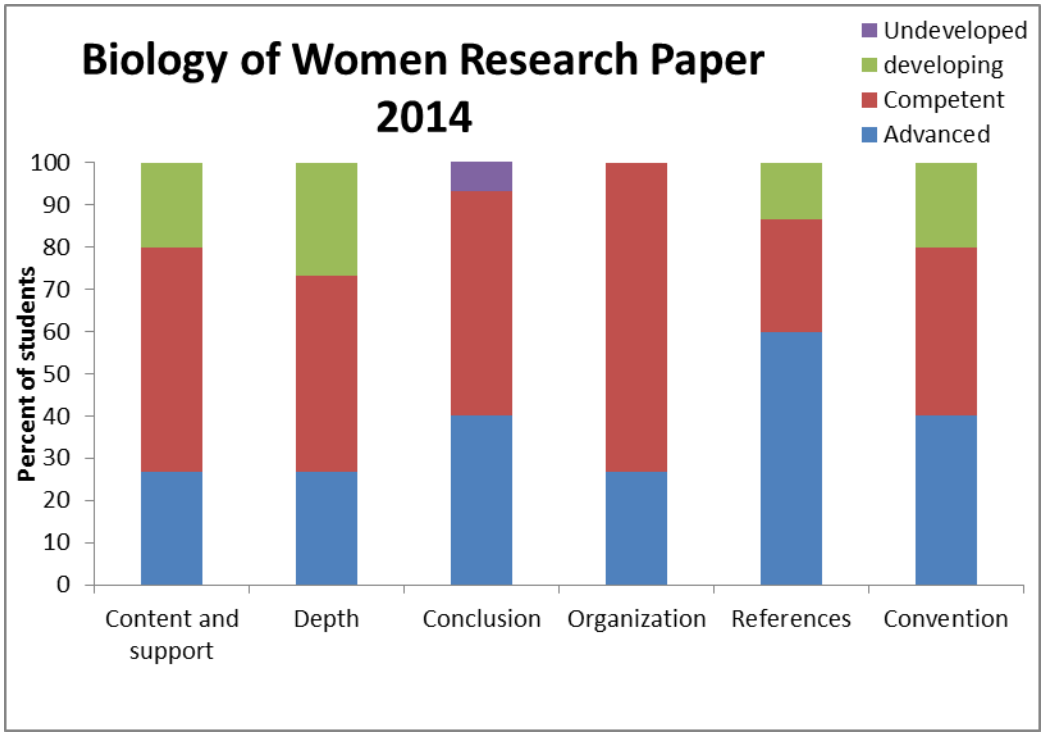
BIOL 101

Biology Pre and Post Assessment Tests have been administered for two consecutive years beginning in the fall of 2013. Students successfully answer 50% of questions.
Biology 101 Assessment Test, Spring 2014
Data



Based on the analysis of post-test, the most challenging topics for students to master appears to be: metric conversion, graph analysis, organelles structure and functions, enzymatic reactions, differences between ionic and polar bonds, differences between mitosis and meiosis, events of transcription and translation as well as the concept of homeostasis.
We are currently in the process of redesigning the assessment test with the goal to reduce the number of questions from 50 to 10. The purpose of the test is to assess student knowledge of basic biological concepts.

Retention for the BIO101 course has been increasing consistently from 2010; in the Fall of 2010 18 students out of 25 (72%) completed the course. In the Spring of 2014, 22 students out of 25 (88%)students completed the course with a grade C or better.



15 students

Biology of Women is a capstone course for the general education curriculum. These data demonstrate outcomes based on a research paper related to the biology of women. For all areas assessed, 70% or more of students demonstrated competency.

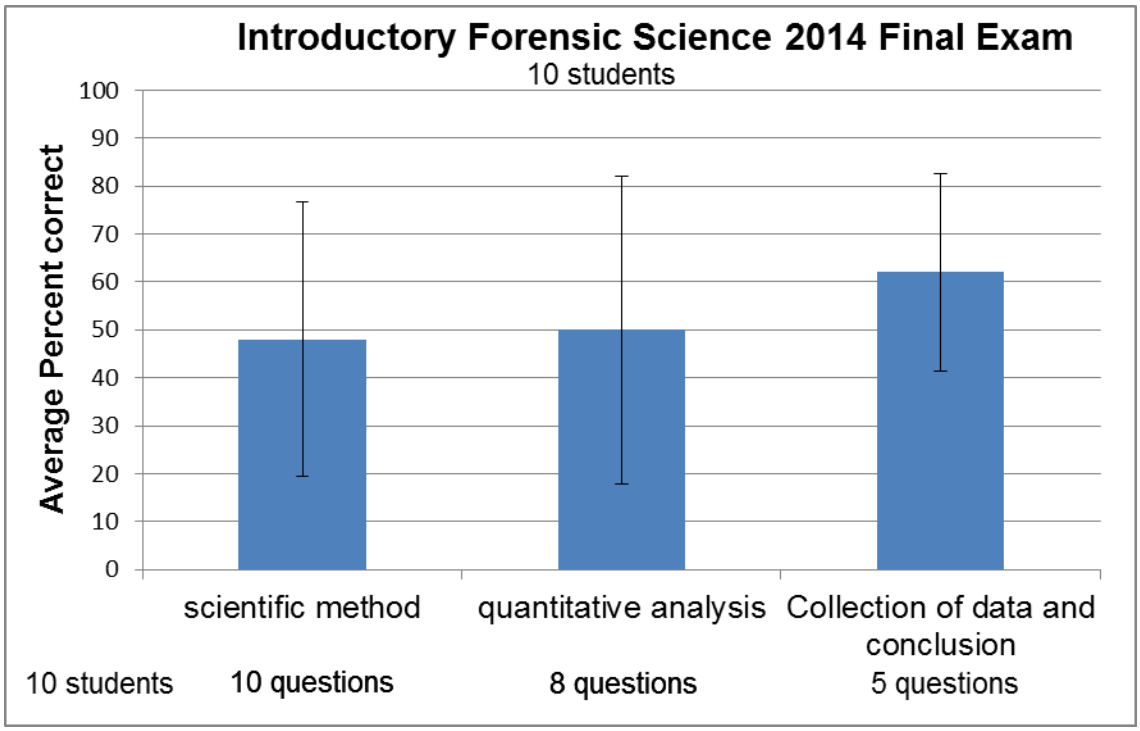
Conclusion and Closing the loop:

Revisions to BIOL 101 are in progress to make the course more engaging and relevant to students. Some laborarory experiences will be replaced with labs to which students will be able to identify, either by relating to themself or empahsizing on civic engagment and responsibility. Assessment in the next cycle will include competency in specific content areas as well as for ethical and cultural implications.

Part 4. Forensic Science

Forensic Science is an interdiciplinary program in which scientific methods, analylsis and conclusions are applied to legal matters. Therefore the emphasis of assessment is on application of quantitative anlsyis, the scientific method, and analyzing data and using data to make conclusions.

BIOL 220 Introductory Forensic Science



Conclusion and closing the loop:

Forensic Science is a new program. Therefore, students have only just begun to move through the courses. Assessment of these same skills will be conducted in the senior year as well. Assessment from the Introductory Forensic Science course helped us identify specific areas of weakness in quantitative skills. As mentioned in the biology program, these skills have been more intentionally introduced and will continue to be emphasized throughout the curriculum. As these skills are incorporated more fully into biology courses that support the forensic science major, it is likely that we will see improvement in quantitative analysis.