

University of Arkansas
Department of Biological Sciences
BISC Assessment of General Education Core Courses
Report: Academic Year 2017-2018

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A. General Background:

The Department of Biological Sciences has developed a two-phased assessment plan. Recognizing that combined BIOL-BA and BIOL-BS programs constitute about 1250 majors (Fall 2017: BA=199 and BS=1050) and approximately 300 graduating seniors per academic year, sub-sampling our students seemed the most effective way to assess our program. Phase I assessment utilizes a sub-sampling of 20 to 25% of our graduating seniors who are pre-medical students that take the MCAT. National MCAT scores are published, and thus provide a benchmark for evaluating our program. Phase II of our assessment examines our General Education courses and involves the comparison of pre- and post- test scores for a standardized test administered at the start and end of each semester. The data for Phase I are outlined in a separate document. The Phase II data on the assessment of our General Education courses is presented in this document. We provide cumulative data to establish a longitudinal assessment of our program and our general education courses.

B. Outcome Reporting:

Program Goals:

1. Foster the scientific curiosity of students about biological sciences.
2. Communicate the current state of knowledge and technology to students.
3. Nurture critical thinking, reasoning, and problem-solving abilities.
4. Enhance students' communication skills for communicating scientific ideas.
5. Prepare students to achieve academic and professional success.

Student Learning Outcomes:

The following learning outcomes mirror those proposed in several recent reviews of biology pedagogy. They apply to the both the introductory biology course and to completion of the department's common core of courses, cell biology, genetics, evolutionary biology, and ecology.

1. Show that you can understand data that support the hypothesis that all organisms are genealogically related including the recognition that all organisms are cellular and that they share the same basic genetic system.
2. Show that you can understand data that support the hypothesis that all organisms need energy and a source of building blocks to maintain themselves, grow, and reproduce.
3. Show that you can understand data that support the hypothesis that all organisms use information to maintain themselves, grow, and reproduce, and that that information can both be stored genetically and be received from the environment.
4. Show that you can understand data that support the hypothesis that all organisms interact both with other organisms and with the physical components of their environment and that these interactions affect their ability to maintain themselves, grow, and reproduce.
5. Show that you can distinguish data-supported interpretations of biological systems from anecdotal information.
6. Show that you can understand and use quantitative methods for explaining how biological systems work. This will include graph interpretation, table interpretation, and basic mathematical formulas.
7. Show that you can apply the information that has been presented during the course to novel situations.

Phase II: Pre- and Post- testing of BISC General Education core courses.

Phase II of BISC's program assessment plan requires administration of pre- and post- tests for the general education courses offered by the department. These courses will include: BIOL1543/1541L (Principles of Biology), BIOL1584 (Biology for Majors), BIOL1603/BIOL1601L (Principles of Zoology), BIOL1613/1611L (Plant Biology), BIOL2213/BIOL2211L (Human Physiology), and BIOL2443/2441L (Human Anatomy). The pre- and post-assessment exams were developed by the faculty in Biological Sciences and they are on record with the Fulbright Dean's office. Below are the results of the pre- and post-assessment scores for AY2017-2018.

1. **BIOL1543/1541L (Principles of Biology):** Principles of Biology is a university core general education course that is designed for delivery to non-biology majors. During the first week of classes a pre-assessment exam was administered and the same exam subsequently given at the end of the semester. In the Fall 2017, the instructor implemented more active learning experiences in an effort to engage the students in class, improve learning outcomes and enhance attendance. Our assessment in 2017-2018 assessment scores are indicated in Table 2, and they suggest a slight improvement beginning in Spring 2018. More importantly, we found that overall student success rate was greater and the final average grades were improved. We will continue to maintain longitudinal data sets on the assessment to identify trends and changes over time, but the addition of active learning experiences seems to benefit the students.

Table 2: Assessment scores for Principles of Biology (BIOL1543)

Semester	Average Pre-exam score (%), (n=sample size)	Average Post-exam score (%), (n=sample size)	change in score
Spring 2017	43 (n=509)	61 (n=478)	+18
Fall 2017	47 (n=928)	64 (n=806)	+17
Spring 2018	48 (n=554)	71 (n=519)	+23

2. BIOL1584 (Biology for Majors): Biology for Majors is a newly developed course (started in Fall 2016) offered by Biological Sciences to provide an enhanced introductory freshman biology experience that would be applicable for science majors. The Spring 2017 semester was the first pre- and post-assessment evaluation of the course. We currently have three semesters of assessment data for BIOL1584 and we have not seen the improvement that we anticipated on the assessment exams (Table 3). The course instructor and I have discussed the problem and it appears there may be issues with the format of the assessment exam that is presenting challenges; hence, the instructor plans to change the format of the exam to a more traditional multiple choice assessment, similar to our other courses. Secondly, the current exam is likely too lengthy with 100 questions and the students may not take it seriously since it does not affect their grade, positively or negatively, for the course. The course instructor and I agreed that the exam needs to be significantly shorter (40 questions maximum), evaluate their understanding of fundamental knowledge and the students should have an incentive to perform well on the assessment exam. With these changes, the Chair will continue to monitor the assessment and determine whether additional curricular or pedagogical changes need to occur.

Table 3: Assessment scores for Biology for Majors (BIOL1584)

Semester	Average Pre-exam score (%), (n=sample size)	Average Post-exam score (%), (n=sample size)	change in score
Spring 2017	55.8 (n=193)	57.8 (n=184)	+2
Fall 2017	55 (n=126)	61 (n=116)	+6
Spring 2018	57 (n=192)	59 (n=104)	+2

3. BIOL1603/BIOL1601L (Principles of Zoology): BIOL1603 is only offered in the Fall semester of each academic year; hence, the first assessment of this course occurred in AY2017-2018. In Fall 2017, BIOL1603 has an enrollment of 74 students. The pre-

assessment exam, given at the beginning of the course, yielded a score of 49%. The exam was administered again to the same cohort of students at the end of the course to yield a score of 58.4%. This represented a marked improvement (9.6%); however, we believe further improvement can be achieved. The instructor for the course is working toward making improvements in the course to facilitate better learning and retention. As with other courses, we will maintain longitudinal data sets to identify trends and changes over time, and to determine whether changes in the course are enhancing the learning experience.

- 4. BIOL1613/1611L (Plant Biology):** BIOL1613 is a general education course offered by Biological Sciences in the Spring semester of each academic year. Spring 2018 represents our second assessment of the course with a 2018 enrollment of 42 students. There were 30 members from the same cohort that also completed the post-assessment test with an improvement of 21.5% in the score (Table 4). Along with the marked improvement in performance for those that completed the post-exam, the withdrawal rate from the course was reduced by greater than 10% from 39.5% in 2017 to 28.6% in 2018. The withdrawal rate remained higher than considered acceptable and this has been discussed directly with the instructor. A development plan was provided to assist the instructor with improving the learning experience of the students. We are also closely monitoring the DFW rates on this course, and those values for Spring 2017 and 2018 are extremely concerning. We anticipate that the development plan provided to the instructor will result in lowered DFW rates. We will maintain longitudinal data sets to determine whether changes in the course are enhancing the learning experience.

Table 4: Assessment scores for Plant Biology (BIOL1613)

Semester	Average Pre-exam score (%), (n=sample size)	Average Post-exam score (%), (n=sample size)	change in score	DFW rate for the course (%)
Spring 2017	47.5 (n=49)	62.5 (n=28)	+15	68.8
Spring 2018	46.5 (n=42)	68 (n=30)	+21.5	51.2

- 5. BIOL2213/BIOL2211L (Human Physiology):** BIOL2213 is a general education course offered by Biological Sciences in the Fall, Spring and Summer of each year. For this course, the assessment exam was developed and initially implemented in Fall 2016, so we have completed multiple semesters of data as indicated in Table 5. The data indicates that students markedly improve by approximately 20% when comparing the pre- and post-assessment average exam scores. Over the course of the 2017-2018

academic year, the improvement in scores on the pre- and post-exam were remarkably consistent with previous years. We will continue to maintain longitudinal data sets to identify trends and changes over time.

Table 5: Assessment scores for Human Physiology

Semester	Average Pre-exam score (%), (n=sample size)	Average Post-exam score (%), (n=sample size)	change in score
Fall 2016	48.4 (n=291)	71.2 (n=290)	+22.8
Spring 2017	53.2 (n=461)	79.9 (n=466)	+26.7
Summer 2017	56 (n=49)	78.8 (n=49)	+22.8
Fall 2017	54.4 (n=339)	73.4 (n=316)	+19
Spring 2018	59.4 (n=464)	79.3 (n=426)	+19.9

1. **BIOL2443/2441L (Human Anatomy):** BIOL2443 is a general education course offered by Biological Sciences each semester of the academic year. For this course, the assessment exam was developed and initially implemented in Spring 2017, so we have completed multiple semesters of data as indicated in Table 6. The data indicates that students markedly improve by approximately 30% when comparing the pre- and post-assessment average exam scores. Over the course of the 2017-2018 academic year, the improvement in scores on the pre- and post-exam were remarkably consistent with previous years and they were excellent. We will continue to maintain longitudinal data sets to identify trends and changes over time.

Table 6: Assessment scores for Human Anatomy (BIOL2443)

Semester	Average Pre-exam score (%), (n=sample size)	Average Post-exam score (%), (n=sample size)	change in score
Spring 2017	49 (n=413)	80 (n=417)	+31
Fall 2017	48 (n=363)	78.4 (n=363)	+30.4
Spring 2018	49 (n=399)	78.7 (n=399)	+29.7

C. Summary:

In the Spring of 2017 we implemented pre- and post-assessment exams to evaluate our university general education core courses. From the data acquired thus far, student scores are improving on most of the exams. Some concern with BIOL1584 (Biology for Majors); however, we have identified potential problems and we will address them in the future. We are also concerned with the DFW rates in BIOL1613 (Plant Biology). While the assessment data for

BIOL1613 shows significant improvement, the >50% DFW rate for the past two years is concerning and the issue is being addressed. Longitudinal data for all of the Biology courses will continue to provide us with metrics for evaluating the future learning experience in each university general core course.