

**University of Arkansas**  
**Department of Biological Sciences**  
**BISC Undergraduate Program Assessment (BIOL BA, BIOL BS)**  
**Report: Academic Year 2017-2018**

Prepared by: David S. McNabb, Chair BISC, [dmcnabb@uark.edu](mailto:dmcnabb@uark.edu)

### **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 below. The Phase II data on the assessment of our General Education courses is provided in a separate 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 I - Subsampling with the MCAT:**

Biological Sciences graduates approximately 300 students in the BA and BS programs per year. A large number of these students are declared premedical students and they take the MCAT as an entry-level test for Medical School aptitude. The department has access to summary statistics for our students that participate in the MCAT and applied to medical school. Importantly, statistical summaries of the MCAT test results nationally are published for all students that applied to medical school. The scoring system for the MCAT changed in April 2015, so our assessment only includes scores based on the new scoring strategy. Importantly, the combined scores on the MCAT range from 472 to 528 with the mean and median at 500. This provides a convenient mechanism by which to evaluate our UA Biology students with other individuals nationwide that took the same exam. Table 1 shows the data for MCAT scores from 2015 to 2017. These data do not differentiate between Biology BA and BS degree students; however, since both degrees share identical core biology courses, we take the current combined data to represent performance of both degree programs. Moreover, the vast majority of the Biology majors are seeking a B.S. degree with the B.A. representing a minor contribution to the overall results. The complete data set for 2018 are not available, but they will be included in the 2018-2019 assessment report.

**Table 1: MCAT scores for Biology Majors 2015-2017**

YEAR	# BIOL Students	BIOL Majors Average	U of A Average	BIOL U.S.*	Overall U.S.*
2015	57	502	501.1	NA	NA
2016	71	501.8	502.6	501.6	501.8
2017	81	502.4	504.2	504.5	505.8

\* NA: not available

On the basis of the national average for 2016 and 2017, BISC majors (BS and BA combined) performed above the MCAT median of 500. While UA BIOL majors are slightly below the national average of all BIOL majors and the overall U.S. average, we are encouraged by the fact that the 2017 data indicate a slight improvement from prior years. Nevertheless, we will continue to strive for improvement in our curriculum. Since the new MCAT is heavily focused on critical reasoning skills, our curriculum improvement needs to focus more in this area to facilitate improved scores.

### **C. Summary:**

The BISC assessment plan has provided positive data from Phase I (MCAT), suggesting that our programs are effectively serving our undergraduate students. In 2017, we had 81 BIOL majors take the MCAT with an average score of 502.4 compared to the U.S. BIOL majors average of 504.5. Our immediate goal for improvement is to reach the national average for BIOL majors.

## **University of Arkansas**

### **Department of Biological Sciences**

#### **Graduate Program Assessment (BIOL MS, BIOL PhD)**

#### **Report: Academic Year 2017-2018**

Prepared by: David S. McNabb, Chair BISC, [dmcnabb@uark.edu](mailto:dmcnabb@uark.edu)

### **A. General Background:**

The graduate programs in Biological Sciences (M.S. and Ph.D.) offer the opportunity for advanced study and research for students that desire a comprehensive view of biological sciences. Accomplishment is judged by competence and a developing sense of responsibility for the advancement of knowledge rather than the fulfillment of routine requirements. It is expected that all candidates for advanced degrees will have a period of study in residence, complete the required courses in advanced biology appropriate for the chosen discipline,

demonstration of advanced competence in the chosen area of expertise, satisfactory introduction to allied subjects, the ability to communicate at a scholarly level, and the satisfactory performance in examinations. As of Spring 2018, the BISC graduate student population is represented by 62 BIOL students, 30 CEMB students, and 1 STAN student. For assessment purposes, we only include those obtaining an M.S. or Ph.D. in Biology. In the Spring of 2018, the BIOL program had 42 Ph.D., 18 M.S., and 2 concurrently enrolled in the M.S. and Ph.D. program actively enrolled.

For the AY2017-2018 academic year, we are providing additional data on our single most important metric, namely the scientific careers of our graduates upon completion of their advanced degree. A longitudinal summary (2006 to 2018) of those data are provided for both the M.S. and Ph.D. graduates. We have getting the infrastructure in place to quantify other metrics of assessment as defined by our submitted assessment plan.

## **B. Outcome Reporting:**

### **Learning Outcomes: PhD in Biology**

- Mastery of the chosen discipline of biology at the graduate level
- Capacity for original research as evidenced by the preparation and defense of a Ph.D. dissertation
- Ability to communicate effectively both as a participant and presenter in graduate seminars
- Demonstrated excellence in the classroom for teaching assistants
- Professional development in science via the presentation of research at national conferences, applying for and receiving nationally competitive grants, publishing research articles and books in the chosen discipline, participation in departmental professional development seminars
- Participation in the academic life of the Department (attending seminars and public lectures)

### **Learning Outcomes: M.S. in Biology**

- Mastery of the chosen discipline of biology at the graduate level
- Capacity for original research as evidenced by the preparation and defense of a M.S. thesis
- Ability to communicate effectively both as a participant and presenter in graduate seminars
- Demonstrated excellence in the classroom for teaching assistants
- Professional development in science via the presentation of research at national conferences, applying for and receiving nationally competitive grants, publishing research articles and books in the chosen discipline, participation in departmental professional development seminars
- Participation in the academic life of the Department (attending seminars and public lectures)

## C. Results of Assessment:

For Ph.D. seeking graduate students, we have assessed their continuation in science careers after completion of their doctoral degree in the Department of Biological Sciences. We have classified students into six broad categories:

1. Employed as a faculty member (Instructors, Assistant Professors, Associate Professors, Professors at academic institutions nationally and internationally).
2. Employed in postdoctoral training positions.
3. Employed in nonacademic science (i.e. industry, state or federal agencies).
4. Continued education toward a professional degree (i.e. MD, DO, JD, DDS, etc.)
5. Left the Ph.D. program without completion.
6. Unknown

The results of our longitudinal data from 2006 to 2018 are shown below in Table 1.

**Table 1: Longitudinal data on Ph.D. graduates in Biological Sciences.**

Ph.D. graduates	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total	% Total
Faculty	1	3	3	4	5	2	2	3	0	0	0	0	0	23	40.4
Postdoctoral	1	0	0	0	1	2	1	3	0	4	4	1	1	18	31.6
Nonacademic sci.	0	0	1	1	3	0	1	0	1	2	0	1	0	10	17.5
Professional	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Left Ph.D.	0	0	0	0	0	0	0	0	1	2	2	0	0	5	8.8
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.7
<b>TOTAL</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>9</b>	<b>4</b>	<b>4</b>	<b>6</b>	<b>2</b>	<b>8</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>57</b>	<b>100</b>

For M.S. seeking graduate students, we have assessed their continuation in science careers after completion of their M.S. degree in Biological Sciences. We have classified students into six broad categories:

1. Employed in science-related technical positions.
2. Continued education toward a Ph.D. at the U of A or other doctoral granting institutions.
3. Employed as science instructors (i.e. K-12, college, etc.)
4. Continued education toward a professional degree (i.e. MD, DO, JD, DDS, etc.)
5. Employment outside of science
6. Unknown or left the program

The results of our longitudinal data from 2006 to 2017 are shown below in Table 2.

**Table 2: Longitudinal data on M.S. graduates in Biological Sciences.**

M.S. graduates	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total	% Total
Employed in science	2	3	2	0	1	1	3	1	5	4	1	5	3	31	45
Education to Ph.D.	3	1	2	1	0	2	0	2	0	3	1	0	1	16	23.3
Science Instructor	1	0	2	0	1	0	0	0	1	1	1	0	0	7	10
Professional	1	1	0	0	0	0	0	0	0	0	0	0	0	2	2.9
Outside science	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1.4
Unknown	2	0	1	2	0	0	0	0	1	4	1	1	0	12	17.4
<b>TOTAL</b>	<b>9</b>	<b>5</b>	<b>7</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>7</b>	<b>12</b>	<b>4</b>	<b>6</b>	<b>5</b>	<b>69</b>	<b>100</b>

**Summary of Assessment (2006 to 2018):**

The Department of Biological Sciences has successfully graduated 126 students (2006-2017) that were awarded advanced degrees (M.S. or Ph.D.) in Biology. The students receiving M.S. degrees maintained a GPA as required to be awarded the degree. Additionally, they have successfully written M.S. theses and defended their theses before a committee of experts in the respective fields of biology. The students receiving Ph.D. degrees have maintained a GPA as required by the University to be awarded the degree. In addition, they have successfully passed both written and oral qualifying examinations to enter doctoral candidacy. Finally, the doctoral students have successfully written doctoral dissertations and defended the dissertation before a committee of experts in their field of biology. Most importantly, the vast majority of M.S. and Ph.D. students (83.3%) completing advanced degrees in biology have remained successfully employed in science-related disciplines after completing their advanced degrees in Biology.

Since 2006 the Department of Biological Sciences has graduated 52 doctoral students with only 5 students leaving the program without degree completion (91% completion). Of those that completed their degree, over 40% are employed as faculty members, ~32% moved on the postdoctoral training positions and ~18% were employed in nonacademic science jobs. Hence, students completing their doctoral degrees in Biological Sciences are successful in gaining employment.

Since 2006 the Department of Biological Sciences has graduated 69 Master's degree students with only 4 that were dismissed from the program without degree completion (95% completion). Of those that completed their degree, 45% are employed in science-related technical positions, 23% continued their education toward a doctoral degree, 10% were employed as a science instructor and 3% pursued other professional degrees. Thus, students completing their M.S. degrees in Biological Sciences are successfully gaining employment with the vast majority remaining in some type of science-related career.