

Student Learning Outcomes Assessment Summary

Biological Sciences, PhD

College of Natural Science and Mathematics

AY 2012/13 and 2013/14

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During AY 2012/13 and 2013/14 there were approximately 50 PhD students enrolled in the Biological Sciences program, about the same number as were enrolled during the previous 2-year period. Eight new students were admitted to the program and 15 students graduated during the most recent period of record. Numbers of both newly enrolled students and graduating students are down slightly from the previous two years (Table 1). These trends may reflect a downturn in research funding over the past few years. The median time to degree completion was a 5.9 years (range 2.7 – 10.4 years).

Table 1. Numbers of students in the Biological Sciences PhD program.

Number of students	2013/14	2012/13	2011/12	2010/11
Majors	49	52	46	56
Newly enrolled	2	6	6	5
Graduated	7	8	11	10

1. Assessment information collected

1.1. Knowledge

New PhD students entering without a Masters degree take the Qualifying Exam to ensure they have adequate knowledge to make a productive start on their degree program. The qualifying exam is administered by two members of the Comprehensive Exam Committee, the student's advisor, and one additional member of the student's Graduate Advisory Committee.

Established students are expected to demonstrate broad knowledge of biological concepts and more detailed knowledge of the biology related to their area of study. This is assessed with a written and oral PhD Comprehensive Exam, which ideally takes place during the second year. The exam is administered by the

Graduate Advisory Committee, joined by an outside examiner appointed by the Graduate School.

1.2. Communication of Science

PhD students should make substantial and original contributions to scientific knowledge in their field of study, communicated in oral and written form. To assess this objective, we evaluate two criteria.

- Students must write a dissertation, publically present their research results, and defend their work in an oral exam setting. The quality of the dissertation and the defense is assessed by the Graduate Advisory Committee, joined by an outside examiner.
- Students must publish papers and make presentations at professional meetings. Additionally, students should write grant proposals, in order to gain feedback on their ideas, help to support their research, and to develop this important professional skill.

1.3. Occupation

Students should obtain employment in their chosen field or continue on to post-doctoral education. We track student employment by communicating directly with former students, surveying former major advisors, and by using online resources such as Research Gate and LinkedIn.

2. Conclusions drawn from the information summarized above

2.1. Knowledge

Five students entered the PhD program without an MS degree during AY 2012/13 and 2013/14, and of these, three students took and passed the Qualifying Exam within the first semester of study. Two students did not take the exam; one transferred to another university shortly thereafter and the other plans to take the exam in the near future.

Thirteen PhD students took the Comprehensive Exam during the period of record. Of these students, 8 (62%) passed both the oral and written portions, four received a "conditional pass" on one or both portions, and one failed the oral portion of the exam outright. Students who received conditional and failing grades have either re-taken and passed the exam, or plan to retake the exam in fall. Only two outside examiners returned exam reports to the Graduate School. Both of the outside

examiners reports that the academic standards of the exam were high, and the communication skills of the students were excellent.

2.2. Communication of Science

Twelve students defended their dissertations during the period of record and all were successful. Only two outside examiners returned reports to the Graduate School, and both of these reported that the academic standards of the committee were high and that the student's communication skills were at least satisfactory.

During AY 2012/13 and 2013/14, 84% (42 of 50) of PhD students submitted at least one supplemental annual report to the department detailing their publications, presentations, and grant proposals. The following paragraphs summarize the information contained in those reports.

Across the two years of review, 69% of respondents (29 of 42) published at least one peer-reviewed journal article or book chapter. The average rate of publication was 0.6 per student per year; similar to the rate reported for 2010-2012. At this rate of publication, the average student would be expected to produce approximately 3 publications across a 5-year PhD program, which meets the department's expectations for productivity. The evidence suggests that PhD students in the program are publishing well while still in the program, which will help them to secure research-related employment after they graduate.

During AY 2012/13 and AY 2013/14, 35 of 42 respondents (83%) delivered at least one oral or poster presentation on their research. Students averaged 1.8 presentations per year, a rate similar to that reported for the 2010-2012 period (2.1 presentations per student per year). Approximately 40% of these presentations were delivered at international or national conferences, while 60% were delivered at state or local venues. This level of research presentation is very good, especially considering that most first-year students are unlikely to have research results suitable for presentation.

The 42 respondents applied for 78 research grants, fellowships, scholarships, and travel grants per year during the period of review. Of the applications, 30% were submitted to external agencies and institutions, including the National Science Foundation (NSF), the US Geological Survey, and national organizations such as the Wildlife Society. 86% of respondents applied for at least one award during the 2-year period. On average, students submitted 3.7 proposals per year, a rate considerably higher than the 1.1 applications per year reported for the previous 2-year period. Overall, at least 59% of proposals were successful; a subset of proposals was still pending when the data were tabulated.

2.3. Occupation

The department was able to locate current employment information for two-thirds of those graduating in the past 2 years. All of the graduates located are currently working in the field of biology: one in a faculty position, seven as post-doctoral scholars and medical students, and two as professional biologists (Figure 1). The occupations of about one-quarter of graduates are unknown.

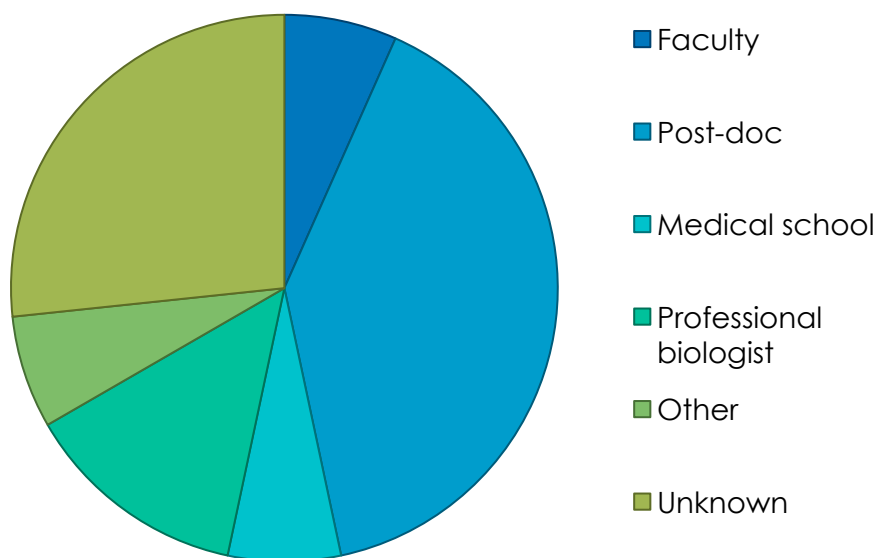


Figure 1. The occupations of PhD students graduating in AY 2012-13 and AY 2013-14, on a percentage basis.

3. Curricular changes resulting from conclusions drawn above

- The frequency of first-time passes on the Comprehensive Exam was somewhat low. Two changes may improve this outcome in the future. First, in May 2014, the faculty voted to raise the minimum GRE performance standards for graduate admissions, which may improve general student preparation upon entering the program. Second, the faculty has recognized the need to offer on a regular basis seminar courses that will provide graduate students with experience presenting and critiquing science and challenge them with a range of ideas and research approaches. A greater number and more even distribution of such course offerings may help to improve student performance on the Comprehensive Exam. There is currently a particular dearth of seminar courses in the areas of cellular/molecular and physiology.

The following seminars were taught during the two-year period of record.

- Animal Migration (BIOL F692)
 - Spatial Pattern and Ecological Process (BIOL F692)
 - Animal-Plant Interactions (BIOL F692)
 - Biogeography: reconstructing patterns of diversification (BIOL F644)
 - Climate Change (BIOL 692)
 - Advanced Community Ecology (BIOL 692)
 - Introduction to Natural Resources Professional Opportunities (BIOL 692)
 - Introduction to Programming and Data Analysis in R (BIOL 692)
- PhD students in Biological Sciences have a good record of submitting grant proposals, but relatively few of our PhD students apply to major national fellowship and grant programs such as the NSF Graduate Research Fellowship and the NSF Doctoral Dissertation Improvement Grant. To encourage more students to apply for these funds and help students to compete successfully at the national level, we plan to offer a course in proposal writing focused on NSF competitions in fall 2014. A similar course was taught previously and one student in the class subsequently earned an NSF Graduate Research Fellowship, which provides three years of funding.
 - The department needs a more integrated data storage and retrieval system that will allow us to more effectively relate policies and practices to measures of student progress and success, such as degree duration, publications, and employment. The development and implementation of such a system is a priority for the next few years.

4. Identify the faculty members involved in reaching the conclusions drawn above and agreeing upon the curricular changes resulting

Jeremy Jones (Chair, Teaching Advisory Committee)

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