

2007 Annual Report

Graduate Program Assessment in Biological Sciences (MS Degree)

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Mission Statement: The Graduate Program of the Department of Biological Sciences will produce graduates who are technically literate, excellent at communication, and scientifically well-trained, making them highly competitive for employment in biology, biotechnology, and biomedical sciences.

I. Assessment Activities

A. Program Goals. As part of a thorough reorganization of the Department of Biological Sciences, the Graduate Program Committee has been reconstituted and expanded. Frequent meetings of the committee have established that the goals of the program are to:

1. **Maintain high standards of academic excellence** among our graduate students by engendering in-depth content delivery and rigorous assessment.
2. **Introduce students to the process of scientific investigation** through multiple modalities, including laboratory exercises, field work, independent study projects, and thesis research.
3. **Develop core research skills** in students, including experimental design, data collection, analytical procedures, and scientific writing.
4. **Continuously update curriculum** to best meet the needs of students by the use of multiple learning techniques, including advanced computer skills, technical communication, critical thinking exercises, and literature-based content in our graduate courses
5. **Continuously develop new courses** that will provide students with cutting-edge preparation for the rapidly changing scientific world.
6. **Continuously foster faculty development** to ensure the program stays current through workshops, meetings and collaborations.
7. **Enhance faculty teaching expertise** through access to on- and off-campus workshops, and by providing access to innovative teaching modalities in the classroom.

B. Learning Outcomes/Data Collection. The desired learning outcomes for each student in the graduate program are:

1. **Graduates of the program will have a broad knowledge base in Biological Sciences.** The MS program requires a minimum of 18 hours of graded BSC coursework at the 500-level or above. Furthermore, graduate course offerings have broadened recently to include molecular biology, comparative vertebrate anatomy, developmental genetics, and biosystematics, among other new courses. To assess student progress in building a broad knowledge base, we rely on multiple methods of assessing student progress in each course (multiple choice exams, essay exams, writing assignments, and oral presentations). Student progress department-wide is monitored using available data such as grade point averages. The benchmarks for these data are indicated in the attached table. The BSC Graduate Program Committee does not require completion of the Biology subject GRE or the Biological Sciences portion of the MCAT for graduation. For that reason, the data available from standardized tests is too limited for use in assessment.
2. **Graduates of the program will have a demonstrated ability to perform research in a specific field of interest.** MS students are permitted to apply up to 12 hours of thesis credit toward the 32 total hours required for graduation. This ability emphasizes the fact that the MS in BSC is a research degree, and it allows students to devote more of their time to producing tangible products of research such as theses, articles in peer-reviewed journals, and presentations at scientific meetings. The BSC Assessment Committee is working to build a database of thesis completion rates, student authorship of scientific manuscripts, and presentations. The database will include student publication and presentation data from before and after the initiation of the new guidelines in order to assess the impact of the additional research emphasis on productivity.
3. **Graduates of the program will have good oral communication skills.** Students are required to participate in a structured scientific seminar course (BSC 661 or 662) during each semester that they are actively enrolled in the BSC graduate program. Seminar participation reflects the importance placed on oral communication skills in the scientific community. These courses include instruction and practice in formal oral scientific presentations. In addition, many courses in the BSC curriculum require graduate students to make class presentations, and many graduate students make presentations at regional and national scientific meetings each year. The BSC Assessment Committee is currently working to tabulate the number of graduate courses that require an oral presentation, and the number of external scientific talks given by students each year.
4. **Graduates of the program will have good written communication skills.** All BSC graduate courses include writing assignments. Evaluation of student writing focuses on the students' ability to demonstrate an understanding of the scientific method, scientific content, and to clearly communicate his or her analysis of the information. All MS students submit a written thesis. The departmental goal is

that 90% or more of MS students have generated an acceptable thesis within 6 academic semesters. Furthermore, our goal is to have at least 50% of graduate students as co-authors on peer reviewed journal articles within 3 years of graduation. Publishing peer-reviewed articles is the best indication of clear research communication and competitiveness with our peer graduate programs. The BSC Assessment Committee, in partnership with the BSC faculty, is currently working to establish a database of student co-authored publications.

5. **Graduates of the program will have working knowledge of career opportunities in their fields of interest.** When students apply to the BSC MS program they submit statements of purpose, which allow their advisors to evaluate and discuss student career objectives. Most students currently enrolled in the BSC MS program are pursuing careers in environmental biology, biomolecular sciences, or organismal biology. For graduate students, the most important aspect of career development is attendance at scientific meetings. The BSC Graduate Program Committee gathers data on the number of BSC graduate students who attend regional or national scientific meetings.
6. **Graduates of the program will succeed in finding employment and/or further educational opportunities in their areas of interest.** The department surveys the immediate plans of its graduates, and a new on-line alumni survey is still under development. The departmental goal is that all of our graduates seeking employment or advanced training will succeed within one year of graduation.

C. Results.

1. **Graduates of the program will have a broad knowledge base in Biological Sciences.** Twenty-three students successfully completed the graduate program in biological sciences during the reporting period. Numerical evaluation data were recovered for 20 of these students. These students had an average graduate GPA of 3.69, indicating good command of biological subject matter.
2. **Graduates of the program will have a demonstrated ability to perform research in a specific field of interest.** Successful completion of the MS degree requires the completion of an original research project. As evaluated by their thesis advisors, 11 of 16 (69%) of MS students received the highest possible mark for thesis performance, indicating a high degree of scientific performance.
3. **Graduates of the program will have good oral communication skills.** The responders to our assessment query reported that they had attended an average of 2.9 scientific conferences while enrolled in the program, and gave an average of 3.7 scientific presentations in these and other venues. A respondent's self-assessment of improved speaking ability was significantly ($P = 0.035$) associated with an excellent rating on the final oral comprehensive examination.

4. **Graduates of the program will have good written communication skills.** Seventeen students who graduated during the reporting period responded to a self-evaluation survey of their writing ability. All seventeen either agreed (10) or strongly agreed (7) with the statement “My writing skills have improved because of this program.” During the reporting period, graduate students (both graduating and continuing students) co-authored 26 peer-reviewed publications and made 23 professional presentations.
5. **Graduates of the program will have working knowledge of careers in their fields of interest.** Seventeen students who graduated during the reporting period responded to a self-evaluation survey of their career opportunities and professional networks. Fifteen graduates either strongly agreed (10) or agreed (5) with the statement “I know more about my career and/or educational opportunities than before I joined this program”. Two graduates had no strong opinion about that statement. All seventeen graduates either strongly agreed (12) or agreed (5) with the statement “I have expanded my scientific and professional network because of this program”. Survey data regarding success in finding employment and/or educational opportunities (see below) indicate that students are both aware and taking advantage of post-graduation opportunities.
6. **Graduates of the program will succeed in finding employment and/or further educational opportunities in their areas of interest.** Data on this metric were gathered from 18 students who graduated during the reporting period. Eight respondents (44%) reported that they had been accepted in a PhD or professional education program. Seven (39%) reported having found a job in their field of study. Two respondents (11%) indicated that they were actively seeking employment, and one (6%) indicated that s/he had applied to a PhD program, but had not yet been accepted.

II. Plans for the current year.

The departmental administration and the Graduate Program Committee continue to develop and refine both the program admission procedures and the program guidelines to maximize recruitment and retention of talented students. One major recent change in the BSC MS program is that 12 hours of thesis credit may now be applied toward graduation. This change in culture, which places greater emphasis on research, along with the recruitment of research active faculty to the graduate program, has already yielded an increase in the number of publications and presentations made by MS students over previous years. Data gathered for the current year will include student authored publications. Further development of the program will include the following actions.

- The BSC Graduate Program Committee has thoroughly reviewed and revised the admissions procedures for the program, making application easier and standards enforcement more uniform. Increased organization will ensure that the department can act quickly on talented applicants.

- The Graduate Program Committee is in the process of creating a web-based application and recruitment tool; this will raise the visibility of the graduate program and ensure an expanded pool of quality applicants.
- The BSC Curriculum Committee is currently engaged in a thorough evaluation of, and expansion of, BSC graduate course offerings. The administration and committee have identified an increase in graduate-level courses as a priority task, and development is ongoing
- The BSC Graduate Program and Assessment Committees continuously evaluate the BSC MS program and establish databases and data gathering tools required for more accurate and complete assessment of student progress in the BSC MS program. Two priority items for the improvement of assessment of the graduate program are post-graduate tracking of employment history, and the compilation of scientific publication data, both at graduate and subsequent to this.

III. Assistance needed.

The Department of Biological Sciences appreciates the help provided by the Graduate College and by Institutional Research. We will continue to rely on this support. Full implementation of the assessment plans outlined here will require significant investment of time from faculty and staff members who already have full teaching, service, and administrative loads. Allocation of additional resources for implementation of the assessment plan would be welcome.

IV. What one most important thing has the department/program learned through this process?

The data needed for an accurate assessment of progress in the BSC graduate program is available, but more data can be collected in some categories, and assessment will benefit from a more interactive relationship with the MU Office of Assessment.

Marshall University
Assessment of Student Outcomes: Component/Course/Program Level

Component Area/Program/Discipline Master of Science /Arts (MS, MA) Program in Biological Sciences

Date December 2007

Component/Course/Program Level					
Student Outcome	Responsible Person(s) or Office	Approach & Assessment Tools	Standards & Benchmarks	Results/Analysis	Actions to be Taken
1. Graduates of the program will have a broad knowledge base in Biological Sciences	The student's graduate advisor helps the student formulate a plan of study. Faculty provide classroom and laboratory instruction as well as guidance in the use of primary scientific literature.	Standard coursework emphasizes broad knowledge of Biological Sciences. Department keeps records of standardized test scores (GRE, MCAT, etc.), and will compare pre and post graduation scores when available.	Faculty set standards for achievement in individual courses. Course GPAs will be ≥ 3.5 . Students will achieve a GPA ≥ 3.30 by the time they have earned 18 graduate credits.	Average GPA for recent graduates = 3.69. GRE data indicates weak but positive correlations between GGPA vs. UGPA, GGPA vs. GRE Quant score, GGPA vs. GRE Verbal score, and GGPA vs. GRE writing score. The strongest association was with the GRE Verbal score.	Data indicate that graduate performance is good, and that GRE scores are somewhat predictive of graduate performance, supporting the retention of GRE-based admission criteria with some refinement of how they are used.
2. Graduates of the program will have a demonstrated ability to perform research in a specific field of interest.	Students and Faculty The student and his or her major professor design an acceptable thesis research project.	Thesis project requires awareness and understanding of all published research in the field as well as detailed design, performance and analysis of experiments using techniques appropriate to the discipline. The department will keep records of scholarly publications resulting from graduate work.	90% of students enrolled full time will complete an acceptable thesis within 6 semesters. 50% of students will be authors on peer-reviewed publications within 3 years of graduation.	Twenty-three students completed a master's degree during AY 2006-2007. Nineteen students completed the MS (thesis option) and four completed the MA (non-thesis option). 78% completed their programs within 4 semesters, and 94% completed programs within 6 semesters.	Assessment committee will create a bibliography of all student publications and be more active in compiling this information, especially from post-graduates.
3. Graduates of the program will have good oral communication skills.	Students and Faculty	Students participate in Seminar I (BSC 661) or Seminar II (BSC 662) each semester. Their presentations are rated relative to their peers. Students are encouraged to present their research at regional and national scientific meetings.	Oral communication must be clear and accurate. Students must demonstrate a mastery of content and an understanding of experimental design and analysis. Composite seminar GPA will be ≥ 3.5 .	Responders to evaluation query reported that they had attended an average of 2.9 scientific conferences during the program, and gave an average of 3.7 scientific presentations in these and other venues. Composite GPA in graduate seminar = 3.38	Faculty will continue to revise and improve seminar series. BSC will seek to improve student & faculty attendance at all departmental seminars.
4. Graduates of the program will have good written communication skills.	Students, Faculty, and Thesis Advisors	All graduate courses include writing assignments. Faculty provide examples and grading rubrics that indicate	Writing benchmarks mirror those of research ability since the two are intimately associated in scientific	Graduate students co-authored 26 peer-reviewed publications and made 23 professional presentations	The Graduate Program Committee requires writing samples as part of the application for admission,

		<p>expectations. Writing exercises also include the preparation and review of drafts.</p> <p>Thesis advisors work closely with students on the preparation and revision of research proposals, theses, presentation abstracts, and scientific manuscripts.</p> <p>Publication in peer-reviewed journals is strongly encouraged.</p>	<p>research.</p> <p>90% of students enrolled full time will complete an acceptable thesis within 6 semesters.</p> <p>50% of students will be authors on peer-reviewed publications within 3 years of graduation.</p>	<p>during the reporting period.</p>	<p>and is considering the use of the GRE writing score as an admission criterion.</p> <p>Students with low writing scores or poor writing performance will be advised to enroll in a scientific writing course and/or formal tutoring at the Writing Center.</p> <p>BSC Assessment committee will compile a bibliography of all peer-reviewed articles with student co-authors.</p>
<p>5. Graduates of the program will have working knowledge of careers in their fields of interest.</p>	<p>Student, Faculty Advisor & Professional Mentors.</p> <p>Entering students provide a written statement of career goals. Faculty and professional mentors provide feedback and help design a plan of study that is appropriate to the student's goals.</p>	<p>Student faculty advisor and external advisors will meet to discuss professional development and evaluate the student's career goals.</p>	<p>All students will be able to state short-term career goals during their oral exam.</p>	<p>Survey evidence suggests that students are well-informed about career and educational opportunities (see below).</p>	<p>Students will continue to be encouraged to join appropriate professional organizations and attend meetings.</p> <p>BSC will continue to use faculty networks to organize and disseminate information on employment and continued educational opportunities to students.</p>
<p>6. Graduates of the program will succeed in finding employment and/or further educational opportunities in their areas of interest.</p>	<p>Students and Faculty Advisors</p>	<p>Students respond to graduation survey to determine status of job and/or academic applications</p>	<p>90% of students seeking employment or advanced study will find suitable positions within one year of graduation.</p>	<p>Of 18 responders, 15 graduates reported that they were either already employed in their field of interest (7), or where accepted to PhD. programs in their field of interest (8). Only three of 18 responders were currently seeking employment or further educational opportunities.</p>	<p>The actions outlined above also apply to this goal.</p>