2008 Annual Report of Graduate Program Assessment in Biological Sciences (MS & MA Degrees)

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I. Assessment Activities

A. Program Goals. The goals of the MS and MA programs in Biological Sciences have not changed since our last assessment report. 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.

1. **Graduates of the program will have a broad knowledge base in Biological Sciences.** The MS and MA programs require a minimum of 18 hours of graded BSC coursework at the 500-level or above. Thirty-two BSC graduate courses were offered during the reporting period (see Table 1). Twenty-five courses were offered at the 500-level and seven were at the 600-level. Graduate courses included content from the study of individual molecules (e.g. Mass Spectrometry) to ecosystem-scale processes (e.g. Remote Sensing/Geographic Information Systems Applications). Eight of the courses were offered as Special Topics, indicating that they are new or recent additions to the curriculum. Three

Special Topics courses were offered at the 600-level, and all were new during the reporting period. In addition to BSC graduate courses, students in the MS and MA programs are encouraged to enroll in graduate courses offered in the Biomedical Sciences (BMS) program of the Joan C. Edwards School of Medicine, and by the College of Information Technology and Engineering (CITE). To assess student progress in building a broad knowledge base, instructors rely on multiple methods of assessing student progress (e.g. multiple choice exams, essay exams, writing assignments, and oral presentations). Student progress department-wide is monitored using available data such as grade point averages.

2. **Graduates of the MS 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 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 Graduate Program Committee has been tasked with compiling a database of tangible outcomes of scientific research. Those data will be presented in future reports.

3. **Graduates of the program will have good oral communication skills.** BSC graduate students are required to participate in a seminar course (BSC 661 or 662) during each semester that they are actively enrolled in the BSC graduate program. This requirement reflects the importance placed on oral communication skills. 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 Graduate Program Committee tracks the number of oral presentations made by students in the BSC graduate program, and assesses proficiency in oral communication through final grades in BSC 661 and 662.

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 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 Graduate Program Committee has been charged with establishing a database of student co-authored publications. Data on student publications will be presented in future reports.

5. **Graduates of the program will have working knowledge of careers in their fields of interest.** Students who completed the BSC graduate program during 2008 completed the following assessment survey:

   Rate the following statements from 1 to 5, where 1 = strongly disagree; 2 = disagree; 3 = no strong opinion; 4 = agree; 5 = strongly agree.

   a. I have a better understanding of biological sciences than before I joined this program.

   b. My analytical and critical thinking skills have improved because of this program.

   c. My writing skills have improved because of this program.

   d. My public speaking skills have improved because of this program.

   e. I know more about my career and/or educational opportunities than before I joined this program.

   f. I have expanded my scientific and professional network because of this program.

6. **Graduates of the program will succeed in finding employment and/or further educational opportunities in their areas of interest.** Students who completed the BSC graduate program during 2008 completed the following checklist:

   Work status after completion of the BSC graduate program (check all that apply)

   I already have or will soon start a job in my field of study.

   I already have or will soon start a job that is not in my field of study.

   I am actively seeking employment.

   I do not plan to seek employment.

   I have already been accepted to a PhD program or professional school.

   I have applied, but have not yet been accepted to a PhD program or prof. school.

   I have no immediate plans for further education.

C. Results.

1. **Graduates of the program will have a broad knowledge base in Biological Sciences.** Students enrolled in the MS and MA programs during 2008 had a weighted composite GPA of 3.54. Students who completed the MS or MA degree during 2008 earned a weighted composite GPA of 3.77. Eighteen students completed the BSC graduate program during 2008.

2. **Graduates of the program will have a demonstrated ability to perform research in a specific field of interest.** Of those students completing the BSC graduate program during 2008, 17 completed acceptable theses and one thesis is currently under revision. Students who completed a BSC graduate degree in 2008 on average attended 3 scientific conferences during their graduate careers. Data on student publications are being compiled and will be presented in future reports.

3. **Graduates of the program will have good oral communication skills.** Graduates of the BSC graduate program during 2008 reported making 96 presentations at local, regional, national, or international scientific meetings during their graduate careers – an average of over 5 talks per person. Assessment of proficiency in oral communication is tracked through final grades in BSC 661 and 662. The average grade in BSC 661 (Fall 2008) was 3.61. The average grades in BSC 662 were 3.59 (Spring 2008) and 3.35 (Fall 2008). Composite grades for two of the three classes were above our stated goal of 3.5.

4. **Graduates of the program will have good written communication skills.** Seventeen of eighteen graduates of the BSC graduate program (94%) produced acceptable theses within 6 academic semesters of their initial enrollment. This is above our stated goal of 90%. Data on peer-reviewed publications are being compiled and will be presented in future reports.

5. **Graduates of the program will have working knowledge of careers in their fields of interest.** The results of the graduate assessment survey were:

    a. I have a better understanding of biological sciences than before I joined this program. (mean response = 4.70; median = 5.0; mode = 5.0)

    b. My analytical and critical thinking skills have improved because of this program. (mean response = 4.60; median = 5.0; mode = 5.0)

    c. My writing skills have improved because of this program. (mean response = 4.35; median = 4.0; mode = 4.0)

    d. My public speaking skills have improved because of this program. (mean response = 4.60; median = 5.0; mode = 5.0)

e. I know more about my career and/or educational opportunities than before I joined this program. (mean response = 4.45; median = 5.0; mode = 5.0)

f. I have expanded my scientific and professional network because of this program. (mean response = 4.50; median = 5.0; mode = 5.0)

6. **Graduates of the program will succeed in finding employment and/or further educational opportunities in their areas of interest.** Of the eighteen graduates of the BSC graduate program in 2008: eight (44%) reported having a job in their field of study; seven (39%) reported actively seeking employment; two (11%) reported having been accepted to a PhD program or professional school; and one (6%) reported no immediate plans for further education.

II. Plans for the current year.

Much of our effort in 2009 will go toward the completion of the 5 year program review for the MA and MS degrees in Biological Sciences. The departmental administration and the Graduate Program Committee will work together to review the BSC graduate program and establish the databases and data gathering tools that are required for more accurate and complete assessment of student outcomes.

III. Assistance needed.

The Office of the Department of Biological Sciences is short-handed, and requires additional help to fulfill its administrative and assessment duties. Funding for an Associate Chair has been requested.

In addition, graduate stipends are very low. The amount of the BSC graduate stipend is so low that we are in danger of not being able to recruit to the graduate program at all. Because the graduate program provides significant support for the undergraduate program, this is a problem that threatens the entire department. Furthermore, it is imperative that tuition waivers continue to be provided for all graduate students supported by the department.

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

Some data needed for an accurate assessment of progress in the BSC graduate program are still not readily available. We will make improvements in gathering and archiving assessment data during the current year.

Table 1. BSC graduate courses offered during 2008.

Course No.	Course Name	Semester	Enrollment
BSC 501	Ichthyology	Spring	7
BSC 505	Economic Botany	Spring	1
BSC 506	Herpetology	Fall	10
BSC 508	Ornithology	Spring	7
BSC 510	Remote Sensing/Geographic Information Systems Appl.	Fall	1
BSC 511	Digital Image Processing/Geographic Information Systems	Spring	1
BSC 513	Principles of Organic Evolution	Fall	3
BSC 516	Plant Taxonomy	Fall	9
BSC 517	Biostatistics	Spring	14
BSC 517	Biostatistics	Fall	5
BSC 522	Animal Physiology	Spring	11
BSC 524	Animal Parasitology	Spring	3
BSC 525	Biosystematics	Fall	7
BSC 530	Plant Ecology	Spring	3
BSC 531	Limnology	Fall	13
BSC 543	Microbial Genetics	Fall	0
BSC 545	Microbial Ecology	Spring	9
BSC 550	Molecular Biology	Fall	3
BSC 556	Genes and Development	Spring	1
BSC 560	Conservation of Forests, Soil and Wildlife	Spring	0
BSC 580	SpTp: Intermediate Biochemistry	Spring	2
BSC 580	SpTp: Biochemistry, Mass Spectrometry	Spring	1
BSC 581	SpTp: Issues in Modern Malacology	Fall	3
BSC 582	SpTp: Applied Microscopy in Research	Spring	1
BSC 582	SpTp: Intermediate Metabolism	Fall	4
BSC 585	Independent Study	Spring	12
BSC 585	Independent Study	Fall	8
BSC 620/621	Taxonomy of Vascular Plants	Spring	3
BSC 661	Graduate Seminar I	Fall	23
BSC 662	Graduate Seminar II	Spring	46
BSC 662	Graduate Seminar II	Fall	20
BSC 680	SpTp: Advanced Ornithology	Spring	1
BSC 680	SpTp: Cell Biology and Biotechnology	Fall	10
BSC 680	SpTp: Herpetology Journal Club	Fall	7
BSC 681	Thesis	Spring	33
BSC 681	Thesis	Summer 5	1
BSC 681	Thesis	Fall	23

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

Component Area/Program/Discipline MA and MS Programs in Biological Sciences **Date** January 2009

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 = 3.77. GRE data indicates positive correlation between GGPA vs. UGPA, GGPA vs. GRE Verbal score, and GGPA vs. GRE writing score. The strongest association was with the GRE Verbal score.	Data indicate that graduate peformance 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 MS 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.	Eighteen students completed a master's degree during 2008. 94% completed an acceptable thesis within 6 semesters. Data are being compiled for peer-reviewed publications.	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 3 scientific conferences during the program, and gave an average of over 5 scientific presentations in these and other venues. Composite averages in graduate seminar courses were 3.61, 3.59 and 3.35.	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	Data on peer reviewed publications is being compiled.	The Graduate Program Committee requires writing samples as part of the application for admission,

		expectations. Writing exercises also include the preparation and review of drafts. Thesis advisors work closely with students on the preparation and revision of research proposals, theses, presentation abstracts, and scientific manuscripts. Publication in peer-reviewed journals is strongly encouraged.	research. 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.	Student survey indicated lowest satisfaction with progress in writing. This outcome was not fully evaluated during this reporting period.	and is considering the use of the GRE writing score as an admission criterion. More attention is being placed on scientific writing in the BSC seminar series. BSC Assessment committee will compile a bibliography of all peer-reviewed articles with student co-authors.
5. Graduates of the program will have working knowledge of careers in their fields of interest.	Student, Faculty Advisor & Professional Mentors. 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.	Student faculty advisor and external advisors will meet to discuss professional development and evaluate the student's career goals.	All students will be able to state short-term career goals during their oral exam.	Survey evidence suggests that students are well-informed about career and educational opportunities .	Students will continue to be encouraged to join appropriate professional organizations and attend meetings. BSC will continue to use faculty networks to organize and disseminate information on employment and continued educational opportunities to students.
6. Graduates of the program will succeed in finding employment and/or further educational opportunities in their areas of interest.	Students and Faculty Advisors	Students respond to graduation survey to determine status of job and/or academic applications	90% of students seeking employment or advanced study will find suitable positions within one year of graduation.	At the time of completion of the program, 55% of graduates had either already located a job or had been accepted to a PhD or professional program. Data are not available post graduation.	The actions outlined above also apply to this goal. The Graduate Program Committee will seek further information from past graduates.