

2007-08 ASSESSMENT Annual Report for Department of Biological Sciences

- a. **Program Name** – Department of Biological Sciences
b. **Report prepared by** – Deborah Marr
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d. **Should assessment information be sent to anyone else in your department?**
- Peter Bushnell, Department Chair
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1. What are the program's educational goals?

We did not make any changes to our educational goals for 2008.

Educational goals for Biology Majors

1. Discipline specific knowledge and skills
 - mastery of a given body of biological information
 - mastery of biological techniques
 - develop skills necessary to pursue a career in any areas of the life sciences
2. Basic academic skills
 - improve writing and speaking skills
 - develop appreciation for learning in different disciplines (humanities, social sciences, and sciences)
3. Higher order thinking skills
 - develop high level cognitive thinking including observation and experimentation, collection and analysis of data, synthesis of information, and extrapolation of information and data from scientific literature
 - develop the ability to learn independently
 - develop critical thinking skills
4. Academic values
 - apply ethical principles of the discipline with regard to human and animal subjects
 - develop skills working in groups and in collaboration with colleagues
 - citizen skills?

2. What assessment techniques did the program use? (Please take assessment techniques directly from your program's assessment plan and highlight any changes made this year.)

We use four techniques to assess the Biology program (briefly explained below). In 2007, we added a senior survey and an alumni survey to our assessment techniques in order to receive more feedback from students who had completed the Biology program. The senior survey was repeated in 2008, and the alumni survey will be repeated every 3-5 years. In addition, the success of individual students is monitored through academic advising and a variety of course assignments used by faculty.

1. We use a **Capstone course** (L403) to assess a student's knowledge of biology, ability to analyze scientific literature, write a scientific review paper, and summarize those results in a formal research seminar to the faculty. All students working towards the BA and BS degree are required to take L403 in either their junior or senior year. (Provides measure of Educational Goals 1-3)

2. **Undergraduate research** - Students need research experience in order to be competitive for jobs, graduate school, and pre-professional programs. Independent research projects are required in some upper level labs (in courses such as L308, L391, L474, and L490), and students can participate in research with faculty. Undergraduate grants, fellowships, and acceptance of abstracts to professional meetings provide an external measure of student achievement and quality of undergraduate research (Conference abstracts, grants, and fellowships are evaluated by faculty outside of the Biology department). Examples of external reviewers who have reviewed our students' work this past year include IU-South Bend SMART committee, Midwest Ecology and Evolution Association, and American Society of Microbiology (Provides measure of Educational Goals 1-4)
3. **Senior survey** - The survey was given to all students taking the Capstone course, and a summary is reported in Table 1. (Provides measure of Educational Goals 1-4)
4. **Alumni survey** - The purpose of this survey was to see what types of jobs our majors are getting, and receive feedback on how to better prepare our graduates for jobs and post-baccalaureate education. The alumni survey was sent out in 2007, and will be repeated in 2010 (every 3-5 years) so that each graduate is surveyed twice. (Provides measure of Educational Goals 1-4)

In addition, the progress of each biology major and individual course assessment is informally assessed through advising and courses developed by each faculty member.

Entry-level assessment and Student Advising is used to ensure that students have the skills necessary to succeed in introductory-level and upper-level classes. Prerequisites are strictly enforced for our courses. We assume that certain skills and information are obtained in specified prerequisite classes (chemistry, math, introductory biology or upper level courses, etc.), and we examine the grades students receive before advancing them through the curriculum. All first-year Biology and pre-professional students are advised by Biology faculty at Student Orientation, and 95% of our majors are advised each semester.

Faculty use multiple **Course assessment** tools to measure student mastery of material and skills. Assessment techniques include graded homework, quizzes, midterm exams, final exams, lab practicals, laboratory reports, scientific review papers, and analysis of primary literature. Each faculty member designs the assignments appropriate for his/her course, but we periodically have discussions (department meetings and informal discussions) to coordinate courses and ensure that students have the opportunity to develop a variety of skills.

3. What has your program done with assessment information this year? (i.e. communicated results to faculty, staff, alumni and students, made changes in the curriculum, made changes in the budget, added new courses. . .)

Summary of Assessment Results

Senior Capstone Course (BIOL L403)

Students performed as well as expected in the Senior capstone course (BIOL L403). One of the recommendations from the 2007 alumni survey was to provide better career mentoring and more information on a broad range of life science career options to undergraduates. To address this suggestion, an assignment to write a resume and cover letter was added to the senior seminar course. In addition, a discussion of the career center resources was provided at the beginning of the course, and students were encouraged to attend interview workshops and resume workshops. The department is continuing to discuss ways to help students explore career options earlier in their undergraduate career.

Undergraduate Research

In general, students who participated in undergraduate research did well as measured by their participation in research conferences and as co-authors on publications. A total of 19 IUSB Biology majors did independent research projects in 2007-08 (Summer, Fall, Spring) mentored by Clark, Grens, Marr, McLister, Mecklenburg, Pope, Qian, and Schnabel. Nine of these students did research for L490 credit (total of 16 credit hours of L490), five students were supported by an NSF grant to A. Schnabel. Seven students were involved in research conference presentations and six students were co-authors (or authors) on publications.

GRANTS AWARDED TO UNDERGRADUATES:

Three students received SMART travel grants to attend conferences.

One student received an American Society of Microbiology Travel Award to present at ASM in June 2007 (mentored by Qian).

PRESENTATIONS (undergraduates indicated in caps):

BAKER B, JODWAY T, Qian Y (2007) "Cloning and Expression of a bifunctional glucosidase/xylosidase from *Bifidobacterium scardovii*." Annual Meeting of American Society for Microbiology, May 2007, Toronto, Canada (Poster)

BOROWSKI B, Qian Y (2008) "Intracellular granule formation, acid tolerance and cell surface hydrophobicity in *Bifidobacterium scardovii* under different growth conditions." Annual Meeting of American Society for Microbiology, May 2008, Boston, MA (Poster)

DULEH S, Pope R (2007) "Cloning and Analysis of Zebrafish (*Danio rerio*) Supervilin." American Society for Cell Biology Annual Meeting, December 2007. Washington, D.C. (Poster)

FOUTCH BR, Otero-Arnaiz A, Ruiz-Guajardo JC, Schnabel A. "Does presence of staminodes affect insect visitation to *Commelina reptans*?" Annual meeting of the Botanical Society of America, July 2007, Chicago, IL. (Talk)

FOUTCH BR, Schnabel A, DELAPAZ A. "Interspecific variation of selfing rates in a population of *Hibiscus aponeurus* and *Hibiscus flavifolius*." 28th Annual Midwest Ecology and Evolution Conference, March 2008, Ohio University, Athens, OH. (Foutch received a SMART Travel Grant for this.) (Talk)

Marr D, Schnabel A, ORR S. "How closely do restored prairies mimic community composition of remnant prairies?" Annual meeting of the Ecological Society of America, August 2007, San Jose, CA.

PUBLICATIONS (names of undergraduate authors indicated in Capital letters):

Clark TM, VIEIRA M, HUEGEL KL, FLURY D, CARPER M. (2007) Strategies for regulation of hemolymph pH in acidic and alkaline water by the larval mosquito *Aedes aegypti* (L.) (Diptera; Culicidae). *Journal of Experimental Biology*, **210**, 4359-4367.

HUNTINGTON D (2008) Small mammal species and diversity in Potato Creek State Park. *Indiana University South Bend Undergraduate Research Journal*, **8**, 7-15. (Mentor: McLister)

Ruiz-Guajardo JC, Otero-Arnaiz A, TAYLOR T, Stone G, Glenn TC, Schable NA, Miller JT, Preuss S, Schnabel A (2007) Isolation of polymorphic microsatellite markers in the sub-Saharan tree, *Acacia (Senegalia) mellifera* (Fabaceae: Mimosoideae). *Molecular Ecology Notes*, **7**, 1138-1140 (doi:10.1111/j.1471-8286.2007.01809.x)

Senior Survey

A summary of how students ranked their mastery of each educational goal is shown in Table 1. The majority of students (75%) felt they had mastered Discipline specific knowledge and skills “quite well” or higher. In contrast to the 2007 survey, the academic values (ethical principles, collaboration, and citizenship skills) all received high marks. All of the students chose “1 = fully achieved ranking” for confidence working in groups and in collaboration with colleagues.

Similar to the 2007 survey, aspects of the Biology program that students ranked highest were accessibility of faculty, small class size, the recent addition of new upper-level majors courses, and opportunity to do research. One common comment was that students would like to have more upper-level majors courses offered every year, rather than every other year, because it was difficult to fit some electives into their schedules. Unfortunately, at the current time, this suggestion is difficult to implement due to budget constraints and the smaller enrollment of upper-level courses. Several students commented that a statistics course designed for Biology majors would be helpful. A Biostatistics course was added in Fall 2007, so this should address the concern about training in statistics. Students also commented that more encouragement from professors on the range of career options available to Biology graduates would be helpful.

Table 1. Results of 2008 survey of Senior Biology students. Each student was asked to rank how well he or she had mastered departmental learning goals; 4 of 7 students completed the survey. The scale was 1 = fully mastered, 2 = quite well, 3 = average, 4 = below average.

Educational Goals	Mean (± 1 standard deviation)
A. Discipline specific knowledge and skills	
Mastery of biological concepts	2.25 (0.50)
Mastery of biological techniques	1.75 (0.96)
Developed skills necessary to pursue career in life sciences	1.75 (0.96)
B. Basic academic skills	
Developed writing and speaking skills necessary to communicate effectively	1.50 (0.58)
Developed appreciation for learning in different disciplines	1.25 (0.50)
C. Higher order thinking skills	
Developed high level cognitive thinking (including observation and experimentation, collection and analysis of data, synthesis of information, and ability to understand and interpret information and data from scientific literature)	1.50 (1.0)
Developed the ability to learn independently	1.50 (0.58)
Developed skills to think critically about scientific information and issues	1.50 (1.0)
D. Academic values in biology and general education	
Awareness of the importance of ethical principles in academics and in biology	1.50 (0.58)
Developed skills at working in groups and in collaboration with Colleagues	1.00 (0.0)
Improved citizenship skills (e.g. participating in community events, government)	1.25 (0.50)

4. After reflecting on assessment activities in your unit, as a result of assessment what are two issues you would like to address?

Two issues that we would like to address next year include

(1) Discuss ways to improve our mentoring of students for a range of careers earlier in the undergraduate experience.

- Make internship and research opportunities more widely known to students early in their undergraduate careers through Bio-Chem Club and announcements in courses.
- Continue to encourage students to talk to their professors about their career goals and make them aware of the Career Center Services.
- Share some of the comments made by alumni on their work experience with Introductory Biology students.

(2) Discuss ways to increase internship and research opportunities for students.

Similar to the 2007 senior survey, the 2008 survey showed that students felt independent research was one of the most valuable experiences that prepared them for their job or post-baccalaureate program. Although it is clear that students benefit from these experiences, we do not have the resources required to provide individualized independent research opportunities to all students. Faculty research space is limited (mentoring more than 2 students/semester doing lab research is difficult due to limited lab space). In addition, there is currently no mechanism for receiving teaching credit, and monetary support for undergraduate research is limited to grants written by faculty or students. Finding ways to increase the number of students who can participate in research or internships (without burning out the faculty) will strengthen the Biology program. One model that we will be trying in Spring 2009 is an L490 course taught as a 3-credit course in which students will be assigned specific research questions and work in small teams to do this research.

The Department received a National Science Foundation equipment grant in 2007 to purchase a DNA sequencer (grant awarded to Schnabel and Mecklenburg). This provides a wonderful training opportunity for our students. Five faculty members are currently using the DNA sequencer in their research, and several faculty are working to include DNA sequencing as part of their lab courses.

APPENDIX 1

Survey for Seniors (Spring 2008)

Department of Biological Sciences - Indiana University South Bend

Congratulations – you are about to graduate! We hope that you have had some time to reflect on your education at IU-South Bend, and would greatly appreciate your feedback on several aspects of the Biology program as we continue to seek ways to strengthen the program and the success of future IUSB biology majors.

1. What year did you start the program? _____
2. If you transferred to IU-South Bend, what school did you transfer from? _____
3. What Biology courses have you taken at IUSB? _____

4. The departmental learning goals are listed below.

For each item, please mark how well you believe you have achieved each goal.

	1 = fully	2 = quite well	3 = average	4 = below average
A. Discipline specific knowledge and skills				
Mastery of biological concepts				
Mastery of biological techniques				
Developed skills necessary to pursue a life sciences career				
Comments:				
B. Basic academic skills				
Developed writing and speaking skills necessary to communicate effectively				
Developed appreciation for learning in different disciplines (humanities, social sciences, and sciences)				
Comments:				
C. Higher order thinking skills				
Developed high level cognitive thinking including observation and experimentation, collection and analysis of data, synthesis of information, and ability to understand and interpret information and data from scientific literature				
Developed the ability to learn independently				
Developed skills to think critically about scientific information and issues				
Comments:				
D. Academic values (in discipline and general education at IU-South Bend)				
Awareness of the importance of ethical principles in academics and in biology				
Developed skills at working in groups and in collaboration with colleagues				
Improved citizenship skills (e.g., participating in community events, government)				
Comments				

5. What aspects of your education and/or experiences with faculty helped you achieve these goals?

6. What suggestions do you have for ways the department could better help a student achieve these goals?