Institutional Effectiveness (IE) Report

Academic Year 2011-2012
Department of Biology

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Contents

Mission and Goals

The Department of Biology has seven core goals to support the mission of the Francis Marion University (FMU):

1) To provide all baccalaureate degree students with proficiency in the use of scientific methods in a particular discipline, including the ability to understand the core concepts and the expertise to apply the core methodologies of that discipline.

2) To offer programs of study that encourage students to think critically and creatively and to acquire the ability to access information.

3) To emphasize an individualized approach to education through personalized attention to academic advising and career development and to develop skills for more advanced study in professional or graduate schools.

4) To provide a learning-centered environment.

5) To support scholarly pursuits by students and faculty and promote academic development and intellectual stimulation.

6) To render academic assistance to regional schools and other organizations and build a more culturally enriched region

7) To engage in continuous evaluation of all its activities in order to improve quality and efficiency and to place the highest priority on excellence in teaching and learning.

Assessment Activities

<u>Faculty Academic Development (Scholarly Activities and Continuing Education):</u>

We divide academic development into four categories of scholarly activities and one combined category of continuing education. The questionnaire shown below was used to assess the extent to which members of the biology department are involved in academic development. Question 1, 2, 3 and 4 address the scholarly activities categories. Questions 5 and 6 together address continuing education. Scholarly activities and continuing education may sometimes overlap. Category results are listed in the Assessment Activities Results section under <u>Faculty Academic</u>

Development (Scholarly Activities and Continuing Education).

1) Are you (or have you been) involved in a research project during this current academic year? Please list your projects and indicate whether they are new or continuing.

2) Are you a member of a professional society? Please list the relevant professional organizations to which you belong and indicate your level of activity.

3) Have you published any articles during this current academic year? Please list all publications and indicate whether they are peer-reviewed or not.

4) Have you made any presentations to professional groups in the current academic year? Please list the title and date of presentation.

5) Have you attended workshops, seminars, conferences etc. or taken a course to further your professional development this year? Please list those attended.

6) In the current academic year, have you engaged in discipline related self-study equivalent to a short course, seminar or workshop? Briefly explain.

Benchmark: 90 % of the full-time, biology faculty members do participate in at least 2 of the categories of academic development or 80% of the faculty do participate in at least 3 of the categories.

Faculty Community Service:

The extent of biology faculty participation in community service is assessed by gathering information from each faculty member's annual report or from a questionnaire. Community service by biology faculty members have included many different kinds of activities such as participation in departmental and university committees, professional assistance to area schools and other local educational organizations, and service to statewide and regional scientific/educational organizations among others.

Benchmark: None this year. Benchmark is under re-evaluation.

Teaching Effectiveness and Student Ratings of Instructors:

Through the use of a campus-wide questionnaire, students rated instructors and courses at the end of each semester. There were thirteen questions addressing specific issue such as the ability to present materials clearly, ability to improve understanding of the subject, overall grading fairness in the course, etc. The rating scale was 1 = excellent, 2 = good, 3 = fair, 4 = poor.

Benchmark: 2.0 average on a scale of 1 to 4. A student's response to this questionnaire (or any other type of student evaluation of a faculty's teaching effectiveness) probably is a reasonably accurate indicator of how satisfied a student is with the instructor and the course. Are these responses or ratings truly a measure of teaching effectiveness? Do high ratings really indicate that meaningful learning took place? These are controversial questions and issues. Some instructors assume that a rating of 1 (i.e.," excellent") given by students indicate excellence in teaching. Others believe that most students lack the necessary experience, and therefore degree of understanding required to assess teaching effectiveness. A rating of 1 may instead be more of an indication that the course was easy or personally interesting to the student. Which among these (or other interpretations) is the most correct is an open question. Given the fact that experts in education research struggle with questions about what is effective teaching, as well as how to assess it, we more or less have arbitrarily decided that a 2.0 is a reasonable rating to choose as a benchmark with the understanding that lower or higher numbers may not necessarily indicate a "better" or "worse" performance by the instructor.

Assessment of General Education Requirements:

The Department of Biology offers courses that students can take to meet science-related goals of general education. In particular, our courses provide students with the opportunity to meet the following two goals:

1) The student will be able to apply scientific principles to reach conclusions.

2) The student will have an understanding of the natural world.

We teach four course (Biology 103, 104, 105 and 106) in which significant numbers of non-majors are enrolled for the purpose of meeting these two general education goals. To carry out an assessment of the student's success in meeting these goals, a course-specific cumulative quiz is given in the laboratory sections of usually two or more of these courses during the end of either Fall or Spring semester or both semesters. The quizzes are multiple-choice in format and designed to test the student's knowledge of biology and their ability to interpret data and reach conclusions. The average quiz score of the combined sections of each course and simple statistical parameters of the quiz results are calculated and tabulated by Academic Computer

Services.

Benchmark: Students are expected to achieve a score of 60% or higher. We regard the mean percent score of the quiz results of the laboratory sections of these courses to be a reasonable numerical assessment indicator of student-success in meeting the two science-related general education goals listed above.

Application of Technology:

Information about submissions and awards of grants potentially, or actually, resulting in the acquisition of equipment and software to improve teaching and research were gathered from the biology faculty. Information regarding current use of technology in the classroom was also gathered. However, because the use of technology in our classroom and labs is so diverse, categorization and quantitative analysis were not done. Similarly, we have elected not to report all the classroom and lab applications of technology currently in place.

Benchmark: None established because it is not practical to do so.

Support of Student Activities (Biology Student Organizations, Conferences, and Other Activities:

Various data regarding student activities are collected each year. These data usually include such things as level of participation and types of activities conducted by our student clubs, Ars Medica, Tri Beta, and the Ecology Club; seminar talks or other extracurricular presentations delivered by students; as well information about conferences that they may have attended.

Benchmark: 30 % of majors are members of biology student organizations. Benchmark have not established for the degree of student participation in conferences and other activities.

External Assessment Test:

The ETS Major Field Test in Biology was administered to the graduating or near-graduating seniors enrolled in our capstone course (Senior Seminar) during Spring semester 2008.

Benchmark: We have not established a quantitative benchmark for the ETS Major Field Test in Biology

Laboratory Skills Assessment:

A survey is conducted to determine the extent to which eight basic categories of necessary skills are taught. This information is used to assess the level and types of learning opportunities offered to students that support their development of skills in the use of scientific methods. The categories of skills are as follows:

1) Experiment design
2) Laboratory techniques
3) Lab data collection
4) Field data collection
5) Quantitative analysis of data
6) Data interpretation
7) Scientific report writing
8) Use of microprocessor technology

Benchmark: Students in the biology program will have the opportunity to learn at least three laboratory or field methods within each of the eight categories of skills.

Assessment Activities Results

<u>Faculty Academic Development (Scholarly Activities and Continuing Education)</u>:

Participation Levels in Scholarly Activities:

86% of respondents (14 faculty members) were actively involved in a research project during the year (50% reported involvement in 3 or more projects).

86% of respondents participated in professional societies.

42% reported publishing articles. (more than half were peer-reviewed papers)

50% respondents gave at least one professional presentation.

Participation Level in Continuing Education:

71% of the respondents attended at least one professional meeting, conference or workshop.

At least 14% were in involved in self-taught activities and learning outside of workshops, seminars, or courses, such as learning new lab techniques, new data analysis methods, and readings to further their knowledge in science beyond their immediate research specialty.

Evaluation of Academic Development:

The majority of the biology faculty participated in 3 out of the 6 categories (listed above) of academic development. We broadly define academic development as scholarly activities and continuing education. Our benchmark that 80 % of the full-time, biology faculty members will have participated in 3 of the categories of academic development (or 90% in 2 of the categories) was not met this year. However, we came pretty close to the alternative benchmark that 90% will have participated in 2 categories.

Much of the research conducted by members of the biology faculty does involve participation of students. This greatly increases individual attention given to students and significantly increases the teaching load of instructors to more than 18 contact hours per week (9 to 12 contact hours is the normal contracted teaching load). This year 20 students were involved in research projects through our directed/independent study, internship or honors thesis courses (Biol 497, 498, Biol 491-499 or Women and Minorities in Science program). Nine members of our department mentored these students.

Collaborations between our biology faculty and scientists from other colleges and universities are notable. In mammalian surveys and targeted ecological studies in Ecuador, members of our department played key roles in a multi-institutional partnership of faculty, students, and conservation professionals. Participating institutions were the University of North Carolina, Wilmington, Pontificia Universidad Católica del Ecuador, Wildsumaco Wildlife Sanctuary S.A. (Ecuador), and Francis Marion University (lead academic partner). The Wildsumaco Biological Station is a newly constructed facility located at the Wildsumaco Wildlife Sanctuary in Ecuador. The academic and research programs at the station are directed by a member of our department.

Furthermore, some members of our department are involved in writing grant proposals, which we do not document quantitatively but agree are very important. Proposals are submitted to on-campus funding committees yearly and have been awarded on a regular basis each year. From time to time members of our department have submitted, and were awarded, major grant proposals from external granting agencies. Most notable are 1) the Math and Science Partnership grant, which supports hands-on lab experiences for high school and middle school teachers who earn graduate credit upon completion of the course, and 2) a $1.5 million SC INBRE grant that was awarded to three of our faculty members in September 2010. Both of these have been renewed for the 2011 – 2012 academic year.

Some members of our department are involved in service oriented professional activities such as: 1) Regional Coordinator for USGS North American Amphibian Monitoring Program, 2) General Secretary of Consortium of South Carolina Herbaria, 3) Judges of papers at the South Carolina Academy of Sciences, 4) leading a delegation to Ecuador in March, 2012 for a dedication / ribbon-cutting ceremony at Francis Marion's new Wildsumaco Biological Station, and 5) Director of Academic and Research Programs at Wildsumaco Biological Station.

In addition, one member has published a 368 page book (Can a Christian be an Evolutionist?) which rationally discusses the biblical feasibility of Evolutionary Creationism, including scientific and theological perspectives.

Listed below are some examples of the wide-variety of ongoing research projects conducted this academic year by our faculty:

- Studies on over-expression of Acid Ceramidase in prostate cancer cells
- Pine-barrens tree frog genetic
- Herpetology survey of Sumaco Ecuador
- Cloning the cDNA of the putative member of the p53 superfamily in D. pulex.
- Cloning the promoter putative member of the p53 superfamily in D. pulex
- Survey of the flora of Sandhills State Forest.
- Potential effects of an invasive zooplankton, *Daphnia lumholtzi*, on South Carolina lakes

- DNA damage repair in Daphnia

- Radio-telemetry study of snakes in wetland areas

- Amphibian and reptile diversity and succession of disturbed habitats in the Pee Dee

- Community ecology of lotic larval midges in the Lynches River

- Mammal inventory, flagship species, and conservation in Ecuador's tropical Andes and foothills

- In vitro transcription using fluorescently-labeled nucleotides

FMU is primarily an undergraduate teaching institution and in our department nearly all courses and labs above the freshmen level are prepared and taught by faculty alone without the aid of student assistants. Given this and our relatively high teaching load, we are satisfied with the quality and quantity of scholarly activities that we have achieved this academic year. We will attempt to continue equivalent or greater efforts in the future as well.

Faculty Community Service:

We did not collect quantitative data on community service activities this year. However, a variety community service activities were reported, such as judging science fairs, performing bird and amphibians counts for conservation groups, talks given to garden clubs, teaching Merit badge classes, displaying insects and snakes at fairs, and assisting with SC Envirothon.

Evaluation of Service Activities:

Most members of the biology faculty have participated in service activities at Francis Marion University. Currently there is no benchmark. A decrease in community service activities might have occurred over the last few years. But this seems to be correlated with an increase in research/scholarly activities. In any event, given our high level of participation in scholarly activities, as described above, our relatively heavy teaching load, we are satisfied with the quality and level of our participation in community services, which we hope to continue at a reasonable level in the future.

Teaching Effectiveness and Student Ratings of Instructors:

The students gave most biology instructors and their courses a rating between 1.0 (excellent) and 2.0 (good) for all categories of evaluation. Spring 2012 Student's evaluations (pages 1, 3, and 4 only) are appended at the end of this report as examples. Page 3 could not be printed because of technical difficulties. Fall 2011 evaluations were very similar.

Evaluation of Teaching Effectiveness:

Overall we received ratings that are considered very high (close to excellent). But we realize that these ratings only reflect the student's degree of satisfaction with the instructor and the course, or their perception of teaching effectiveness. Furthermore, we acknowledge that there is no agreement among us (and the academic community at large) about the degree to which student evaluations of instructors truly represent an instructor's teaching effectiveness in the classroom or laboratory. We also feel that there is no consensus among the community of college biology educators at large as to what constitutes effective teaching and how to meaningfully measure it.

Because all of us were students, and have experience in scientific research, and are college-level teachers, and continue to develop professionally, we have a pretty clear understanding of the nature and level of scientific knowledge and problem-solving skills students with baccalaureate degrees must have in order to successfully achieve further training in graduate/professional programs and then succeed beyond that. We probably have a lesser understanding of the knowledge level and problem-solving skills required in the wide variety of workplaces where baccalaureate degree students find employment. But we do know that even at the most rudimentary level scientific knowledge and problem-solving skills are not easily mastered. Furthermore, skilled laboratory technicians in research labs and good science teachers in high schools, for example, do not, and should not, consider themselves to be laypersons in science or with regard to their jobs.

The following issues and questions are often discussed among members of our department in our attempts to find some universal direction that would lead to better teaching:

1) Should we, especially in a major's course, teach in a style and academic level that probably will alienate unwilling students, many of which probably will fail, in order to challenge students who are willing to learn to their fullest potential? In this case, it seems likely that our students with the best attitudes about learning will learn a great deal more than if taught otherwise and will be well prepared for the workplace and for graduate/professional training. However, this probably will represent less than 20 percent of the students.

2) Instead, should we, in hopes of engaging a large majority of students, even in a major's course, try to teach in a style more comfortable to those students wanting or willing only to achieve a layperson's understanding of science? Perhaps no student will feel estranged and many will be engaged in learning at a level akin to a National Geographic Science documentary. In this case, it is likely that most students will be satisfied, but won't have achieved the level of knowledge and skill required for the workplace or for graduate/professional training programs. Many most likely won't even be aware of this deficit. Also many high achievers, who are willing to accept the challenges and responsibilities to learn at a more proficient level, may not do so on their own when not required, or when guidance is not provided in that direction.

3) Can we teach effectively with a style and level more in the middle ground? This may on the surface seem like a solution. But depending upon the level of

preparedness of the students entering college, which varies widely among different universities, what may seem to be an intermediate teaching style and level to a college professor may still be far too demanding for the majority of students. Consequently, instructors who primarily take this approach might rely far too heavily on the course evaluations when making decisions about course content and depth.

4) Should student performance (GPA and/or standardized exit exam results, for example) dictate the teaching style and level of expectation?

5) Does a high GPA indicate meaningful learning? What about high test scores on standardized tests--do they?

6) What do we do when GPA and performance on standardized test are inconsistent? Should we challenge students with greater expectations so they hopefully will achieve higher standardized test scores? Will this lower their GPA and result in more failing grades (some instructors are convinced that it will), but raise the average scores on exit exams? Will this lower graduation rates; and if so, is it a necessary consequence of a solution that might work? Or do we simply develop a teaching style that results in high student ratings of faculty on the assumption that what we are teaching effectively when the students are satisfied?

7) Is there a way to convert non-willing students into students willing to learn above the layperson's level so that they will be prepared for the work place or further training?

8) Is it possible to stimulate student interest in the subject matter without bringing it down too much to a layperson's level in the style of delivery, content, and learning expectations?

9) Does the linear way of presenting information, such as typically done in PowerPoint presentations, lend itself well to explaining interacting components of complex processes?

10) The design and relationships of biological structures, processes, and the interactions of organisms with their environment are complex phenomena that pose major learning challenges. Students often express the desire to somehow learn biology without having to learn these difficult things. Can we somehow convince our students that fascination or interest in the beauty or complexity of an organism is just the starting point of a new adventure and only scratches the surface of meaningful knowledge about biology, and that understanding what lie beneath requires intelligence and hard work?

11) Can we somehow convince students that a willingness to learn difficult concepts and principles is a choice that they have to make if they want to understand biology and be prepared for the next phase of their educational or professional development?

12) Do we over-simplify teaching biology to the point where it is closer to a layperson's level of understanding--that is, at far less depth than what is described and explained in the textbooks that are required for the courses? If so, is this appropriate? Do we have doable alternatives?

13) What areas of biology should we offer courses in? Which courses should be core courses and which should be electives?

14) What skills should they learn in the laboratory and in the field?

With the exception of question 13) and 14), we struggle with what seems to be an endless number of questions with no clear-cut answers. For nearly all of these issues and questions, there are no widely accepted models to serve as possible solutions. We have met our benchmark, but because of these unanswered questions, we are *not* confident that this or other teaching effectiveness benchmarks have convincing value. As always, we strive to improve our teaching effectiveness. But the changes that we make to improve our teaching are, for the most part, based on instinct and anecdotal evidence garnered from our diverse experiences and trial and error. It is also guided by the tradition of academic freedom.

Assessment of General Education Requirements:

Listed below are the results and other relevant information about the cumulative quiz given during the end Spring semester of 2012 in six lab sections of Biol 103. Biol 103 is designed for non-majors, and it meets the general education science requirements for our students. This quiz was given for the purpose of assessing how successful the students were in meeting the two science-related goals of general education:

1) The student will be able to apply scientific principles to reach conclusions.

2) The student will have an understanding of the natural world.

Approximately 120 students were tested among 6 lab sections.

Environmental Biology (Biol 103) General Education Assessment Quiz Results:

- Mean percentage score was 62.55 with a standard deviation of 2.02 from the mean score of 7.51 out of 12.0 total points.

Evaluation of Student Success in Meeting General Education Goals:

The mean percentage score of the laboratory sections combined for Biol 103 was above our benchmark of 60 %. This score was not significantly different than scores of years past. To the best of our knowledge, there are no reliable and widely accepted quantitative benchmarks that we can use as references. Consequently, our benchmark was chosen somewhat arbitrarily.

Because inclusion of a pre-test is more expensive and time-consuming, we have elected to give one test (a cumulative quiz) only at the end of the semester. Pre- and post-testing using similar quizzes in the past have revealed that the mean score of our students typically is around 40 % on pre-tests and 60 to 70 % on post-tests. Consequently, we made the assumption that the mean score of our students would have been approximately 40 % on pre-tests had they been tested at the beginning of the course. The students met the benchmark of 60 % on the cumulative quiz, and we feel that a score of 60% indicates that at least a minimally significant degree of learning had occurred.

Application of Technology:

Most Notable New Application of Technology

Major new acquisitions and installations of equipment and technology were not reported this year by members of our department. A great deal of our acquisitions and installations of new technology occurred during the previous 5 years. Currently those technologies are meeting our needs satisfactorily.

As mentioned in the ***Assessment Methods*** section, categorization and quantitative analysis were not done because the diversity of technological applications implemented within our department is extensive and not amenable to analysis.

Given our high level of participation in scholarly activities, community service, and our relatively heavy teaching load, we are satisfied with the quality and level of our "grantsmanship" in acquiring information technology and modern lab equipment to enhance laboratory and classroom teaching as well as faculty and student research. We are also very satisfied with quality and level of applying technology in labs and classrooms. We plan to continue an equivalent level of activity in the future, especially with regard to system updates and acquisition of new and useful technology.

Support of Student Activities (Research, Conferences, and Other Activities):

Research:

Twenty students were involved in research projects mentored by 9 faculty members in our department.

Attendance at Conferences:

Six students reported research results at professional conferences. Eight students presented their research project results at our PURE symposium, an annual departmental event.

Club activites:

Quantitative data was not gathered this year on student club activities. However, as in the past, guest speakers representing professionals in biology, health related careers, medical, dental and graduate schools, gave presentations to ARS Medica (our health careers-related student organization) and these sessions were well attended by students. Student participation in Tri Beta was also significant.

Evaluation of Support for Student Activities:

We do not have a quantitative benchmark for evaluating the level and quality of support we provide for student activities. Practical and logistical difficulties are encountered when attempting to establish such a benchmark. Our evaluation is primarily based on anecdotal and common sense observations. Nevertheless, we are more than satisfied with the level and quality of support that we provide.

External Assessment Test:

ETS Major Field Test in Biology was not conducted this year.

Issues of Concern and Actions Taken:

Issues of Concern 2011-2012	Actions Taken
Hire replacement faculty to replace 3 tenure track faculty no longer in our department who taught physiology.	Two new tenure-track positions were filled to teach physiology. Candidates for the 3rd position are being interviewed in June and July of 2012.
Enhance field biology teaching	Faculty and students have improved the quality of our Windham Environmental Center as a place for ecological education/restoration. Young native trees were restored and exotic woody plants were removed.
External assessment test (ETS Major Field Test) results are too low.	A committee will be appointed to study this problem. Action on this matter is still pending as of 2011-2012.

Laboratory Skills Assessment 2010-2011

Appended to this report in detail of the laboratory skills taught by instructors and used by students in the Biology Department. We feel that there are eight basic categories of skills necessary for a biologist to master. Within these categories there are many skills taught depending on the course and instructor. For each of the eight basic categories, the courses are split into "Required Courses" and "Elective Courses." Within the "Required Courses" grouping, all listed sections of these required courses guarantee the instruction and use of the listed skills. Additionally, however, several courses are listed in this category that are options that fill a basic requirement of the degree, such as a botany or ecology course. Not every student will take each of these courses. "Elective Courses" listed are courses that majors will take, fulfilling the requirement of taking two elective courses. Not every student will take each of these courses. Additionally, all non-major courses are listed in this section.

Laboratory Skills Assessment 2011-2012

Required Courses (*guaranteed for all sections of each course taught this year*)

Department	Course	Professor	Term	1. Experimental Design Comments	2.Laboratory Techniques Comments
Biology	115	All professors	Sum., Fall, Spring	Lab on scientific method and experimental design, Students write lab reports emphasizing the scientific method.	Microscopy, Mass and volume measurements, Gel electrophoresis, Colorimetric chemical assays, DNA isolation, Bacterial transformation.
Biology	106	All professors	Sum., Fall, Spring	Design experiments with flatworms, Betta fish and Pill bugs	Sterile technique (Gram staining), Microscopy, Dissection, Animal behavior analysis.
Biology	206	Long	Fall		Dissecting scopes, taxonomic keys.
Biology	207	Long	Spring		Dissecting scopes.
Biology	301	Slone, Shannon	Sum., Fall, Spring	Design experiments to characterize earthworm blood.	Microscopy, Differential Centrifugation, Gel electrophoresis of proteins. (Slone only) Detergent/aqueous phase partitioning. (Shannon only) Western blotting.
Biology	302	Bauer	Fall		Protein expression during early development in *Drosophila* and oogenesis in chicken, eye pigment production in *Drosophila*.
Biology	303	Long	Not Offered		Compound and dissecting microscopes to learn histological and reproductive details of plants.
Biology	308	Rae	Summer, Fall		
Biology	310	Stroup	Fall, Spring		
Biology	313	Long	Spring (alternate)		Compound and dissecting microscopes.
Biology	401	Bauer, Camper	Sum., Fall, Spring	Dihybrid crosses of *Drosophila*.	PCR, Gel electrophoresis, Restriction digests, DNA fingerprinting, Transformation, Plating, Plasmid DNA isolation.
Biology	402	Steinmetz	Fall	Design independent projects.	
Biology	407	McCumber	Spring	Scientific method, Use of controls.	IEP, Ouchterlony, RIA, RID, ELISA, Cytology, Precipitation, Agglutination, Western, Northern & Southern gels, Gel Filtration, Ion exchange.
Biology	411	Rae	Spring	Design Field and Laboratory Studies.	Grow duckweed.

Elective Courses (*also for unique sections of core courses & non-major cou*rses)

Department	Course	Professor	Term	1. Experimental Design Comments	2.Laboratory Techniques Comments
Biology	103	All professors	Spring	Lab on scientific method & experimental design, Water pollution & LD50, Plant transpiration.	Pasco Probes, Serial dilutions.
Biology	104	All professors	Fall	Two labs on scientific method experimental design, and analytical methods. Students write lab reports emphasizing the scientific method.	DNA isolation, DNA fingerprinting, Dissection, Use of microscope. Electrophoresis. Calorimetry and enzyme kinetics.
Biology	201	Rae	Fall		Dissect invertebrates.
Biology	202	Steinmetz	Spring	Design field studies.	
Biology	204	Stoeckmann	Spring		
Biology	205	Barbeau, Stoeckmann	Sum, Fall, Spring		Dissection.
Biology	210	Knowles	Fall		
Biology	236	Turner, Wrighten	Fall, Spring	Scientific Method, Use of controls	Digital data collection, Blood pressure, EKG, Electrophoresis, Pulmonary function, Urinalysis. Blood glucose monitoring. Pipetting, Dilutions & concentrations, Statistical analysis.
Biology	305	Krebs	Spring		
Biology	311	McCumber, Pryor	Summer, Fall, Spring	Scientific method, Use of controls.	Sterile technique – Loops & pipettes, Agar streak plates, Serial dilution, Heat resistance, Autoclave, Pasteurization, Coliform tests, Biochemical testing, MPN analysis, Staining techniques.
Biology	312	Camper	Spring		
Biology	406	Malaiyandi, Eaton, Turner	Fall, Spring, Summer	All students complete a lab research project which includes developing a hypothesis and testing the hypothesis (E.g. by collection and analysis of data).	Digital data collection, Blood pressure, EKG, Electrophoresis, Pulmonary function, Urinalysis. Blood glucose monitoring. Pipetting, Dilutions & concentrations, Statistical analysis.

Laboratory Skills Assessment 2011-2012

Required Courses (*guaranteed for all sections of each course taught this year*)

Department	Course	Professor	Term	3. Lab Data Collection Comments	4. Field Data Collection Comments
Biology	115	All professors	Sum., Fall, Spring	Every lab exercise involves observation and data collection to some extent.	
Biology	106	All professors	Sum., Fall, Spring	Data collection in these experiments: fungal growth, *Planaria* and earthworm response to stimuli, Potometer experiment, Pillbug taxis, *Betta*agonistic behavior.	Quadrat sampling and Biodiversity comparison.
Biology	206	Long	Fall		Collected & identified specimens from the field.
Biology	207	Long	Spring		Collected & identified specimens from the field.
Biology	301	Slone, Shannon	Sum., Fall, Spring	Protein gel electrophoresis. Western blotting. (Slone only) Biological Image Capture; Investigative project on earthworm blood.	
Biology	302	Bauer	Fall		
Biology	303	Long	Not Offered		
Biology	308	Rae	Summer, Fall		Collect water chemistry and organisms.
Biology	310	Stroup	Fall, Spring		
Biology	313	Long	Spring		
Biology	401	Bauer, Camper	Sum., Fall, Spring	Dihybrid crosses of *Drosophila*. Monohybrid, test crosses and dihybrid crosses in corn [chi square].	
Biology	402	Steinmetz	Fall	Data collection in numerous lab activities and forest survey, squirrel forging, plant competion, herpetological survey, independent project, long leaf survey.	Plant & animal sampling.
Biology	407	McCumber	Spring	Gathering, analysis, & presentation of data.	
Biology	411	Rae	Spring	Collect survivorship data and duckweed growth data.	Class projects.

Elective Courses (*also for unique sections of core courses & non-major courses*)

Department	Course	Professor	Term	3. Lab Data Collection Comments	4. Field Data Collection Comments
Biology	103	All professors	Spring	Species diversity/area curve, Abiotic shrimp response, Population estimates, Plant transpiration, & photosynthesis.	Population studies (survivorship curves), Species diversity vs. area curve.
Biology	104	All professors	Fall	Digital data collection, Graphing – tables etc., Blood pressure.	
Biology	201	Rae	Fall		
Biology	202	Steinmetz	Spring		Bird identification, Herpetology sampling, Fish & mammal identification. Mammal collection.
Biology	204	Stoeckmann	Spring		Collected and identified specimens from the field. Collecting methods.
Biology	205	Barbeau, Stoeckmann	Sum, Fall, Spring		
Biology	210	Knowles	Fall		Quadrat sampling. Data collection and mapping with GPS units.
Biology	236	Turner, Wrighten	Fall, Spring	Digital data collection, includes respirometry, EKG, muscle contraction, urinalysis, metabolic rate.	
Biology	305	Krebs	Spring		
Biology	311	McCumber, Pryor	Summer, Fall, Spring	Unknown analysis & Identification.	
Biology	312	Camper	Spring		Amphibian/reptile ID, classification, capture, and observation.
Biology	406	Malaiyandi, Eaton, Turner	Fall, Spring, Summer	Digital data collection, includes respirometry, EKG, muscle contraction, urinalysis, metabolic rate. Research project, includes data collection and analysis.	

Laboratory Skills Assessment 2011-2012

Required Courses (*guaranteed for all sections of each course taught this year*)

Department	Course	Professor	Term	5. Quantitative Analysis of Data Comments	6. Data Interpretation Comments
Biology	115	All professors	Sum., Fall, Spring		Most lab experiments.
Biology	106	All professors	Sum., Fall, Spring		Several lab experiments.
Biology	206	Long	Fall		
Biology	207	Long	Spring		Id specimens using taxonomic keys.
Biology	301	Slone, Shannon	Sum., Fall, Spring	Protein gel electrophoresis. (Slone only) Computer assisted image analysis.	Gel electrophoresis. (Slone only) Biological Image Analysis
Biology	302	Bauer	Fall		
Biology	303	Long	Not Offered		
Biology	308	Rae	Summer, Fall	Duckweed data and Plankton analysis.	Plankton analysis and Duckweed data analysis.
Biology	310	Stroup	Fall, Spring		
Biology	313	Long	Spring		
Biology	401	Bauer, Camper	Sum., Fall, Spring	Analysis of quantitative traits, Maize genetics, Dihybrid crosses of *Drosophila*.	DNA fingerprinting, Gel electrophoresis. Molecular biology exercise, Nucleotide sequence analysis.
Biology	402	Steinmetz	Fall	Statistical analysis lab, analysis of numerous lab data. Individual projects.	Forest comparisons, squirrel forging, plant competion, herp survey, long leaf survey. Independent projects.
Biology	407	McCumber	Spring	Molecular weight analysis on SDS gels, Gel filtration, RID analysis.	Molecular weight analysis on SDS gels, Gel filtration, RID analysis.
Biology	411	Rae	Spring	Class projects.	Class projects.

Elective Courses (*also for unique sections of core courses & non-major cou*rses)

Department	Course	Professor	Term	5. Quantitative Analysis of Data	6. Data Interpretation Comments
Biology	103	All professors	Spring	Many labs: also graphing.	Many labs.
Biology	104	All professors	Fall	Statistical analysis of data. Contrasting means using t-tests in Excel.	Interpret graphs and tables, Standardize physiological data in an index, Social implications of scientific advances.
Biology	201	Rae	Fall		
Biology	202	Steinmetz	Spring		Interpretation of sampling data.
Biology	204	Stoeckmann	Spring		Marine habitat comparisons.
Biology	205	Barbeau, Stoeckmann	Sum, Fall, Spring		
Biology	210	Knowles	Fall	Species richness, Diversity indices	
Biology	236	Turner, Wrighten	Fall, Spring		Data analysis involved in many labs, ie. EKG reading, blood pressure, urine analysis and research projects.
Biology	305	Krebs	Spring		
Biology	311	McCumber, Pryor	Summer, Fall, Spring	Most probable number analysis.	Most probable number analysis.
Biology	312	Camper	Spring		
Biology	406	Malaiyandi, Eaton, Turner	Fall, Spring, Summer	Research project involves analysis of data collected by students to test their hypothesis, t tests.	Data analysis involved in many labs, ie. EKG reading, blood pressure, urine analysis and research projects.

Laboratory Skills Assessment 2011-2012

Required Courses (*guaranteed for all sections of each course taught this year*)

Department	Course	Professor	Term	7. Scientific Report Writing Comments	8. Use of Microprocessor Technology Comments
Biology	115	All professors	Sum., Fall, Spring	At least 3 reports.	
Biology	115H	Shannon	Fall	At least 3 reports, Poster presentation on library research (genetic disease).	
Biology	106	All professors	Sum., Fall, Spring	At least 3 reports.	
Biology	206	Long	Fall		
Biology	207	Long	Spring		
Biology	301	Slone, Shannon	Sum., Fall, Spring	Poster presentation on library research (cancer proteins).	Data manipulation. (Slone only) Biological Image Capture and Analysis
Biology	302	Bauer	Fall		
Biology	303	Long	Not Offered		
Biology	308	Rae	Summer	Taught writing, students wrote a critique of a paper.	Oxygen meter, Ecobeaker simulation labs.
Biology	308	Rae	Fall	Taught writing & students wrote two reports.	
Biology	310	Stroup	Fall, Spring	Written report; oral presentation.	
Biology	313	Long	Spring		
Biology	401	Bauer, Camper	Sum., Fall, Spring	At least two reports.	Ecobeaker-sickle cell, Biology Labs online – FlyLab.
Biology	402	Steinmetz	Fall	Students write two major lab reports a final research paper.	GIS Software, Graphes and Prism
Biology	407	McCumber	Spring		
Biology	411	Rae	Spring	Students write several lab reports.	Computer simulations (Ecobeaker).

Elective Courses (*also for unique sections of core courses & non-major courses*)

Department	Course	Professor	Term	7. Scientific Report Writing Comments	8. Use of Microprocessor Technology
Biology	103	All professors	Spring	Many labs. Write ups.	Pasco probes for photosynthesis, GMO foods lab-Use PCR (micropipette).
Biology	104	All professors	Fall	Instruction on scientific report writing. Write 2 lab reports.	Use computers (Excel) and internet.
Biology	201	Rae	Fall		
Biology	202	Steinmetz	Spring		GIS Software
Biology	204	Stoeckmann	Spring		Eco Beaker computer simulations
Biology	205	Barbeau, Stoeckmann	Sum, Fall, Spring		
Biology	210	Knowles	Fall	Major literature review paper in scientific format.	Ecobeaker computer simulations: quadrat sampling, island biogeography, metapopulation analysis. Geographic information systems lab.
Biology	236	Turner, Wrighten	Fall, Spring		Use Vernier equipment & computers to gather data. Use computer simulation.
Biology	305	Krebs	Spring		
Biology	311	McCumber, Pryor	Summer, Fall, Spring		
Biology	312	Camper	Spring		
Biology	406	Malaiyandi, Eaton, Turner	Fall, Spring, Summer	Submit lab report, write abstract, assemble powerpoint presentation.	Use Vernier equipment & computers to gather data. Use computer simulation.

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COURSE	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13
BI-103													
Mean	1.76	2.00	1.83	1.60	1.95	1.73	1.84	1.63	1.92	1.73	2.02	1.53	1.63
N	132	132	132	133	132	131	133	132	133	132	132	133	133
Median	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00
StdDev	.83	.92	.88	.81	.89	.82	.87	.56	.86	.83	.92	.71	.78
Skewness	.64	.47	.75	1.29	.56	.80	.59	.14	.67	.96	.57	1.37	1.14
BI-103L													
Mean	1.73	1.97	1.82	1.46	1.88	1.79	1.78	1.57	1.78	1.68	1.84	1.47	1.68
N	136	137	136	134	135	136	133	133	135	133	135	136	135
Median	1.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	1.00	1.00
StdDev	.88	1.00	.90	.70	.91	.88	.85	.62	.89	.83	.88	.70	.90
Skewness	.89	.69	.87	1.60	.73	.82	.81	.99	1.03	1.05	.78	1.56	1.29
BI-104													
Mean	1.36	1.43	1.36	1.00	1.50	1.29	1.36	1.00	1.36	1.36	1.64	1.29	1.43
N	14	14	14	14	14	14	14	13	14	14	14	14	14
Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00
StdDev	.74	.65	.63	.00	.94	.61	.74	.00	.84	.74	.63	.61	.76
Skewness	1.87	1.30	1.69	.	1.94	2.17	1.87	.	2.78	1.87	.43	2.17	1.53
BI-105A													
Mean	2.28	2.40	2.31	1.73	2.25	2.06	2.19	1.92	2.35	2.05	2.12	2.31	2.03
N	131	130	129	130	131	130	129	125	129	130	130	129	127
Median	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
StdDev	.88	.87	.93	.78	.93	.92	.86	.68	.88	.76	.86	.90	.84
Skewness	.17	.13	.16	.71	.29	.54	.37	.57	.30	.34	.27	.26	.42
BI-106													
Mean	1.52	1.68	1.62	1.25	1.66	1.53	1.46	1.53	1.64	1.54	1.75	1.62	1.55
N	85	85	85	85	85	85	84	85	85	83	83	85	83
Median	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	1.0C	1.00	2.00	1.00	1.00
StdDev	.68	.76	.76	.49	.72	.68	.67	.59	.78	.69	.75	.79	.82
Skewness	1.20	.94	1.09	1.81	1.01	1.38	1.38	.60	1.05	1.12	.81	1.23	1:41
BI-106L													
Mean	1.33	1.59	1.38	1.20	1.46	1.37	1.35	1.42	1.55	1.42	1.58	1.24	1.27
N	99	99	99	99	99	99	96	96	97	99	99	98	98
Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
StdDev	.57	.69	.62	.40	.58	.56	.58	.56	.69	.62	.76	.48	.57
Skewness	1.53	.75	1.38	1.51	.79	1.21	1.42	1.28	1.08	1.45	1.32	1.77	2.40
BI-115L													
Mean	1.96	2.13	2.00	1.55	1.94	2.01	1.92	1.61	2.01	1.85	1.85	1.87	1.99
N	106	105	106	106	106	105	104	102	106	106	104	104	103
Median	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
StdDev	.97	.96	.91	.74	.89	.97	.90	.57	.86	.81	.81	.91	.99
Skewness	.66	.26	.55	1.24	.52	.57	.72	.23	.45	.50	.51	.74	.71
BI-202													
Mean	1.11	1.33	1.33	1.22	1.44	1.22	1.22	1.44	1.22	1.22	2.11	1.33	1.22
N	9	9	9	9	9	9	9	9	9	9	9	9	9
Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00
StdDev	.33	.50	.50	.44	.73	.44	.44	.53	.44	.44	.93	.50	.44
Skewness	3.00	.86	.86	1.62	1.50	1.62	1.62	.27	1.62	1.62	-.26	.86	1.62
BI-204													
Mean	1.67	1.33	1.44	1.11	1.67	1.33	1.44	1.44	1.44	1.44	1.88	1.67	1.89
N	9	9	9	9	9	9	9	9	9	9	8	9	9
Median	2.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00
StdDev	.71	.50	.53	.33	.71	.50	.53	.53	.53	.53	.83	.50	1.05
Skewness	.61	.86	.27	3.00	.61	.86	.27	.27	.27	.27	.28	-.86	1.09

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DPT	DIV	COURSE	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13
BIO	UP	BI-312													
		Mean	1.25	1.13	1.19	1.06	1.50	1.38	1.25	1.19	1.19	1.31	1.71	1.31	1.19
		N	16	16	16	16	16	16	16	16	16	16	14	16	16
		Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		StdDev	.45	.34	.40	.25	.73	.72	.45	.40	.40	.60	1.07	.60	.40
		Skewness	1.28	2.51	1.77	4.00	1.17	1.73	1.28	1.77	1.77	1.89	1.11	1.89	1.77
		BI-313													
		Mean	1.47	1.47	1.47	1.13	1.53	1.33	1.33	1.36	1.60	1.40	1.71	1.27	1.33
		N	15	15	15	15	15	15	15	14	15	15	14	15	15
		Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		StdDev	.74	.92	.92	.35	.83	.49	.62	.50	.83	.63	.91	.46	.72
		Skewness	1.33	2.05	2.05	2.40	2.01	.79	1.79	.67	.94	1.41	.66	1.18	1.98
		BI-401													
		Mean	1.21	1.26	1.20	1.15	1.14	1.18	1.15	1.21	1.29	1.21	1.28	1.26	1.29
		N	34	34	35	33	35	34	33	33	34	34	32	35	34
		Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		StdDev	.48	.62	.47	.44	.43	.46	.44	.42	.52	.48	.52	.51	.52
		Skewness	2.36	2.23	2.41	3.11	3.22	2.72	3.11	1.48	1.60	2.36	1.72	1.86	1.60
		BI-401L													
		Mean	1.00	1.00	.	.	.	.	.	1.00	.	.	.	2.00	1.00
		N	1	1	0	0	0	0	0	1	0	0	0	1	1
		Median	.	.	.	.	.	.	.	.	.	.	.	.	.
		StdDev	.	.	.	.	.	.	.	.	.	.	.	.	.
		Skewness	.	.	.	.	.	.	.	.	.	.	.	.	.
		BI-406													
		Mean	1.56	1.44	1.50	1.22	1.44	1.50	1.56	1.18	1.44	1.44	1.61	1.44	1.56
		N	18	18	18	18	18	18	18	17	18	18	18	18	18
		Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		StdDev	.70	.62	.62	.43	.70	.79	.78	.39	.78	.62	.85	.62	.78
		Skewness	.91	1.09	.84	1.46	1.35	2.04	1.86	1.87	2.27	1.09	1.55	1.09	1.86
		BI-407													
		Mean	2.57	2.62	2.52	1.38	2.48	2.29	2.52	1.75	2.35	2.00	1.89	1.50	1.84
		N	21	21	21	21	21	21	21	20	20	19	19	20	19
		Median	2.00	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00
		StdDev	.81	.86	.87	.50	.81	.96	.81	.79	.75	.67	.66	.61	1.01
		Skewness	.37	.36	.17	.53	.70	.50	.53	1.22	1.00	.00	1.41	.78	1.06
		BI-411													
		Mean	1.93	2.33	2.26	1.74	2.19	2.15	2.15	1.84	2.22	1.93	2.16	1.67	2.22
		N	27	27	27	27	27	27	27	25	27	27	25	27	27
		Median	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
		StdDev	.62	.83	.81	.66	.79	.82	.72	.69	.85	.73	.85	.55	.93
		Skewness	.04	.14	.40	.32	.16	.16	-.23	1.05	.36	.12	.56	.00	.13
		BI-499													
		Mean	1.53	1.63	1.57	1.43	1.51	1.49	1.51	1.41	1.62	1.49	1.54	1.85	1.65
		N	38	38	37	37	37	37	37	37	37	37	28	33	31
		Median	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	2.00	1.00
		StdDev	.65	.75	.69	.65	.65	.65	.65	.50	.68	.69	.69	.97	.80
		Skewness	.85	1.14	.82	1.24	.91	1.01	.91	.40	.65	1.11	.94	.97	1.17
	Mean		1.48	1.54	1.51	1.26	1.50	1.49	1.49	1.36	1.55	1.42	1.64	1.44	1.51
	N		308	307	307	302	307	306	304	301	304	304	286	300	297
	Median		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	StdDev		.70	.79	.76	.55	.74	.76	.74	.54	.79	.63	.82	.73	.78
	Skewness		1.34	1.36	1.43	2.22	1.40	1.48	1.44	1.40	1.45	1.25	1.09	1.80	1.51

Biology - Students' Evaluation of Spring 2012 Page 4

DPT DIV COURSE	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13
Mean	1.70	1.85	1.75	1.44	1.76	1.67	1.70	1.53	1.78	1.62	1.80	1.64	1.67
N	1173	1171	1169	1165	1171	1167	1158	1148	1164	1163	1144	1161	1150
Median	1.00	2.00	1.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00	2.00	1.00	1.00
StdDev	.87	.92	.89	.71	.87	.85	.86	.61	.89	.77	.87	.84	.88
Skewness	1.01	.76	.95	1.62	.90	1.08	1.00	.93	.92	1.01	.82	1.21	1.17