Institutional Effectiveness (IE) Report
Academic Year 2007-2008
Department of Biology

J. Henry Slone
Coordinator of IE and Professor of Biology

Peter King
Chair, Department of Biology

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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

Faculty Academic Development (Scholarly Activities and Continuing Education):

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 Section II under Faculty Academic 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. 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: 100 % of the full-time, biology faculty members do participate in at least 2 of the categories of community service or 70% of the faculty do participate in at least 3 of the categories.

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 was given during the end of the semester in the laboratory sections of each of these courses. The quizzes were 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 were 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

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

Faculty Academic Development (Scholarly Activities and Continuing Education):

Participation Level in Scholarly Activities:

We had 18 full-time faculty members this year. Participation activity was as follows:

17 full-time faculty members were actively involved in a research project during the year.

18 full-time faculty members are members of professional societies. Two faculty members play active roles in professional societies.

16 full-time faculty members attended workshops, seminars or conferences to further their knowledge in specific areas.

6 full-time faculty members have had 9 papers published this past year.

14 full-time members are contributing authors to custom published lab manuals.

10 full time members made 18 presentations to professional groups.

Participation Level in Continuing Education:

All full time faculty members attended workshops, seminars or conferences, or have engaged in independent study (tutorials, readings in professional or technical journals, etc.) to further their knowledge in specific areas.

Evaluation of Academic Development:

The majority of the biology faculty participated in 4 out of the 5 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 do participate in 3 of the categories of academic development (or 90% in 2 of the categories) was met.

Much of the research conducted by members of the biology faculty does involve participation of students through various courses. This greatly increases individual attention given to students and significantly increases the teaching load of instructors to more than 18 contact hours in the classroom or lab per week (9 to 12 contact hours is the normal contracted teaching load). At least eight students were involved in research projects through our directed/independent study, internship or honors thesis courses (Biol 497, 498, or Biol 491-499). These students were mentored mostly by our faculty. In some cases members from various scientific organization in the Pee Dee region, such as Clemson University Pee Dee Research Education Center and USDA's local agricultural research services, may have served has mentors as well.

Furthermore, some members of our department are involved in writing grant proposals, which we do not document quantitatively but agree are very important. Some also regularly submit grant proposals to on-campus funding committees each year and sometimes submit major grant proposals to external granting agencies. A Merck/AAAS Undergraduate Research Program grant ($60,000) and an American Wildlife Conservation Foundation grant was awarded this year. A number of internal grants were also funded.

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

- Radio-telemetry study of snakes in wetland areas
- Diamondback Terrapins research in the North Inlet of Winyah bay
- Amphibian and reptile diversity and succession of disturbed habitats in the Pee Dee
- Water quality of Jeffrey's creek
- Microhabitat analysis of the Eastern Wood Rat nest sites
- Community ecology of lotic larval midges in the Lynches River
- Role of Podocytes in the recognition of non-self in crayfish
- Effects of zinc and calcium on liver and brain mitochondria
- Cell cycle regulation
- Gene expression

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:

A survey was sent out to all Biology faculty asking about their participation in service in four different areas: 1) to Francis Marion University (faculty governance, for example), 2) to other schools (a talk to an elementary class, for example), 3) to organizations (serving as an officer in a professional organization, for example), or 4) to enhance the cultural life of the community (playing in the local community orchestra, for example).

83 % of the 18 faculty members responded. The following table shows the response of those faculty members and indicates the level of faculty participation in service activities of those that responded.

Table I

Biology Faculty Participation in Service Activities

Percent participation	98-99	99-00	00-01	01-02	03-04	04-05	05-06	**07-08**
To Francis Marion University	100	100	100	100	100	100	100	**100**
To other schools	87	75	92	77	77	75	92	**53**
To organizations	100	100	100	100	100	88	69	**93**
To enhance culture	60	53	69	92	77	56	69	**66**

Evaluation of Service Activities:

All members of the biology faculty have participated in service activities at Francis Marion University. About one-half of our faculty provided services to local schools and over 90 % provided services to various local organizations. Two-thirds participated in the enhancement of culture in the Pee Dee region of South Carolina. We have met our bench mark that 100 % of full-time, biology faculty do participate in at least 2 of the categories of community service or 70 of our faculty do participate in at least 3 of the categories. Given our high level of participation i scholarly activities, as described above, and our relatively heavy teaching load, we are satisfied with the quality and level of our participation in community service, which we plan t continue in the future.

<u>Teaching Effectiveness and Student Ratings of Instructors</u>:

The students gave most biology instructors and their courses a rating between 1.0 (excellent) and 2.0 (good) for all categories of evaluation.

Evaluation of Teaching Effectiveness:

Overall we received ratings close to the benchmark of 2.0 and are satisfied with these results. However, 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 as 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 course-specific cumulative quizzes that were given during the end of the Fall semester 2007 and Spring semester 2008 in the lab sections of courses in which significant numbers of non-majors are enrolled (Biol 105, 104, 103 and 106). The quizzes were given for the purpose of assessing how successful the students were in meeting the two science-related goals of general education as described in Section I.

Environmental Biology (Biol103):

-10 laboratory sections (182 students total) were tested.
- Mean percentage score was 63.74.

Introduction to Biological Sciences (Biol 105):

- 12 laboratory sections (251 students total) were tested.
- Mean percentage score was 63.41.

Organismal Biology (Biol 106):

- 2 laboratory sections 32 students total) were tested.
- Mean percentage score was 68.33.

Human Biology (Biology 104): Data was not collected this year.

Evaluation of Student Success in Meeting General Education Goals:

The mean percentage score of the laboratory sections combined for each particular course was above our benchmark of 60 %. A small number of laboratory sections "performed" below this benchmark. 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 (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.

<u>Application of Technology</u>:

Most Notable New Application of Technology

A gel documentation system was acquired for chemiluminesence work. Various other acquisitions were made for research and teaching labs, including mini-centrifuges, vortexors enzyme immunoassay kits, and laptop computers.

New computers were installed the Burroughs and Chapin computer lab and completely replaced the old ones.

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. However, in addition to that noted above, other important acquisitions and applications of technology are described briefly in

.

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 (Biology Student Organizations , Research, Conferences, and Other Activities):

Student Organizations:

Quantitative data about student organizations were not gathered this year. Data will be reported in future reports.

Research:

At least 12 students were involved in research projects mentored by at least 7 faculty members in our department.

Attendance at Conferences:

At least 10 students attended scientific conferences (SYNAPSE, March 8, Charleston, SC; or SCAS at Clemson University). Six students gave presentations.

PURE (Program for Undergraduate Research Experiences) at FMU:

Six students gave presentations on campus about the research projects they did this academic year under the guidance of faculty mentors in our department.

Evaluation of Support for Student Activities

The students who attended scientific conferences reported that these experiences were valuable. We will continue to encourage students to attend scientific conferences to present their work. We will also continue our efforts to provide monetary support to enable students to attend these conferences.

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) which was well attended by students. Student participation in Tri Beta as also significant.

External Assessment Test:

ETS Major Field Test in Biology was given to seniors during spring semester of 2008. The test results are shown below.

Subject Area:	Mean Score (FMU):	Mean Score (*National):
Cell Biology	35	52.9
Molecular and Genetics	39	52.7
Organismal Biology	33	52.6
Population Biology, Evolution, and Ecology	32	52.0

*Obtained from MFT Comparative Data Guide at www.ets.org/hea/mft/compare.html. Data from August 2005 to June 2007

Evaluation of External Assessment Test Results

Our students score lower than the national average. This year our students scored substantially lower than two years ago when last tested. The national mean did not change significantly. We have explored and employed alternative strategies or incentives--most notably technological and multimedia-based strategies--that we hoped would improve student learning and test performance. However, to date the data that we have collected and analyzed regarding the efficacy of using new technological tools indicate that improved learning does not occur. For example, the results from our own study 3 years ago of CPS (classroom performance system) adoption showed that it does not enhance student learning over traditional methods. Similarly a study that was completed 2 years ago on the use of computer-interfaced laboratory exercises using HP Tablet PCs and lab data acquisition technology indicated that there was no statistically significant difference in student learning compared to more traditional methods.

As mentioned above in the **Teaching Effectiveness and Student Ratings of Instructors** section of this report, there are no widely-accepted learning strategies that we can use as models. However, we continue to try to make improvements in teaching and student learning mostly by way of trial and error, instinct, and anecdotal evidence. To date we have not studied these issues thoroughly enough to agree on a benchmark.

<u>Laboratory Skills Assessment</u>:

Every year from each faculty member we gather information about the type of laboratory skills taught. This information is summarized in tables shown below. 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 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 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. Also in this grouping are unique sections of required courses that offer a unique skill for that section. Lastly, all non-major courses are listed in this section.

Evaluation of Laboratory Skills Assessment:

The most notable ongoing and new laboratory skills taught this year are included in the tables below. It is clear that we offer students ample opportunities in the lab and in the field to develop skills in the use of scientific methodology. We have met the benchmark that biology majors will have the opportunity to learn at least three laboratory and field methods within each of the eight categories of skills. In most cases students have had opportunities to learn many more methods within each category.

We are satisfied with these results but will continue to reexamine many different aspects of our lab and field courses to improve the opportunities for our students to develop skills.

Laboratory Skills Assessment 2007-2008

1. Experimental Design

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

Department	*Course*	*Professor*	*Term*	*Comments*

Biology	105	All professors	Sum., Fall, Spring	First lab on scientific method and experimental design, Students write at least 3 lab reports emphasizing the scientific method.
Biology	106	All professors	Sum., Fall, Spring	Students write lab reports emphasizing the scientific method and experimental design.
Biology	301	Slone	Fall, Spring	Design experiments to characterize earthworm blood.
Biology	401	Bauer, Camper	Sum., Fall, Spring	Dihybrid crosses of *Drosophila*.
Biology	402	Krebs	Fall	Design field studies.
Biology	407	McCumber	Spring	Scientific method, Use of controls.
Biology	411	Rae	Spring	Design Field and Laboratory Studies.

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

Department	*Course*	*Professor*	*Term*	*Comments*

Biology	103	Pike, Krebs, Camper, Eaton, Long, Vanderhoff, Scarborough, Stoeckmann, Pryor, Barbeau, Dineley.	Spring	A lab specifically on scientific method & experimental design, Plant growth & fertilizer, Plant transpiration. Non-majors course.
Biology	104	Barbeau, Camper, Eaton, King, Knowles, Krebs, Sanderson, Scarborough, Shannon, Stoeckmann, Vanderhoff.	Fall	Two labs specifically on scientific method and experimental design, and analytical methods. Students write at least 2 lab reports emphasizing the scientific method.
Biology	202	Krebs	Spring	Design field studies.
Biology	306	Dineley	Fall	All students carry out a research project.
Biology	311	McCumber, Pryor.	Summer, Fall, Spring	Scientific method, Use of controls.
Biology	315	Krebs	Spring	All students do a research project. Observation leading to development of a hypothesis which could be tested.
Biology	406	Eaton, King.	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).

Biology	410	King	Spring	All students do a research project: develop a hypothesis and test it by collecting data and analyzing results.

2. Laboratory Techniques

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	105	All professors	Sum., Fall, Spring	Microscopy, Mass and volume measurements, Gel electrophoresis, Colorimetric chemical assays, DNA isolation, Bacterial transformation.
Biology	106	All professors	Sum., Fall, Spring	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	Microscopy, Differential Centrifugation, Gel electrophoresis of proteins.

Biology	303	Long	Spring	Compound & dissecting microscopes to learn histological & reproductive details of plants.
Biology	305	Krebs	Spring	Dissection of shark & cat.
Biology	313	Long	Spring (alternate)	Compound and dissecting microscopes.
Biology	401	Bauer, Camper	Sum., Fall, Spring	PCR, Gel electrophoresis, Restriction digests, DNA fingerprinting.
Biology	407	McCumber	Spring	IEP, Ouchterlony, RIA, RID, ELISA, Cytology, Precipitation, Agglutination, Western, Northern & Southern gels, Gel Filtration, Ion exchange.
Biology	411	Rae	Spring	Grow duckweed.

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

Department	*Course*	*Professor*	*Term*	*Comments*

Biology	103	Pike, Krebs, Camper, Eaton, Long, Vanderhoff, Scarborough, Stoeckmann, Pryor, Barbeau, Dineley.	Spring	Vernier Probes, Serial dilutions.
Biology	104	Barbeau, Camper, Eaton, King, Knowles, Krebs, Sanderson, Scarborough, Shannon, Stoeckmann, Vanderhoff.	Fall	DNA isolation, DNA fingerprinting, Dissection, Use of microscope. Electrophoresis. Calorimetry and enzyme kinetics.
Biology	201	Rae	Fall	Dissect invertebrates.
Biology	205	Barbeau, Eaton, Malaiyandi, Stoeckmann.	Summer, Fall, Spring	Dissection.
Biology	301	Slone only	Fall	Detergent/aqueous phase partitioning.
Biology	301	Shannon only	Summer, Spring.	Western blotting.
Biology	302	Bauer	Fall	Fertilization using sea urchin gametes, Protein expression during early development in *Drosophila*.

Biology	306	Dineley	Fall	Microscopy, spectrofluorophotometry, cell culture.
Biology	311	McCumber, Pryor.	Summer, Fall, Spring.	Sterile technique – Loops & pipettes, Agar streak plates, Serial dilution, Heat resistance, Autoclave, Pasteurization, Coliform tests, Biochemical testing, MPN analysis, Staining techniques.
Biology	315	Krebs	Spring	Taxodermy & dissection.
Biology	401	*Bauer*, *Camper*.	Spring, Fall	Transformation, Plating, Plasmid DNA isolation.
Biology	406	Eaton, King	Sum., Fall, Spring	Digital data collection, Blood pressure, EKG, Electrophoresis, Fitness test, Pulmonary function, Urinalysis. Blood glucose monitoring.
Biology	410	King	Spring	Digital data collection, Blood pressure, EKG, Electrophoresis, Fitness test, Pulmonary function, Urinalysis, Blood glucose determination, Respirometry.

3. Lab Data Collection

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

Department	*Course*	*Professor*	*Term*	*Comments*

Biology	105	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.
Biology	301	Slone, Shannon	Sum., Fall, Spring	Protein gel electrophoresis. Western blotting.
Biology	401	Bauer, Camper	Sum., Fall, Spring	Dihybrid crosses of *Drosophila*.
Biology	407	McCumber	Spring	Gathering, analysis, & presentation of data.
Biology	411	Rae	Spring	Collect survivorship data and duckweed growth data.

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

Department	*Course*	*Professor*	*Term*	*Comments*

Biology	103	Pike, Krebs, Camper, Eaton, Long, Vanderhoff, Scarborough, Stoeckmann, Pryor, Barbeau, Dineley.	Spring	Plant growth & fertilizer, Abiotic shrimp response, Population estimates, Plant transpiration, & photosynthesis.
Biology	104	Barbeau, Camper, Eaton, King, Knowles, Krebs, Sanderson, Scarborough, Shannon, Stoeckmann, Vanderhoff.	Fall	Digital data collection, Graphing – tables etc., Blood pressure.
Biology	301	Slone only	Fall	Biological Image Capture; Investigative project on earthworm blood
Biology	306	Dineley	Fall	Collect, analyze, and present data.
Biology	311	McCumber, Pryor.	Summer, Fall, Spring.	Unknown analysis & Identification.
Biology	406	Eaton, King	Sum., Fall, Spring	Digital data collection, includes respirometry, EKG, muscle contraction, urinalysis, metabolic rate. Research project, includes data collection and analysis.

Biology	410	King	Spring	Digital data collection, includes respirometry, EKG, muscle contraction, urinalysis, metabolic rate, Blood glucose. Research project, includes data collection and analysis.

4. Field Data Collection

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	106	All professors	Summer, Spring	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	308	Rae	Summer, Fall	Collect water chemistry and organisms.
Biology	402	Krebs	Fall	Plant & animal sampling, soil sampling.
Biology	411	Rae	Spring	Class projects and group projects.

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	103	Pike, Krebs, Camper, Eaton, Long, Vanderhoff, Scarborough, Stoeckmann, Pryor, Barbeau, Dineley.	Spring	Population studies (survivorship curves), Conifer needle length.
Biology	202	Krebs	Spring	Bird identification, Herpetology sampling, Fish & mammal identification. Mammal collection.
Biology	204	Stoeckmann	Summer	Collected and identified specimens from the field. Collecting methods.
Biology	210	Knowles	Fall	Quadrat sampling. Data collection and mapping with GPS units.
Biology	312	Camper	Spring	Amphibian/reptile ID, classification, capture, and observation.
Biology	315	Krebs	Spring	Bird ID, Bird/habitat observation.

5. Quantitative Analysis of Data

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	301	Slone, Shannon	Sum., Fall, Spring	Protein gel electrophoresis.
Biology	401	Bauer, Camper	Sum., Fall, Spring	Analysis of quantitative traits, Maize genetics, Dihybrid crosses of *Drosophila*.
Biology	402	Krebs	Fall	Statistical analysis, Individual projects.
Biology	407	McCumber	Spring	Molecular weight analysis on SDS gels, Gel filtration, RID analysis.
Biology	411	Rae	Spring	Class projects and group projects.

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

Department	*Course*	*Professor*	*Term*	*Comments*

Biology	103	Pike, Krebs, Camper, Eaton, Long, Vanderhoff, Scarborough, Stoeckmann, Pryor, Barbeau, Dineley.	Spring	Many labs: also graphing.
Biology	104	Barbeau, Camper, Eaton, King, Knowles, Krebs, Sanderson, Scarborough, Shannon, Stoeckmann, Vanderhoff.	Fall	Statistical analysis of data. Contrasting means using t-tests in Excel.
Biology	210	Knowles	Fall	Species richness, Diversity indices (Shannon-Weaver, Simpson's).
Biology	301	Slone only	Fall	Computer assisted image analysis.
Biology	306	Dineley	Fall	Research project involves data analysis.
Biology	308	Rae	Fall	Duckweed data and Plankton analysis.
Biology	311	McCumber, Pryor.	Summer, Fall, Spring.	Most probable number analysis.

Biology	406	Eaton, King	Sum., Fall, Spring	Research project involves analysis of data collected by students to test their hypothesis.
Biology	410	King	Spring	Research project involves analysis of data collected by students to test their hypothesis.

6. Data Interpretation

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	105	All professors	Sum., Fall, Spring	Most lab experiments.
Biology	106	All professors	Sum., Fall, Spring	Several lab experiments.
Biology	202	Krebs	Spring	Group projects.
Biology	207	Long	Spring	Id specimens using taxonomic keys.
Biology	301	Slone, Shannon	Sum., Fall, Spring	Gel electrophoresis.
Biology	401	Bauer, Camper	Sum., Fall, Spring	DNA fingerprinting, Gel electrophoresis..

Biology	402	Krebs	Fall	Forest comparisons, Individual projects.
Biology	407	McCumber	Spring	Molecular weight analysis on SDS gels, Gel filtration RID analysis.
Biology	411	Rae	Spring	Class and group projects.

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	103	Pike, Krebs, Camper, Eaton, Long, Vanderhoff, Scarborough, Stoeckmann, Pryor, Barbeau, Dineley.	Spring	Many labs.
Biology	104	Barbeau, Camper, Eaton, King, Knowles, Krebs, Sanderson, Scarborough, Shannon, Stoeckmann, Vanderhoff.	Fall	Interpret graphs and tables, Standardize physiological data in an index, Social implications of scientific advances.
Biology	202	Krebs	Spring	Interpretation of sampling data.

Biology	204	Stoeckmann	Summer	Marine habitat comparisons.
Biology	301	Slone only	Fall	Biological Image Analysis
Biology	306	Dineley	Fall	Analysis of data requires assimilation and interpretation.
Biology	308	Rae	Fall	Plankton analysis and Duckweed data analysis.
Biology	311	McCumber, Pryor.	Summer, Fall, Spring.	Most probable number analysis.
Biology	315	Krebs	Spring	Individual projects.
Biology	401	Bauer, Camper.	Spring	Molecular biology exercise, Nucleotide sequence analysis.
Biology	406	Eaton, King	Fall, Spring	Data analysis involved in many labs, ie. EKG reading, blood pressure, urine analysis and research projects.
Biology	410	King	Spring	Data analysis involved in many labs, ie. EKG reading, blood pressure, urine analysis and research projects.

7. Scientific Report Writing

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	105	All professors	Sum., Fall, Spring	At least 3 reports.
Biology	105H	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	301	Shannon	Summer, Spring	Poster presentation on library research (cancer proteins).
Biology	308	Rae	Summer	Taught writing, students wrote a critique of a paper.
Biology	308	Rae	Fall	Taught writing & students wrote two reports (Population Growth; Plankton).
Biology	310	Stroup	Fall, Spring	Written report; oral presentation.
Biology	401	Bauer, Camper	Sum., Fall, Spring	At least two reports.
Biology	402	Krebs	Fall	Students write two major reports and interpret data on tests.

Biology	411	Rae	Spring	Students write several lab reports.

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	103	Pike, Krebs, Camper, Eaton, Long, Vanderhoff, Scarborough, Stoeckmann, Pryor, Barbeau, Dineley.	Spring	Many labs.
Biology	104	Barbeau, Camper, Eaton, King, Knowles, Krebs, Sanderson, Scarborough, Shannon, Stoeckman, Vanderhoff.	Fall	Instruction on scientific report writing. Write 2 lab reports.
Biology	202	Krebs	Spring	Submit report on research project.
Biology	210	Knowles	Fall	Major literature review paper in scientific format.
Biology	213	Barbeau	Fall	Write 2 essays/critical response papers in review of literature (scientific articles).

Biology	306	Dineley	Fall	Numerous presentations, data article summaries, lab journals.
Biology	315	Krebs	Spring	Made presentations; no written reports.
Biology	406	King	Sum., Fall, Spring	Submit a report for a research project. Review peer reviewed research paper.
Biology	406	Dineley	Sum., Spring.	Submit lab report, write abstract, assemble powerpoint presentation.
Biology	410	King	Spring	Submit a report for a research project. Review peer reviewed research paper.

8. Use of Microprocessor Technology

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	301	Slone/Shannon	Sum., Fall, Spring	Data manipulation.
Biology	308	Rae	Summer, Fall	Oxygen meter, Ecobeaker simulation labs.

Biology	401	Bauer, Camper	Sum., Fall, Spring	Ecobeaker-sickle cell, Biology Labs online – FlyLab.
Biology	411	Rae	Spring	Computer simulations (Ecobeaker).

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

Department	*Course*	*Professor*	*Term*	*Comments*
Biology	103	Pike, Krebs, Camper, Eaton, Long, Vanderhoff, Scarborough, Stoeckmann, Pryor, Barbeau, Dineley.	Spring	Vernier probes for photosynthesis.
Biology	104	Barbeau, Camper, Eaton, King, Knowles, Krebs, Sanderson, Scarborough, Shannon, Stoeckmann, Vanderhoff.	Fall	Use computers (Excel) and internet.

Biology	210	Knowles	Fall	Ecobeaker computer simulations: quadrat sampling, island biogeography, metapopulation analysis. Geographic information systems lab.
Biology	301	Slone only		Biological Image Capture and Analysis
Biology	306	Dineley	Fall	All major equipment integrated with PCS.
Biology	406	Eaton, King	Spring, Fall, Summer	Use Vernier equipment & computers to gather data. Use computer simulation.
Biology	410	King	Spring	Use Vernier equipment & computers to gather data. Use computer simulation.

Issues of Concern 2005-2008	**Actions Taken**
Provide adequate office space for new full-time and current part-time faculty	Converted the student lounge back to a faculty office area. However, this is not an adequate solution or compromise. Better solution needed.
Provide more teaching laboratory space to accommodate the rise in student enrollment (mostly pre-nursing students)	Converted MSB-221 into a Biol 105 teaching laboratory

Provide more space for laboratory research use	Converted excess space in MSB-222 (freshmen biology teaching lab) into a wet lab for research use LSF 209 was converted into a multiple-use cell physiology-pharmacology teaching and research laboratory. Upper level shelves were installed on each lab bench to improve work flow and increase shelf space in LSF 208B.
Hire new faculty to replace retiring faculty	Hired a new faculty member who began teaching in Fall 2007
Develop an assessment protocol to evaluate how well our freshmen courses meet general education goals regarding knowledge and application of science.	Protocol was developed and implemented over 4 semesters
Devise a solution to improve the management of our greenhouse facilities	A student worker was hired to help us manage the greenhouse.
Adequacy of Biol 105 and 106 as pre-requisite courses to prepare students for upper level courses	Subcommittee was formed to study this issue.
Complete the feasibility study for a masters degree program	Subcommittee was formed and a feasibility study for master's degree program in the biological sciences was in progress during 2006-2007. Meeting took place with various representatives from Clemson University to discussion the level of faculty and student interest/need in establishing such a program here. Possible collaborative undertakings between Clemson and Francis Marion were discussed. A committee was appointed within our department to further study the matter in light of Wyndham environmental center
Enhance field biology teaching	Wyndham Environmental Center will be developed on a 48 acre site in Lamar, which was donation by the Greer family to FMU. The property and center will be developed as a facility to be used mostly for the purpose of field biology-related teaching.
External assessment test (ETS Major Field Test) results are too low.	A committee will be appointed to study this problem.