

## **Biological Sciences – Strategic Goals and Action Plans**

**Goal 1: To continue to build research and instruction on the Boca Raton, Jupiter and Davie campuses along the lines already established.**

- We will continue to shift commuter students to the Davie and Jupiter campuses as described in the Program Review document, to re-distribute the teaching load and to maximize the use of space.
- FAU's president signed an agreement with Scripps Florida's CEO and Max Planck's CEO and Scientific Director in March 2015 fortifying our relationships, both in research and education on the Jupiter campus.
- A newly hired Director of the Center for Environmental Science is now established in Davie.
- Boca Raton faculty members are developing a new marine biology concentration for the Integrative Biology Ph.D. Program.

**Goal 2: To develop a reliable, efficient transportation system between the different campuses for students and faculty as soon as possible.**

This is a University-wide priority and the President has proposed a bus link from Boca Raton to Jupiter campuses.

**Goal 3: To support the sense of community in the Biology Department by developing institutional habits and traditions that support it, such as a monthly departmental day on the Boca Raton campus that all are expected to attend.**

We will continue biannual retreats with improved consistency. These events will rotate between FAU's three main sites and be programmed around curriculum discussions or seminars. In Fall 2015 we will use a retreat format to discuss some of the items in this report such as enhancing the quality of the biology majors (Goal #4), or how best to modify the advising operation (Goal #10). We have scheduled a seminar by Alex Keene (our newest faculty member) followed by a welcome reception for Spring 2016, since his recruiting seminar was inaccessible due to technical glitches during Spring 2014.

**Goal 4: To raise the threshold for entry into the B.S. in Biology Program (by considering limiting future University growth in the largest undergraduate major to enable the faculty to plan for orderly instruction in this discipline).**

The Biology Department has discussed this issue many times. We think that there are a number of standards that could enhance the quality of the students in our classes. We will recommend to the College of Science Dean and Provost that in order to declare a major in Biology, students must meet a new threshold of requirements modeled after those required for declaring a major in FAU's Colleges of Nursing or Business. Biology faculty members will discuss and design the limits for these missing requirements at the biannual retreat in Fall 2015.

Ideally, students will declare a major in biology in the B.A. program, but must earn minimum grades in several courses before admittance to the B.S. program. Students who cannot pass the upper division courses for the B.A. in Biology can elect to choose the B.A. in General Studies as an alternative way to earn their undergraduate degree.

These requirements will enable faculty members to plan orderly instruction in the 2000 level and higher biology courses by allowing only the more capable and serious students to complete the major. The suggested requirements will be easily achieved within the student's first 60 credits.

**Goal 5: To develop a first semester, one credit course that introduces first year students to exciting developments in the life sciences, explains the need for tools and concepts from the hard sciences and mathematics, and identifies career pathways in the life sciences other than pre-medicine.**

Biology's Curriculum and Assessment committee, led by the Director of Undergraduate Research and Mentoring Program, will study Goal #5 and suggest potential implementation as a part of the required freshman majors' biology courses. We also need to find ways to work with freshmen to reduce attrition from the major in the first year of their undergraduate careers. This is a nation-wide issue and we will need to confront the trend. See also Goal #9

for novel course structures that the Biology Department will implement to increase the interaction of students and instructors by engaging the students in molecular and field research during teaching labs of introductory biology courses.

**Goal 6. To create course sequences and major/minor combinations that lead to degrees in Biology/public policy, Biology/law, Biology/business and finance and non-profits.**

We appreciate the concept but think it would be difficult to implement due to the very large student population in biology and the biology faculty workload.

**Goal 7. To hire additional faculty or non-tenure-track instructors to reduce the student/faculty ratio.**

Our departmental student to faculty ratio is **97:1** (note that this includes instructors); six years ago the ratio was 67:1. A survey of other programs throughout the state system shows a student to faculty ratio that ranges between 21:1 and 100:1. Of recent, we have received comments from external reviewers (including from University of Toronto Mississauga, Rutgers, Florida International University and University of Florida) during our promotion and tenure process that confirm the extraordinary teaching load of our faculty. One example, from Monica Driscoll (Rutgers), re: promotion to Associate Professor and tenure for Kialiang Jia, “Dr. Jia has pressed forward with his research program against a backdrop of outstanding contribution to teaching at the university. The workload involved in the new course development he has accomplished is staggering. ... Just these exemplary accomplishments on behalf of the teaching mission of your Department should warrant promotion.”

The number of faculty has grown recently due to hiring two junior faculty members and the return of the former President and the former Provost to their departmental status in Biology. This has helped our teaching ratios and strengthened areas that have long lacked critical mass like plant sciences. The Life Science Initiative, based primarily in Jupiter, has also facilitated hiring in the Biology Department and this will help reduce the overall student to teacher ratio.

However, to adjust to the growing student population and lighten the teaching load of tenure-track faculty members so that they might engage more in research and scholarly activities, we recommend the hiring of two new instructors. The current hiring of tenure-track faculty members at the rate of one to two per academic year will further sustain the department's productivity.

**Goal 8: To create a formal faculty mentoring program.**

The Biology Department has a faculty mentoring program in-place (see Insert from Bylaws). Our two most recent faculty hires have barely settled in their offices. One has a mentor, a senior member of the Biology Department, provided by a University wide program. The other has not settled into a routine full time schedule due to family leave.

**From Our Departmental Bylaws: The Personnel Committee Will...(b) assign mentors for newly-hired Assistant Professors,** monitor progress of Assistant Professors toward tenure, oversee the initiation and completion of the third year review for Assistant Professors, evaluate applications for promotion from Assistant Professor to Associate Professor and granting of tenure, and provide recommendations to the Faculty.

Under the departmental program, a tenured faculty member is assigned to each new faculty member to give one-on-one mentoring regarding the tenure process. There is also one Master Teacher and one Master Researcher designated in the Biology Department. The Master Teacher is responsible for giving workshops to new hires (and previous hires with low teaching evaluation scores) on teaching tips and pedagogies. The Master Researcher provides workshops on grant writing and various research concerns.

Now that our two newest hires have had adequate time to relocate and begin setting up their laboratories, they will be formally assigned tenured mentors within the department by our Personnel Committee.

**Goal 9: To consider course structures that increase the interaction of students and instructors; the 'recitation section' is one possible model.**

The proposed suggestion is challenging with our current departmental responsibilities. Annualized state fundable FTEs continue to increase, while our faculty numbers stay almost

constant. In addition to our research and other scholarly responsibilities, the department's faculty members are mentoring undergraduate and graduate researchers.

Approximately 10% of Biology undergraduate students are engaged in research and 85% of faculty members are acting as mentors. In the four semesters from (and including) Spring 2014 through and including Spring 2015, there were an average of 70 undergraduate students engaged in *Directed Independent Study* (DIS) alone per semester.

For the past fifteen years, peer-led Lifeline sessions (24 students maximum per session) have been used to achieve more individual (peer) interactions in the introductory *Biological Principles* (BSC 1010) and *Biodiversity* (BSC 1011) courses for majors.

Another course structure that increases the interaction of students and instructors is engaging the students in molecular and field research during teaching labs. The Biology Department is one of the sites for the Small World Initiative from Yale University, which aims at initiating freshmen in biological research at the molecular level. In next spring (2016), we will run a pilot study with one lab (24 students) for *Biological Principles* (BSC 1010) where students will collect soil samples at the FAU preserve and use basic molecular biology techniques to isolate bacterial DNA from soil samples, PCR amplify the DNA and send the isolated DNA to Yale University for DNA sequencing. Students will receive the DNA sequences back and learn how to conduct basic metagenomic analyses on computer databases. Upon successful results of these pilot studies, additional BSC1010 labs will be engaged in the same research data collection and analyses. It is hoped that over 1,000 BSC 1010 students will eventually take part in these molecular biology studies annually.

The Biology Department was also just awarded a university technology fee grant to allow undergraduate students to obtain real field data in introductory labs for *Biodiversity* (BSC 1011). The faculty and graduate students will spend one year planning the pilot lab. Pilot studies will be launched in Fall 2016 and will consist of one BSC 1011 lab (24 students) participating in collecting data for long-term studies on gopher tortoises at the FAU preserve. Students will collect data using receivers to monitor tortoise movement through local

burrows (tortoises will have been previously tagged by scientists and graduate students with transmitters). Undergraduates will then analyze the data and write up lab reports on how various conditions affect tortoise movement. Students will then develop their own research questions concerning different aspects of gopher tortoise biology and be asked to develop the methodology to address their questions. Upon successful results of these pilot studies, additional BSC 1011 labs will be engaged in the same long-term research data collection and analyses. It is hoped that over 1,000 BSC 1011 students will eventually take part in these field studies annually.

**Goal 10: To bring advisement for sophomores and upper class students back to the department.**

The chair and co-chairs agree with the reviewers that advising done within the Biology Department would be beneficial to all. However, as previously discussed in Goals #7 and #9, our current student to faculty ratio precludes this as a realistic goal. Financial backing will be discussed with the College of Science Dean and Provost to seek funding from the President's Office to establish staff lines, specifically designated for advising, in our department to bring some advising back to the department. Advising of the students pursuing a B.S. in Biology (according to the standards set forth in Goal #4) will be returned to the Biology Department. Alternatively, the advisors in the Charles E. Schmidt College of Science Student Services Department will be coached to advise the perspective students pursuing a B.S. in Biology according to the rules set forth in the Biology Department with the Dean's consent.

**Goal 11: To engage the better students in peer-support activities by developing an undergraduate interest/service club.**

Student organizations currently exist within the major, primarily among the students interested in clinical sciences: 1) Strategies for Ecology Education, Diversity & Sustainability (SEEDS) (<https://fau.collegiatelink.net/organization/seeds>) and 2) Scientific Mentoring for Academic Research Training (<https://fau.collegiatelink.net/organization/smart>).

Additionally, our students have volunteered in many projects to protect and improve our sensitive South Florida environment (which are initiated largely by field courses in marine and environmental biology).

**Goal 12: To consult the better graduating seniors about what did and did not work for them, and how it can be improved.**

Our assessment process of student baccalaureate outcomes is not possible within the current FAU infrastructure. FAU's Office of Institutional Effectiveness and Analysis (IEA) data is obtained through Biology graduating senior surveys, but an average of only 25% of graduating seniors with Bachelors degrees in Biology respond. This is an institution-wide issue that should be addressed by the College of Science Dean and Provost to establish staff lines within the Office of Student Affairs that will implement reliable methods to accomplish this student tracking.

The Biology Department will implement an exit interview program and utilize information gleaned to improve student retention. This program will occur near the end of the spring semester by inviting graduating DIS undergraduate students to a pizza party and having them fill out a survey and engage in a roundtable discussion with Biology's Exit Committee (consisting of faculty members and FAU graduate students that have completed FAU undergraduate studies) about their (positive and negative) FAU experiences.

**Goal 13: To strengthen research productivity by encouraging more interdisciplinary ties with other departments and colleges.**

We agree with the reviewers that it is in everyone's best interests to develop more interdisciplinary ties and we will continue to pursue these by hosting and attending interdepartmental seminars. One of our newest hires, Marianne Porter, is a biomechanist who is forging new collaborations with FAU's Engineering Department. Marguerite Koch-Rose is leading Boca Raton faculty members in developing a new marine biology concentration for the Integrative Biology Ph.D. Program to enhance cohesion between the marine biologists at Boca Raton and Fort Pierce.

Currently, there are four faculty members from other departments that share space in the biology departmental labs. We are hosting three faculty members from College of Engineering and Computer Science (Department of Electrical Engineering and Computer Science) and one from College of Arts and Letters (Department of Anthropology). Marianne Porter (an Assistant Professor in Biology) is working with the Department of Ocean and Mechanical Engineering (also within the College of Engineering and Computer Science). Edward Proffitt (Fort Pierce) has a student who is working with a faculty member in the College for Design and Social Inquiry (School of Architecture) on a coral reef restoration-related project. Our faculty members work with faculty members in the College of Medicine (who also participate in the IB Program) and in the Department of Chemistry and Biochemistry (Tanja Godenschwege and Frank Mari share students to look at neurological effects of conotoxins). Ram Narayanan has bioinformatics relationships with people in the Departments of Electrical Engineering and Computer Science, Math and Physics. The Electrical Engineering Department has created their own versions of Narayanan's *Bioinformatics* course for students within their relatively new "Bioengineering" graduate program (M.S.), titled *Bioinformatics: A bioengineering perspective and Datamining in Bioinformatics*.

**Goal 14: To strengthen research productivity by improving the graduate student support package offered to Ph.D. and M.A./M.S. students.**

One of the main resource issues for our department is the limited support for graduate assistants. FAU is at the bottom of the ranking for M.S. stipends and health care across the SUS. Only FIU pays a comparable stipend (\$11,250 per nine months). Every other SUS institution surveyed pays a significantly larger stipend with UF paying double the salary for nine months. And every SUS institution surveyed pays most if not all of the student health care costs. Similar results are available for the Ph.D. students. These numbers can be directly linked to success in recruiting graduate students. Financial support is being discussed with the College of Science Dean and Provost to seek funding from the President's Office to establish more competitive graduate student support packages. This is an ongoing problem at FAU and all of the players involved are aware of the problem and are working to resolve it.