



Guidelines for the Evaluation of Four-Year Undergraduate Biology

Evaluation Criteria: Faculty and Professional Development

Recommendations for Faculty Size and Composition

There should be a minimum of four full-time faculty in the department offering the degree in biology. These faculty members should all have a terminal degree in a biological discipline. The faculty should be diverse enough to provide a well-rounded approach to the discipline. This diversity includes: diversity in areas of domains, diversity in laboratory and field study research, diversity in types of graduate training and professional preparation, and diversity in sub-disciplines. Among the faculty, there should be a minimum of one faculty member with expertise in the botanical domain, and a minimum of one with expertise in the zoological domain. At least one faculty member should have expertise in the cellular and molecular aspects of biology, and at least one have expertise in field studies.

Recommendations for Teaching Load

Faculty should teach a maximum of the equivalent of 12 semester hours per term, with not more than 15 contact hours. The ratio of students to faculty member for non-laboratory biology courses should be no greater than 30 to 1; for laboratory courses, the ratio should be no greater than 24 to 1. Faculty members directing independent student studies or research, or performing administrative duties, should have their teaching load adjusted or be provided with compensation.

Recommendations for Professional Development

All faculty members should be engaged in professional development. This scholarship can be in either a biological discipline or pedagogical research. The department should have a balance between the two. Evidence of faculty scholarship includes, but is not limited to, presentations at regional and national conferences, publications of books and refereed articles, participation in professional development workshops, and procurement of external and internal grants.

All faculty members involved in the biology program should maintain currency in their field. Funds should be provided for each faculty member to attend a minimum of one professional meeting each year.

Evaluation Criteria: Curriculum

General Recommendations

The following criteria describe a high quality program in biology. The goal of these recommendations is to provide undergraduate students with the knowledge and skills necessary to enter a career or graduate program in the biological sciences. While each department offering a bachelor's degree in biology should develop a curriculum that meets the needs of its students and institution, it should consider including as many aspects of these recommendations as possible.

Graduation Requirement

Students graduating with a bachelor's degree in biology are required to have taken:

- a minimum of one course with each of the following orientations: botanical, zoological, cellular-molecular
- chemistry through organic chemistry
- general physics
- calculus or statistics math course. (If only calculus is taken, Introduction to Statistics should be offered within the program.)
- ecology
- a capstone experience. (This senior-level course or project should enable the student to integrate and apply the knowledge and skills gained from his/her previous courses.)
- independent research or an internship
- one half of the credits required for the major in courses in which there is an associated laboratory component. This laboratory component should account for at least one third of the course and include hands-on experimentation. Computer simulations should not replace the laboratory experience.

Curriculum Requirements

The curriculum should be designed so that students develop skills in writing scientific papers, performing statistical analysis of data, reading primary literature, and designing and completing valid scientific experiments.

The curriculum should be developed so that the nature of science is stressed and the investigative nature of science is infused throughout the curriculum. Group

and individual research projects should be incorporated into all courses. The curriculum should be structured so that more extensive independent work and data analysis is required as the student progresses from introductory to upper level courses. These projects should be developed so that students are exposed to library research, field-based research, and laboratory-based research.

Evolution as the unifying theory of biology should be specifically addressed within the curriculum and should be infused throughout the curriculum.

All aspects of the curriculum should adhere to state and federal safety guidelines.

Evaluation Criteria: Support Staff

General Recommendations

All full- and part-time staff should undergo safety training before beginning employment. This training should include the proper use of safety equipment, and the proper handling, storage, and disposal of chemical, biological, and microbiological materials.

Recommendations for Support Staff

It is not in the interest of the students or institution for faculty to spend significant amounts of time performing clerical tasks or preparing materials for teaching laboratories. For this reason, high quality programs in biology should have the following:

1. All instructional faculty should be provided assistance by a full-time (or FTE) laboratory coordinator. The minimum recommendation for a department of four full-time faculty is one full-time (or FTE) laboratory coordinator. This staff person should supply assistance in the preparation and maintenance of materials and supplies for instructional laboratories. The person holding this position should have at least a bachelor's degree in a biological or chemical discipline. Biology departments offering more than eight laboratory sessions per week should supplement their laboratory coordinator with part-time employees. These may be students. These individuals should work under the direction of full-time faculty or the laboratory coordinator.
2. All faculty should have adequate access to a staff person who provides assistance with course handouts, departmental affairs, and accounting.

Evaluation Criteria: Technology

General Recommendations

Faculty and students should have easy access to computers that can functionally run all of the software and various computer peripherals necessary for creating or viewing documents, multimedia presentations, and communication via the Internet. This includes peripherals such as flat-bed scanners, digital cameras, digital projectors, CD-ROM burners, and slide scanners.

All computers for faculty and student use should have the appropriate network connections, hardware, and software for viewing documents or multimedia presentations (which could include CD-ROMs and Web pages), and communicating via the Internet. This includes:

Hardware—adequate RAM, sound and video cards, hard-drive space, CD drives, and CPU

Software—programs for word processing, creating spreadsheets and graphs, creating presentations, image processing, and Web page construction.

The institution should provide financial and technical support to regularly maintain and improve the computer technology available on campus.

Recommendations for Faculty

All full-time faculty should have computers in their offices. These computers should be replaced or upgraded every three years or less. The Biology Department should have flat-bed scanners available for easy use by the faculty. Faculty who make regular use of scanners should have one in their office.

Instructors should have ready access to some method of showing multimedia presentations. This should include a digital projector or some other form of projecting digital images, a screen, and a computer. There should be a minimum of one multimedia classroom or movable projection system (projector and laptop) for every three faculty members. Faculty should have access to a computer classroom with sufficient numbers of computers so that there is at minimum one for every three students.

Training sessions on how to use the various computer technologies available and follow-up support should be provided to faculty.

Recommendations for Students

Students graduating with a degree in biology should be computer literate. They should be able to demonstrate an understanding of basic computer operations, be able to utilize computer technology for the exchange of information, and use computers to collect and analyze data, and produce publications.

Students should have computer access in each biology lab for data collection and analysis. There should be a minimum of one computer for every 10 students. Students should have out-of-class access to a computer lab facility. The computer facility should be open a minimum of 16 hours a day/5 days a week and should provide technical support personnel for at least 10 of those hours.

Training sessions on how to use the various computer technologies available should be provided to students

Evaluation Criteria: Laboratory Instrumentation

General Recommendations

There are at least two purposes for equipment within a biology program: 1) to prepare materials for instructional use or for research, and 2) to provide opportunities to gain skills in the operation and application of equipment.

1. Recommendations for the minimum equipment available for the preparation of instructional materials and/or for faculty/student research. Faculty should have easy access to the following:
 - minimum of two incubators/growth chambers
 - deionized/distilled water system
 - minimum of three refrigerators/freezers, including at least one -20 or -800 C freezer
 - minimum of two water baths
 - glassware washer
 - autoclave
 - aquarium
 - greenhouse or plant growth area
 - microwave
 - microscope with camera
 - stereo microscope with camera
 - phase microscope
 - fume hood

2. Recommendations for equipment that students should be able to use properly upon graduation. Description of how this equipment is used in the biology curriculum is acceptable as evidence of student acquisition of these skills.
 - spectrophotometer
 - UV/Vis spectrophotometer
 - light microscopes
 - stereo microscopes
 - micro-centrifuge
 - low speed centrifuge/tabletop centrifuge
 - hot plates and stirrers

- electrophoresis apparatus
- micropipettes and standard pipetting devices
- pH meters
- analytical balances/pan balances
- PCR thermocycler
- dissection tools
- basic water analysis test kits
- binoculars
- digital cameras
- compass/GPS

Evaluation Criteria: Community Outreach

General Recommendation

A biology program should demonstrate evidence of community outreach. Recommendations for providing community outreach include providing human and physical resources.

Examples of Providing Human Resources

Biology programs may provide personnel, both faculty and students, to assist community science activities such as science contests, Olympiads or fairs, career days, advising/mentoring K-12 students, grant preparation assistance, after-school clubs, and summer camps. Biology programs should promote professional connections, involvement and development with K-12 biology/life science teachers through local, state, or regional outreach programs (such as NABT's state, regional, and national outreach).

Programs may also choose to offer their scientific expertise to the community through workshops, lectures, and demonstrations and by offering pre-college student laboratory internships.

Finally members of the program can show evidence of community outreach through participation in community service organizations and events.

Examples of Providing Physical Resources

Biology programs may offer community service through the loan of equipment and materials to pre-college teachers, including texts, laboratory procedures, software, visuals, and specimens.