

Disciplinary Communication in Ecology & Evolution, Marine Biology and Plant Sciences

I. Educational objectives

The goals of disciplinary communication in the three majors sponsored by the department of Ecology and Evolutionary Biology (EEB) are to train students in effective science writing and presentation. The two fundamental means by which professional ecologists and evolutionary biologists communicate science are through written articles, typically in the structure of a scientific journal publication, and verbal presentations at scientific conferences. Although such communication skills can be targeted at either scientists or non-science audiences, training is geared largely toward communication with the scientific audience. Because learning effective communication skills requires individual iterative interaction between student and teacher, all three EEB majors focus their training of disciplinary communication in the smaller upper division courses (i.e. courses listed as general and topical electives for each major). The three mechanisms used to teach disciplinary communication are (i) examination of the primary scientific literature (i.e. peer-reviewed journal articles), including reviews and syntheses, (ii) iterative writing and feedback on products (i.e. research articles or proposals) in the form of scientific articles, and (iii) verbal and digital presentations on research projects. Upper division courses in the three EEB majors consist of either stand alone lecture courses, coupled lecture-lab courses, or stand alone lab courses. All three formats offer distinct opportunities for training in disciplinary communication. Many of the upper division EEB lecture courses require examination of the primary scientific literature, generation of one or two reviews/syntheses of the primary literature or a research proposal and verbal presentation of a research proposal. Most lecture-lab courses require examination of the primary scientific literature, generation of a series of lab write-ups, including feedback, in the form of a peer reviewed scientific article, and a verbal and digital (i.e. PowerPoint) presentation of research activities or a research proposal. Upper division lecture and lab courses contribute *collectively* to meeting the overall writing and presentation training objectives of each EEB major.

Writing

Students should know...

1. how to prepare and present a research project or proposal in the format of a scientific article (i.e. the objectives of the Abstract, Introduction, Methods, Results, Discussion sections of the research article).
2. how to design and create graphs and tables to effectively summarize and present quantitative information (including the results of statistical analyses)
3. how to search for, locate, read and interpret the primary scientific literature as examples of communicating scientific research

Speaking/presentation

Students should know...

1. how to design, prepare and present a (10-15 min) verbal presentation on a research project or proposal in the format of a scientific talk
2. how to design and create a PowerPoint presentation to support their verbal presentation
3. how to design and create graphs and tables to effectively summarize and present quantitative information (including the results of statistical analyses)

Other communication skills

Some laboratory courses require students to produce scientific illustrations of internal and external structures of lab specimens related to a particular taxonomic group (e.g., Ichthyology, Invertebrate Zoology, Marine Botany).

II. How the educational objectives are met in the curriculum

List of courses committed to disciplinary communication objectives and how each contributes to the objectives:

Courses that contribute collectively to disciplinary communication training include stand-alone lecture courses (5 units), coupled lecture/lab courses (7-10 units), and stand alone laboratory/field courses (5 units).

All three EEB majors require:

- one 7-unit “Organismal” lecture-lab course that focuses on a particular taxonomic group
- three upper division 5 unit EEB general electives
- three upper division 5 unit EEB topical electives

In addition to the required 2-unit Organismal laboratory course, students are required to take one other 2 or 5 unit laboratory/field course. Many of these electives satisfy requirements of all three majors (i.e. are cross-listed) and are therefore described together below and listed under each major separately.

Superscripts denote the major that each course applies to (**EE**, **PS**, **M** are Ecology and Evolution, Plant Science and Marine Biology, respectively)

Lecture courses

BIOE 107 Ecology – 5 units^{EE, PS, M}

Students read six scientific papers for discussion group.

BIOE 108 Marine Ecology – 5 units^M

Students are required to review and discuss primary literature in weekly discussions, submit weekly field notebooks with a verbal and graphed description of a natural pattern, produce a 1 page research pre-proposal, a 5-8 page research proposal and give a 10 minute oral presentation with PowerPoint on their research proposal. Students receive iterative feedback on their field notebooks (i.e. pattern description and graphics).

BIOE 109 Evolution – 5 units^{EE, PS, M}
(to be submitted)

BIOE 129/L Marine Mammal (lab is optional) – 5/2 units^{EE, M}

Students do not have writing assignments in the lecture. The lab course (BIOE129L) has three lab reports that follow independent or group efforts. Students are provided dive behavior data for one lab, marine mammal acoustics records in another and survey data for the third. These require independent and original thought and a write up in scientific format. Students receive feedback on each writing assignment and graded on their development over the course of the three write-ups.

BIOE 131/L Animal Physiology (lab is optional) – 5/2 units^{EE, M}

Students do not produce written products in the lecture course. In the lab course, students work in independent groups to develop research projects and then present them to the class at the end of the quarter, along with a written report in scientific format (including a literature search).

BIOE 135 Plant Physiology – 5 units^{EE, PS}

Separate from lectures, students are assigned to groups of six to conduct a group research project. Groups develop skills of working with others on a project, conducting research on a topic, including in-depth literature research, prepare a 35-40 minute PowerPoint presentation that is presented to the class, and evaluate other presentations.

BIOE 140 Behavioral Ecology – 5 units ^{EE, PS, M}
(to be submitted)

BIOE 145 Plant Ecology – 5 units ^{EE, PS}

Students are required to conduct reading and discussion of one article from the primary literature each week. For one week, students participate in a team of 2-3 in presenting the paper and leading discussion. Students also produce two formal X-page critical reviews of papers. Students also produce an X-page paper describing an experimental design. Students submit a field journal plus 3-5 page summary of findings and give an oral presentation (with two overheads) including data and results of research findings. Students receive written critiques on all of the written products.

BIOE 147 Community Ecology – 5 units ^{EE, PS, M}
(to be submitted)

BIOE 155 Freshwater Ecology – 5 units ^{EE, PS, M}

Students are required to read and discuss the primary literature in weekly discussion sections. Students write a 4-5 page review and synthesis of a topic related to freshwater ecology, supported by primary scientific literature. They produce an outline and annotated bibliography of the topic. Students refine skills in critically evaluating scientific papers in a historical context and become familiar with using reference databases in libraries.

BIOE 163 Ecology of Reefs, Mangroves, and Sea Grasses – 5 units ^{EE, PS, M}

Students are required to produce a term paper, in the order of 20 pages of text plus illustrations. A draft is read at least once by the TA or instructor and students incorporate that feedback into their revised final version. Students also produce a 4-5 page written midterm that is expected to be well written and scientifically informative. Students are evaluated on their writing and content. Students are assigned readings from the primary literature or very recent reviews every week for discussion in section.

BIOE 165 Marine Conservation – 5 units ^{EE, M}

Students are required to produce two 2-page essays that draw from their review and synthesis of the literature on a topic. Essays consist of a 1-page outline each and both outline and essay are critiqued and returned to students. Grading includes grammar, structure and clarity. Students are also required to produce a position paper and oral presentation (with PowerPoint) on a conservation issue.

BIOE 167 Ocean Ecosystems – 5 units ^{EE, M}
(to be submitted)

BIOE 168 Biological Oceanography – 5 units ^{EE, M}
(to be submitted)

BIOE 188 Supervised Teaching – 5 units ^{EE, PS, M}
(to be submitted)

Coupled lecture (5 unit) lab (2 or 5 unit) courses (lab is mandatory)

BIOE 110/L Vertebrates & Lab - 5/2 units ^{EE, M}
(to be submitted)

BIOE 112/L Ornithology & Lab - 5/2 units ^{EE, M}

Students write one term paper where they are expected to read and synthesize at least 10 journal articles.

BIOE 114/L Herpetology & Lab - 5/2 units ^{EE}
(to be submitted)

BIOE 117/L Systematic Botany & Lab - 5/2 units ^{EE, PS}
(to be submitted)

BIOE 120/L Marine Botany & Lab - 5/2 units ^{EE, PS, M}

Lecture component requires three 2-page critical essays of the primary literature and a 10 minute oral presentation based on a synthesis of the literature on a particular topic. The lab component requires detailed illustrations of internal and external structures of marine algae.

BIOE 122/L Invertebrates & Lab - 5/2 units ^{EE, M}
(to be submitted)

BIOE 124/L Marine Plankton - 5/2 units ^{EE, PS, M}
(to be submitted)

BIOE 125 Marine Microbial Ecology - 5/2 units ^{EE, M}

Students do not produce written products in the lecture course. They produce an oral presentation, with PowerPoint, and a one page summary of a journal article.

BIOE 127/L Ichthyology & Lab - 5/2 units ^{EE, M}

Students do not produce written products in the lecture course. In the lab course, they write up their lab results and summaries in their lab notebooks which are graded and returned with feedback. They also read a paper, summarize it in scientific format, review two papers produced by their peers, the their paper reviewed by two students and then submit a final version to me, who provide final feedback.

BIOE 133/L Exercise Physiology & Lab - 5/2 units ^{EE, M}

Students do not produce written products in the lecture course. In the lab course, students work in independent groups to develop research projects and then present them to the class at the end of the quarter, along with a written report in scientific format (including a literature search).

BIOE 150 and 150L Ecological Field Methods Lab – 10 units (lab is mandatory) ^{EE, PS, M}

Students are required to conduct (i) two one-day individually developed research projects for which they generate oral presentations (with PowerPoint), (ii) three research projects for which they generate a 10-page research report in scientific format, and (iii) an in-depth independent research project for which they produce a 10-15 page final report in scientific format and another oral presentation (with PowerPoint). The first of these projects includes a re-write based on edits from the instructor/TA and a peer review of another student's project.

BIOE 161 and 161L Kelp Forest Ecology and Laboratory – 10 units (lab is mandatory) ^{EE, PS, M}

Students are lectured on the design and development of proposals and manuscripts in scientific format. Students are required to conduct reading and discussion of one article from the primary literature each week. For one week, a pair of students present the paper and lead discussion. For the laboratory component, students produce 5-page reports in scientific format for each of three class research projects. These reports are critiqued by the

instructors/TAs. Students submit a 1-page pre-proposal for a group independent research project and a final 5-7 page research report (with figures and tables). Students give an oral presentation (with PowerPoint presentation) of their projects. Students receive written critiques on all of the written products.

BIOE 172/L Population Genetics & Lab - 5/2 units ^{EE, PS, M}
(to be submitted)

Stand alone 5 unit lab courses

BIOE 141L Behavioral Ecology Field Course – 5 units ^{EE, M}

Students are required to produce two short lab reports (1-2 pp text + figures), two medium length lab reports (3-4 pp text + figures), and three long lab reports (6-8 pp text + figures). All reports are critiqued by instructors/TAs and are written in the format of a scientific article. Students are provided written instructions on reading and evaluating the primary scientific literature, and on the proper design and content of a scientific article. Students design and present a PowerPoint presentation on their independent research project.

BIOE 145L Field Methods in Plant Ecology – 5 units ^{EE, PS}

Students are required to produce (i) weekly formal research papers, 5-10 pages plus figures, in standard scientific format (Intro-Methods-Results-Discussions). Eight papers are required throughout the quarter, one rewrite of a critiqued paper is allowed, (ii) one X-page peer review and one rewrite of peer-reviewed draft, (iii) one X-page paper that includes review of the literature and reading and referencing at least 5 primary scientific papers (not websites or textbooks).

BIOE 151ABCD Ecology & Conservation in Practice – 20 units ^{EE, PS, M}

Students are required to conduct (i) two one-day individually developed research projects for which they generate oral presentations (with PowerPoint), (ii) three research projects for which they generate a 10-page research report in scientific format, and (iii) an in-depth independent research project for which they produce a 10-15 page final report in scientific format and another oral presentation (with PowerPoint). The first of these projects includes a re-write based on edits from the instructor/TA and a peer review of another student's project.

BIOL 159ABCD Marine Ecology Field Quarter – 20 units ^{EE, PS, M}
(to be submitted)

BIOE 158L Marine Ecology Lab – 5 units ^{EE, PS, M}

Students are lectured on the design and development of proposals and manuscripts in scientific format. Students produce three 4-5 page class project reports in scientific format with figures and tables, and a group (2-3 students) independent research report in scientific format. Students receive written critiques of each report. Students give a group oral presentation of their proposed research project, and a 10 min group presentation with PowerPoint on the results of their projects.

BIOE 183L Undergraduate Research in EEB - 5 units ^{EE, PS, M}

Students are lectured on the design and development of proposals and manuscripts in scientific format. Individuals are required to submit a 1-page Introduction that is critiqued three times, a 1-page Methods section that is critiqued twice, a 1-2 page Interpretation of Results section critiqued twice and a final 4-page research proposal or report in scientific format that is critiqued once. Students are also required to give a 10 minute oral presentation with PowerPoint on their research proposals.