

Scientific Journal Writing for Dummies: An Approach to Teaching Scientific Writing to First-Year Biology Majors in An Introductory Lab

Kelly E. Bohrer

Biology Department
University of Dayton
300 College Park
Dayton, OH 45469-2320
bohrerke@notes.udayton.edu
937-229-2155

Kelly Bohrer received her B.S. in environmental biology and her M.S. in biology from the University of Dayton where she now works as the Biology Lab Coordinator. She develops the introductory lab curriculum, trains the teaching assistants, supervises the preparatory assistants, and teaches labs. Her professional interests include developing interactive lab exercises and discovering ways to enhance teaching effectiveness. Her research interests include post secondary science pedagogy and wetland ecology.

Reprinted From: Bohrer, K. E. 2004. Scientific journal of writing for dummies: An approach to teaching scientific writing to first-year biology majors in an introductory lab. Pages 302-305 in *Tested studies for laboratory teaching*, Volume 25 (M. A. O'Donnell, Editor). Proceedings of the 25th Workshop/Conference of the Association for Biology Laboratory Education (ABLE), 414 pages.

- Copyright policy: <http://www.zoo.utoronto.ca/able/volumes/copyright.htm>

Although the laboratory exercises in ABLE proceedings volumes have been tested and due consideration has been given to safety, individuals performing these exercises must assume all responsibility for risk. The Association for Biology Laboratory Education (ABLE) disclaims any liability with regards to safety in connection with the use of the exercises in its proceedings volumes.

© 2004 Kelly E. Bohrer

Abstract

In 1996, the University of Dayton Biology Department collaborated with the “Write Place” (a campus resource to enhance writing competency across the curriculum for students) to change the biology department’s curriculum for teaching scientific writing to undergraduate students. Three components for developing an integrated writing program were identified and implemented within the biology labs. In this writing program, students are introduced to scientific writing in their first introductory biology lab via a variety of methods. In the second introductory lab, biology students write two papers. The TA is the main editor (and teacher) through the process of writing the first paper; students act as anonymous reviewers for each other for the second paper. For both papers, we solicit the help of senior biology majors to work as biology writing tutors. Each year the writing

component of the introductory labs is evaluated by the students and the TA's, and the gain in student knowledge is assessed so that future changes can be made to enhance the pedagogy. Evaluation results indicate that this model of teaching scientific writing in introductory labs is effective and meets the component goals set forth by the biology department and the "Write Place." Nevertheless, we will continue to evaluate and assess the curriculum and, if necessary, will continue to tweak our scientific writing teaching methods to better suit the needs of our biology majors.

Overview and Components of the Program

In 1996, biology faculty and staff realized that many graduating biology students lacked general knowledge of scientific writing and lacked experience with writing in a scientific format. At the time, a few of the upper-level labs were requiring the students to submit formal lab reports; however, the students were given few instructions on how to do this correctly and effectively. The instructors seemed to require too much, too early and did not provide enough practice. This process of teaching scientific writing was frustrating for both the students and the TA's and resulted in negative feedback on class evaluations. Because of these problems, the University of Dayton biology department consulted with the "Write Place" to assess and change the scientific writing curriculum. The assessment revealed that the students had problems with style, formatting, and writing standards. Hence, three curricular components were built to correct these problems and to make our biology students effective scientific writers. The goal of component one is to train the TA's to be effective scientific writing teachers. Within this component, it was decided that the TA's needed to review principles of good writing for grading/editing purposes, and they needed to review the "how-to's" for writing scientifically (library research, formatting, and data presentation). The goal of component two is to introduce biology students to scientific writing before having them actually write a scientific paper. This includes contrasting writing in biology from writing in other disciplines, introducing "real" journal articles, and introducing the standards (formatting, etc.) for writing in biology. The goals of the third component are to enhance competence in writing laboratory reports and to have students apply scientific writing standards to a formal lab report.

Implementation

The goals set forth by the three components are achieved in a variety of ways within the biology department curriculum. The goal of the first component, which concern training TA's, is achieved through a college training seminar taught by the biology lab coordinator. One of the topics in the weekly seminar is "teaching and grading scientific writing." During this time, the TA's are given a "bad" example of a lab report to look through and discuss. The TA's review writing standards and scientific writing format while grading this lab report. TA's are given other lab reports to grade as individuals, in groups, and as a class. Library research and data presentation are discussed and many resources are provided for the TA's as they venture into teaching scientific writing.

The goals of the second and third components are achieved within the two introductory biology labs (and some upper-level labs). In the first introductory biology lab, students are introduced to the scientific process, are taught how to develop hypotheses, and are given the opportunity to practice writing about experiments in their lab notebooks. They are expected to write hypotheses,

procedures, results (including making graphs and tables), and short conclusions in their notebooks. The notebook exercise gives them the chance to contrast writing in biology from writing in other disciplines. In the second introductory biology lab, students are introduced to the standards of writing scientifically via a lab exercise. In this exercise, they get a chance to do library research, discuss sections of a lab report with the TA, learn simple statistics, and summarize a journal article. The week after the scientific writing lesson, students are given a chance to design a plant growth experiment in groups. The TA guides the students as they develop hypotheses and set up their experiments. Then, the lab report for the plant growth experiment is written by the students in sections. The TA edits and grades each section and reviews one section a week at the beginning of lab. When all sections are complete, students rewrite them, put them together into a formal lab report, and turn the paper in for a grade. During this process, senior biology majors are available as writing tutors. Later in the semester, students are expected to write a second lab report for which they act as anonymous reviewers for each other. Writing tutors are also available during this time.

Assessment and Evaluation

Each year, the scientific writing curriculum in the introductory biology labs is assessed to determine the effectiveness of the program and to obtain feedback for future improvement. The tools used to assess the scientific writing curriculum include a pretest and posttest during the second semester lab to assess improved student knowledge, student evaluations to assess the pedagogy, and a TA evaluation discussion group to further assess the pedagogy. Pretest/posttest scores have indicated a gain in knowledge during the second biology lab in which students learn about the standards of writing and practice the standards by writing two lab reports. Evaluations have indicated that the students feel better prepared to write lab reports and feel that they better understand the sections of a lab report and the purposes/standards for each section. The evaluations also have revealed that the students like turning their first paper in by sections and appreciated having a check sheet to guide them as they write their papers. This year's student comments on the positive aspects include that students like the teaching format, learn a lot about the how-to's of scientific writing in these labs, and find it academically challenging and satisfying to write lab reports. The suggestions for improvement include providing more time for each paper, allowing for them to see more examples of good and bad papers before writing a paper, and providing more guidance while searching for references. The TA evaluation discussion group indicated that the TA's are satisfied with the process, but feel that it takes too much of their time to do all of the teaching, editing, and grading. They suggested having the biology writing tutors more involved with the editing process or having the students learn about the standards in workshops outside of the lab classroom. The TA's also indicated that they would like to have the students exposed to even more scientific writing their first semester, and they think the students should be given more good and bad examples of lab reports to go through before writing their first report.

Future Directions

Overall, based on evaluations and sentiment, we feel that we are now effectively teaching undergraduates about scientific writing and are giving the students ample practice with writing lab reports. Many more upper level labs now require lab reports, and I have received news that students

are initially doing better on their lab reports in these labs as compared to several years ago. I will be making a few changes to the curriculum based on the results of this year's evaluations and on input from ABLE workshop participants. In the future, during the first introductory lab, the students will be required to select a journal article to read and summarize (TA's will approve of an appropriate article and guidelines for writing a summary will be given to the students). In the second introductory lab, students will be given more examples of bad and good lab reports to look through and to discuss in class with the TA. For students not performing well on the first paper in lab, they will be assessed to see if they need more review on the standards of a lab report or if they are having general writing problems. If they need more help with the standards, we will set up reviews given by the tutors for these students; however, if they need more help on writing in general, they will be asked to visit the "Write Place". Furthermore, to prevent students from plagiarizing, whether by copying off the Internet, from journal articles, or from other students, <www.turnitin.com> will be used for all lab reports in the biology department.

Recommendations

There are three key factors (recommendations) essential for success of a writing program based on the experiences of the UD biology department in developing this new writing curriculum. These recommendations were developed by Trudy Krisher (Write Place), Cathy Wolfe (former biology lab coordinator), and Jayne Robinson (biology professor) in 1999. The first recommendation is to develop the basic skills for writing scientifically while students are in the first year of college. From there, writing in biology should not be neglected, but rather should be a part of other biology classes and labs. Starting with small pilot projects that are then assessed and modified would be the most effective way for developing a writing program that is integrated into all four years of a student's college career. The second recommendation is to make sure that there is a commitment from within the department and from other disciplines outside of the department. A committed team should consist of administrators, faculty, staff, teaching assistants, and students. All of these individuals are necessary to develop an effective writing curriculum. Lastly, ongoing communication should take place throughout the entire process. This communication needs to happen during all phases, including planning, goal setting, implementing, evaluating, and revising.

Two factors were recognized as working against success during the process of implementing our writing curriculum. First, building this writing program took a lot of time and money. Adequate compensation and time was needed to provide the necessary level of commitment and to keep the project from falling to the wayside. Second, faculty initially were reluctant in supporting this program because they feared it would impede, overwhelm, or burden them. It was necessary to consult and involve the faculty, but not to intrude unnecessarily on their time. It was also necessary to show them how this program would ultimately benefit them and their teaching.