Tested Studies for Laboratory Teaching
Proceedings of the Association for Biology Laboratory Education
Vol. 37, Article 49 2016

Torturing Our Students: Can We Teach Lab Reports Better?

Randi Mewhort, Christina Elliott, and Kathy Davies

MacEwan University, Department of Biological Sciences, Room 6-118, City Centre Campus, 10700 – 104 Ave., Edmonton AB T5J 4S2 CAN
(mewhortr2@macewan.ca; elliottc24@macewan.ca; daviesk24@macewan.ca)

Extended Abstract

We have attempted to improve student skills and comfort with scientific communication by practicing writing in one first and one second year course. We have developed scaffolding strategies within and between these courses to help our students learn the format and content of a scientific paper. Our assignments in first year give students the opportunity to practice individual sections of a paper with a focus on citing and academic integrity. In our second year lab, we use group work to accomplish a bigger project focusing on hypothesis formation and data analysis. Qualitatively, student feedback has improved since implementing these strategies.

In our first year cell biology course, we scaffold the writing of a scientific paper by having students write an introduction and a results/discussion in two separate labs (each weighted at 2% of their final course grade). Later in the term students are responsible for writing a full report (6% of their grade). Previously, the students wrote two full lab reports over the course of the term with no scaffolding assignments. We found students were focused on the grade received for their assignment rather than the learning that comes from instructor feedback in this scenario. With two shorter assignments we have a higher number of submissions and students are less frustrated. Grading is spread out for instructors and they see integration of their feedback into future assessments. There is also a large focus on academic integrity in this first year lab, meant to couple practice of proper scientific writing style with appropriate citing conventions right from the start of a student's academic career.

In our second year ecology course we use scaffolding to further student practice with the scientific method. Students may or may not have previous experience in the cell biology course (it is not a prerequisite), so we provide detailed, low stakes assignments. The focus in ecology is on hypothesis formation and the scientific method that follows. In the first lab students receive instruction on the proper components of a hypothesis, and in a group are required to form such a hypothesis using provided literature as background. They write their hypothesis on a hypothesis checklist (Figure 1) and then switch hypotheses with another group. Each receiving group fills out the checklist portion to score the provided hypothesis based on the listed features. The groups can then discuss the feedback when their own checklist is returned to them. We have found that this method of assessing another hypothesis helps students to better understand the process and components that go into their formation.

Students then apply their group hypothesis experience to a field study. The data collection is prescribed, but they are required to come up with their own specific hypotheses ahead of time using their choice of the variables that we are measuring. Students work in groups to analyze the collected data relative to their initial hypotheses. The initial results from this analysis are handed in to the instructor to ensure that the appropriate statistical tests were used and the results were interpreted correctly. The students then use these corrected results to write the methods and results sections for their first "draft" of

their report. This is worth 2% of their final grade, and is graded on a coarse scale (Table 1). After students have received feedback from this assignment, they then add an introduction, discussion and abstract to their corrected draft and hand in the full report.

We saw a high number of negative student comments on the topic of writing lab reports prior to changing to the scaffolding model. Recent student comments have not made reference to the lab reports, which we have interpreted as positive support for scaffolding. While still time intensive for instructors to mark, overall scaffolding appears to offer a better experience for student writing.

This hypothesis:	Score:	Comments/Explanation:
Has a clearly stated observation/phenomenon AND explains how or why → provides mechanism:	0-Yes 1- sort of 2 -No ○ ○ ○	
Compatible with and based upon existing body of knowledge :	0-Yes 1- sort of 2 -No ○ ○ ○	
Fails to explain relevant observations/phenomena:	0- No 1- sort of 2 - Yes ○ ○ ○	
Is measurable /testable:	0- Yes 1- sort of 2 - No ○ ○ ○	
Is falsifiable/ has the potential to be refuted:	0-Yes 1- sort of 2 -No ○ ○ ○	
Has at least two possible outcomes:	0-Yes 1- sort of 2 -No ○ ○ ○	
Is Acceptable:	Total Score: _____ 0-3 = accept 4-8 = accept but modify 9-12 = reject/ redo	Accept ○ Needs Modification ☐ Comments: _____ _____ _____ Redo ○

Figure 1. Hypothesis checklist (adapted from Lyman Briggs College, pers. comm. with C. Murphy). Students exchange checklists with other groups for feedback.

Table 1. Weighting of report components/ grading categories in the rubric for the draft lab report assignment for second year ecology labs. The total value of the assignment is 2% of the final course grade. Students have previously submitted hypotheses and statistical test results for instructor review.

Component and weighting	Grading categories for each component
Methods /7 Results • Text /16 • Visuals /6 • Data manipulation /3 Literature Cited /2 Presentation • Grammar etc. /2 • Format /2 • Clarity /2 Hypotheses /3	90-100% (excellent - exceptional) 75% (good - very good) 50% (minimum requirements met) 25% (inadequate) 0 (did not attempt)

Keywords:Writing, scaffolding, assignments

Mission, Review Process & Disclaimer

The Association for Biology Laboratory Education (ABLE) was founded in 1979 to promote information exchange among university and college educators actively concerned with teaching biology in a laboratory setting. The focus of ABLE is to improve the undergraduate biology laboratory experience by promoting the development and dissemination of interesting, innovative, and reliable laboratory exercises. For more information about ABLE, please visit **http://www.ableweb.org/.**

Papers published in *Tested Studies for Laboratory Teaching: Peer-Reviewed Proceedings of the Conference of the Association for Biology Laboratory Education* are evaluated and selected by a committee prior to presentation at the conference, peer-reviewed by participants at the conference, and edited by members of the ABLE Editorial Board.

Citing This Article

Mewhort, R., C. Elliott, and K. Davies. 2016. Torturing our Students: Can we Teach Lab Reports Better?. Article 49 in *Tested Studies for Laboratory Teaching,* Volume 37 (K. McMahon, Editor). Proceedings of the 37th Conference of the Association for Biology Laboratory Education (ABLE).
http://www.ableweb.org/volumes/vol-37/?art=49