

Science Writing, Wikis, and Collaborative Learning in the Laboratory

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Extended Abstract

Background

As laboratory educators, we try to make the laboratory experience inquiry-based, student-centered, and reflective of the process of science. However, though we may have students work in teams during an experiment, we often have them go their separate ways to write individual reports. But that's not how science is done; it is very hard to find primary articles in the research literature written by one author. We have students collaborate for part of the science process and then send them into solitary confinement to finish the process. Writing is an important part of the collaborative process of science, and that is why I had students use wikis to collaboratively write laboratory reports.

Wikis are a collection of interlinked pages, and their design is made for creating collaboratively authored texts. Instructors can compare document versions (using the wiki's history log), and can therefore verify and evaluate individual student contributions. Group reports also result in fewer reports to grade, which allows more constructive and timely feedback on drafts. Educators have recently started to use wikis to support collaborative and constructivist learning (Parker and Chao, 2007). Education use of wikis in the sciences has been relatively rare, though Elliott and Fraiman (2010) report on chemistry classes writing web-based collaborative lab reports. Using peer reviews and group discussion in the wikis, the focus is not only on the content of the finished lab report, but also on science writing as a creative and iterative process.

Implementation

We used the wiki module in Moodle, our Course Management system. Students wrote group reports using wikis in the spring semester course of our introductory biology sequence for two years in a row. The wikis were set up so that each group sees and can edit only their own wiki. Students wrote 4 group lab reports, including a "practice wiki report." For each report, each student wrote different sections (Intro, Methods, Results, Discussion are all separate "pages" in the wiki), and all students contributed peer review comments on all sections. The original author of each section then used those comments to write a final version. One student had the role of "Principal Investigator" (PI), which meant they were responsible for finalizing the report, checking for good flow from section to section, similar style, etc. Roles were rotated for subsequent reports, so each student had a turn at being the "PI," and each student got to write every section of a report.

Students were told that both their writing and their contributions to the group report would be assessed. This forces students to reflect upon the quality of their contribution as they review and comment on their peers' writing (de Pedro Puente, 2007). I graded each section of the report (based upon a rubric shared with students) and evaluated contributions made by each student. Each contribution received a score of 0 (not useful), 1 (somewhat useful), or 2 (good, useful comment). Nančovska Serbec *et al.* (2010) note that the quality of contributions rather than the quantity is important in assessing student wiki work. I had students submit a "Team Member Assessment" after every report so I had peer grades for each student. Students' grades were determined by a combination of: (1) the grade on the report section they wrote, (2) their "contribution factor," which is their total contribution score relative to the group's average contribution score, (3) their peer review grades assigned by other group members, and (4) the grade on the completed full report.

Assessment and Discussion

Student responses on course evaluations from the 2 years with group wiki writing were compared with responses from the 2 years prior without group writing. Student performance on assignments (lab report grades) was not affected by collaborative writing with wikis. However, student perceptions of the course and of their gains from wiki writing were affected. There was a shift toward a more positive perception (chi-square tests for independence; all $P < 0.01$). In this positive shift, more students agreed that (1) the amount of work during lab sessions was appropriate to the time available, (2) the total workload for lab was appropriate, (3) the lab handout readings were clear, and (4) students had opportunities for extra help.

Students' perceptions of group reports relative to individual reports were also positive. The majority (62-75%) of students reported that, compared to writing individual reports, writing group reports: (1) helped their understanding of the concepts presented, (2) helped improve their scientific writing, (3) helped them think about the strengths and weaknesses of their writing, and (4) helped increase confidence in their ability to write scientifically.

Students' open-ended responses were very similar. A typical, positive open-ended response: "It made effective use of my time during the year. The lab reports offered a chance to more fully investigate the labs we conducted without the effort of writing a whole lab report. At the same time we were able to learn how to write better because of the feedback from our group and also by observing other's work." A typical negative response: "Using the wiki was fine but I hated having group projects I felt like my grade in this class suffered because of my group members and their inefficiency to get their work done."

Student perceptions of the course and of their own abilities improved with collaborative report writing using wikis. Neumann and Hood (2009) found that student perceptions and engagement, but not performance on assessment, might be enhanced when a wiki is used. Even though student grades on assignments were not improved by group wiki writing, the beneficial effects of positive student perception toward such a large introductory biology course should not be ignored. Using peer reviews and group discussion in the wikis, the focus is not only on the content of the finished lab report, but also on science writing as a creative and iterative process.

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