ARTICLE
Collaborative Online Writing Assignments to Foster Active Learning

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To help students master the content of a neurophysiology course, they were asked to participate in collaborative writing projects. In the first two years, students contributed to a class wiki by summarizing one lecture and editing summaries of several others. In the second two years, students worked in teams of three or four to write a series of illustrated chapters spanning the entire semester. The second assignment kept students more engaged than the wiki project, and although they found it a significant amount of work, they also believed that it helped them learn the subject matter. Working in teams, however, was not always a happy experience.

Key words: writing, collaboration, learning strategies, class notes, online work, wiki, Google Docs, neurophysiology course

Writing-to-learn ("writing across the curriculum") and enhancing learning through collaborative work are now well-established principles in higher education. I have implemented these concepts in my Neurophysiology course for the last four years by asking students to write illustrated collaborative lecture notes. In the first two years, the assignment was to contribute to a group Wiki by summarizing one class in detail and editing the summaries of several other classes. In the next two years, students instead used Google Documents in teams of three or four to create a series of illustrated chapters that spanned the entire course. I describe here the details of the assignments, the highlights and difficulties of each approach, and the students' reactions to working in assigned teams.

My inspiration for assigning collaborative lecture notes stemmed from three main sources. The first was hearing from friends who had attended medical school about “lecture committees,” in which students took turns making detailed lecture notes, typing them up, and distributing them to the rest of the class. The goal was to share the work of recording the flood of information they were expected to learn.

A second inspiration was the conventional characterization of today's “millennial students” (Oblinger, 2003), which suggests that they like to work in groups, an experience that supposedly begins in daycare. Current students also expect 24/7 access to online information, and to be in constant digital contact with each other. Thus, collaborative online work seemed to be a natural for them.

The third inspiration was the widespread belief that writing can foster learning in every discipline (see the review by Bazerman et al. (2005), and the extensive site on writing across the curriculum at Colorado State University: http://wac.colostate.edu/). Writing to foster learning was not a novel goal for me; my Neurophysiology course has included essay assignments in addition to exams ever since I began teaching it many years ago. Adding a collaborative writing assignment would be an easy extension of what we already were doing. The course also had a substantial open website with an online lab manual (Olivo, 2003) and an online video guide to the readings (Olivo, 2011); adding another online component would fit right in. Finally, I had noticed over the years that some of my most diligent students rewrote the notes they took in class, usually pasting in figures from the handouts that I distributed in each class. Why not give everyone access to detailed illustrated lecture notes? Wouldn’t it improve everyone’s mastery of the course?

YEARS ONE AND TWO: A GROUP WIKI

For the first two years, the class assignment was to create a collaborative wiki of lecture notes for the course. As most people know, wikis are online documents that retain their history, so that as multiple authors and editors work on a document, the text evolves without destroying earlier versions. It is always possible to read earlier versions, to see which parts were changed from prior versions, and to revert to a previous version if necessary. Wikipedia is the best-known public wiki, but various sites provide the tools to create closed wikis that are open only to a specified group. At the time I selected a wiki environment, the wiki in our campus’s Moodle environment was primitive and virtually useless, but PBWiki.com (now PBWorks.com) offered a free wiki site that would suit a class. Its editing tools resembled a simple word processor, and it was possible to upload files of illustrations from our class handouts that students could incorporate in the text that they wrote. It promised to be – and was – easy to use.

To prepare the wiki for the class’s use, I established the account and set up a home page with a table that listed all the lectures by date and topic, with spaces for students to enter their names as authors and editors (which they did simply by editing the page using the standard editing tools). Students were asked to sign up after the first class, and all of them did so easily.

The home page also linked each lecture to a blank wiki page which the assigned author would later develop. To prevent chaos in uploading figures into the single file-storage environment that the wiki site offered, I established a naming convention for each figure consisting of the lecture number, the lecture topic, and a sequential letter.

Mousing over a filename in the list showed a thumbnail of the figure (Fig. 1).

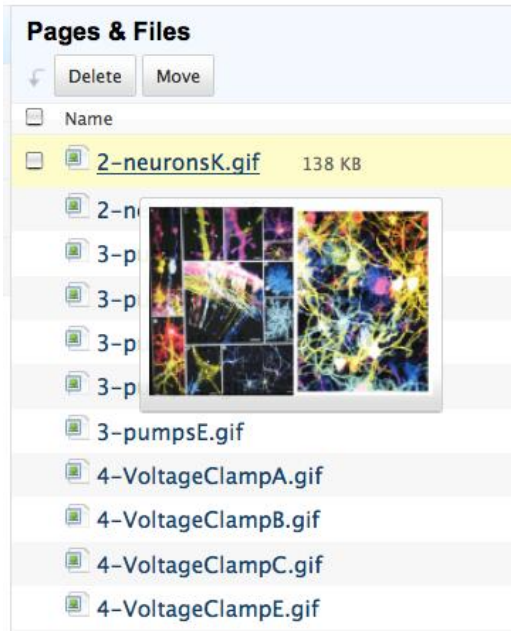

Figure 1. The wiki's list of uploaded illustrations, showing the scheme for creating order by naming each image file with the number of the lecture, its general topic, and a letter for the specific file. Mousing over a filename displayed a thumbnail of the figure.

The organizational aspects of the wiki worked well. Students were able to write notes, incorporate illustrations, and edit the pages in a timely way. The wiki's review structure allowed me to examine contributions from individual students by selecting versions to compare (Fig. 2), and then displaying the edited page with the additions and subtractions marked (Fig. 3).

In the course of the semester, a student's responsibilities were limited to writing one set of notes and editing a few others, which they did in a timely way. It looked as though my plan for an equivalent to the medical lecture committee notes was working out. A closer look, however, showed that things were not always going as well as it seemed. I had made a number of assumptions the first year, and most of them proved overly optimistic:

(a) I assumed the class notes would be of high quality because students would be responsive to peer pressure, and authors and editors would strive to produce accurate and complete notes. When I eventually looked at what was being posted, I found that in some cases this was correct: some students were writing excellent, well-illustrated summaries of the material we had covered in class. But other students, typically weaker ones, were incorporating information that was misunderstood, incomplete, or substantially incorrect. A traditional bit of advice from the staff of university teaching centers is that if you'd like to know what students are getting from your lectures, collect their notebooks and read their notes. Reading the wiki provided similar insight, and it was sometimes very disheartening.

Figure 2. For each page, a wiki allows comparison of different versions by selecting two saved versions of the page to compare.

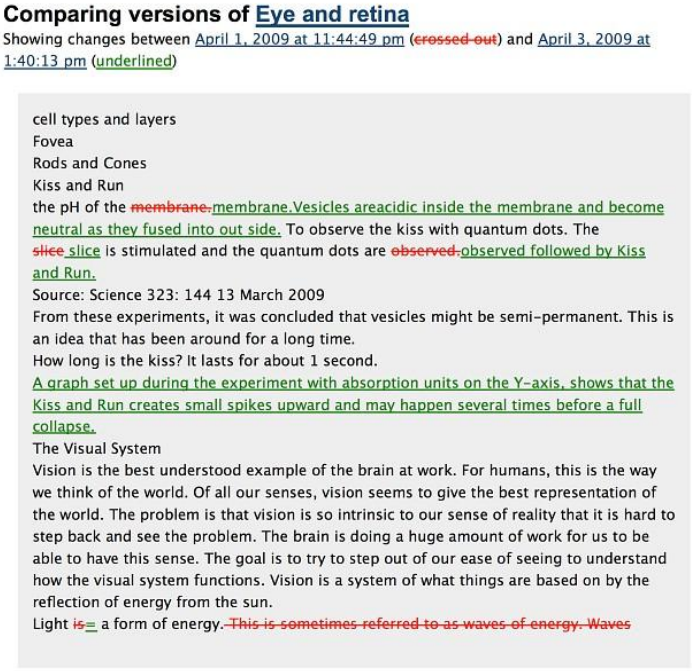

Figure 3. In the comparison of two versions of a wiki page, new material is underlined in green and deleted material is crossed out in red. (The material on "kiss and run" transmitter release was a brief account of a then-current article mentioned at the start of class, and is unrelated to the topic of the class.)

(b) I assumed that the wiki would run itself with no input from me, just like the medical students' lecture committees. After the experience of seeing misinformation incorporated into the summaries, I started lurking on the site. When necessary, I wrote emails to authors and editors suggesting that they revisit their work and make corrections, which they did.

(c) I assumed that students would voluntarily participate in the wiki beyond their assigned author and editor tasks; I thought they would value the extensive notes and figures, and would want them to be as accurate as possible. A few diligent students did voluntarily participate beyond their assignments, but not many

and not consistently. Some students seemed to value the notes, but it is not clear that they all did. The medical lecture committee model was misleading.

(d) The wiki was not graded because I had thought of it as created by students for their own use. For a few students, this was a license to do minimal work, and late in the semester one student actually ignored his writing assignment completely (I must add that he was a cross-registered student from another college).

After two years of the wiki assignment followed by a sabbatical, I decided to explore a different environment for collaborative online writing.

YEARS THREE AND FOUR: GOOGLE DOCS

Armed with my experience from two years of wikis, I completely reworked the assignment. We would use Google Documents, an online writing environment where groups work on a file that is stored "in the cloud." The document can be completely public or shared only among specified individuals; in my plan, a document would be open only to the team that wrote it. Students would be assigned to teams of four, which would be permanent for the semester. I would create the teams, mixing seniors and juniors and strong and weak writers, and they would have to learn to work together. This followed advice about working in teams from Oakley et al. (2004). Each student, instead of writing and editing pages covering only one or two classes, would contribute to a series of chapters that spanned the entire semester. I asked the students to think of themselves as writing a textbook for next year's class, a potential use for their work that I am still contemplating. Since each student would be doing a considerable amount of writing and editing, each team's effort would be rewarded by comments and qualitative grades that would contribute to their final grade. (The full assignment is given in Table 1.)

The new assignment reflected my undiminished belief that extensive writing in neuroscience was beneficial both to develop the students' skills as writers, and also to help them learn the content of our course. In effect, they would all become like the very diligent students from previous years who rewrote their class notes and pasted in illustrations. Peer pressure and altruistic behavior would be supplemented by the strong motivation that comes from work that is graded.

Setting up Google Docs (http://docs.google.com) was relatively straightforward. I established a separate Gmail account for myself to handle this assignment, and I asked each of the students to create Gmail accounts if they did not already have them. (By the second year, our college had switched to Gmail, so it was only Five College students who needed to establish new Gmail accounts.) Each student emailed me from their Gmail account, and I used the identity of those emails to create a folder for each team (Fig. 4). A document dropped into a team's folder would automatically be shared with all members of the team (and me), but no one else. I also created a "Best Chapters" folder accessible to the entire class in which I placed copies of at least one well-written example of each chapter. (A technical note: by copying a chapter, all comments are stripped off, which preserves privacy but also eliminates suggestions for clarifications and other improvements.)

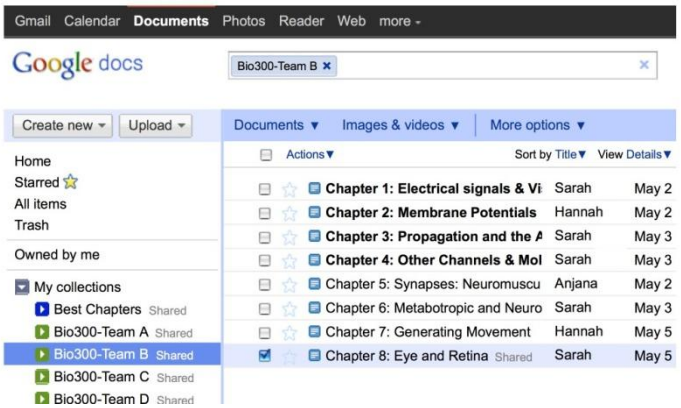

Figure 4. Each of the four teams had a folder that held the team's chapters. Chapters were accessible only to the students on that team and the instructor. Chapters with identical names from different teams remained uniquely identifiable.

Teams had pre-assigned roles for each member, which rotated from chapter to chapter so that eventually each student would fill each role multiple times. Initially, there were four distinct roles:

(1) Organizer of the chapter's structure, uploading illustrations from our Moodle site into Google Docs in an appropriate sequence, creating major subheadings, and writing captions.
(2) Author of the main text.
(3) Content editor, correcting and extending the text and captions as necessary.
(4) Copy editor, correcting spelling, punctuation, and formatting.

Although it was understood that these roles were unequal, the students felt they were too unequal. After several chapters, the roles were changed to:

(1) Organizer, illustrations and captions (unchanged).
(2) & (3) Two authors of the text (half of the chapter each).
(4) Editor for both content and copy quality.

This distributed effort more fairly for each chapter, and we kept this structure for the rest of the semester.

Titles and due-dates for each chapter were listed in the writing assignment and on the syllabus. Since transitions between major topics (and thus between chapters) sometimes occurred in the middle of our 80-minute classes, the syllabus was clear about where a chapter ended. In general, teams produced work that met the assignment well. They followed the formatting instructions for headings, captions and text, and placed illustrations in appropriate places, as shown in the example in Figure 5.

	**COLLABORATIVE WRITING PROJECT**
The Project	Our collective goal is to write a set of **high-quality course notes** that could potentially serve as a textbook for the course. We will create teams of three or four students. Each team will produce a series of illustrated chapters that will summarize the different sections of our course. The best version of each chapter will be available to the entire class.
Teams	**Writing teams** will be formed by the instructor, mixing students with different levels of experience. Teams will be permanent for the semester, although a member can be expelled from a team if the other members agree that she has not been pulling her weight. Team members will rotate through the following roles, moving down the list with each new chapter. The team roles are: • **Organizer** of the chapter, establishing subtopic headings and uploading all the illustrations for each subtopic. • **Caption Writer,** providing detailed captions for each illustration. • **Text Author,** writing the main text that weaves the illustrations and captions into a whole. • **Editor,** revising the draft for accuracy, clarity and style; checking spelling, punctuation, and layout; notifying the instructor that the assignment is ready for review; and making any revisions that are suggested later. [For teams with only three members, the Organizer and Editor roles will be combined.] Although these roles do not always involve equal amounts of work, rotating through the roles will guarantee that all team members contribute equally over the span of the semester. Teams are always encouraged to make decisions collaboratively (such as modifying a chapter's organization, or discussing the point that an illustration is meant to convey), regardless of each member's assigned role for that chapter. Teams may, if they wish, choose to **organize their work differently** as long as all members make equivalent contributions. For example, the team could divide the chapter topic into two equal sections, with each half-team dividing the task of providing illustrations, captions, and text for its section.
Signing Up with Google	Our collaborative writing will use **Google Docs**, a free online authoring environment that allows multiple authors to work on the same document. Your Smith gmail account will give you access to Google Docs. If you need to create a gmail account**,** go to http://docs.google.com/. On the right side of the page, you will see a box to "Sign in with your Google Account," and under that, a smaller box inviting you to "Create an account now." Follow that link and fill in the information requested. Use your gmail account to send a message to RichardFOlivo@gmail.com. I will use your address to assign you to a team.
Accessing Google Docs	To access your documents, go to http://docs.google.com/. Sign in and click the link on the left for items "Shared with me." Your team folder should be there. The first time you visit, it will contain a mostly blank document, "Chapter 1," which your team can then expand. (The document contains a title, a subheading, some text, and a figure to demonstrate the format. You may replace this material with your own version, or you may keep it and continue from where it leaves off.) For future chapters, your team will create new blank documents to place in your shared folder.
Illustrations	PDF files of PowerPoint slides from our classes will be available in our course's **Moodle site**. You can download the Moodle file to your own computer, open it with Adobe Reader (or Preview on the Mac), and then zoom in on individual images until they fill the screen. Take a screenshot of the image to save in a folder for future insertion in your Google document. To upload the image, place the cursor on a new blank line where the figure will be inserted. The blue-green "insert image" button in the formatting bar will open a dialog box that lets you browse on your computer to select an illustration to insert at that position. You may also bring in additional figures from other sources to further illustrate your chapter, but only if they are scientifically accurate and visually informative. Avoid illustrations that are merely decorative. In the caption, please identify the source of any new figures (give the complete URL if you found it online). Illustrations can be reduced in size by dragging a corner. After clicking on an illustration (which will highlight its corners), it should say "Position: **Inline**." If it does not, click the "inline" link. This will keep the illustration in its proper place in the text if you later make edits before or after the figure. The Caption Writer will later add a caption under the figure (in Arial 10 point) to explain its details.

Table 1. The collaborative writing assignment to create a series of illustrated chapters in Google Docs. Later in the semester, the text author's role (the most substantial task) was divided between two students for each chapter.

	**COLLABORATIVE WRITING PROJECT**
Formatting Chapters	Google Docs uses a formatting bar that is similar to ones you are familiar with in Word and other software. Since chapters by different teams will eventually be combined into a uniform set of course notes, please use our standard formatting. Use the following default settings: **Chapter titles: Heading 2** (Arial 18 point) **Major subtopics: Heading 3** (Arial 14 point) **Text: Normal text** (Times New Roman 12 point). Do not indent new paragraphs, but skip a line before them. **Figure captions**: Arial 10 point. **Illustrations:** Insert figures on blank lines between paragraphs of text, centered, with a caption (Arial 10 point) under the figure. Chapters should end with the names of the team members and each one's role for that chapter.
Chapter Titles & Due Dates	The titles and due-dates for this year's chapters are shown here. They are also marked on the main syllabus. Chapter **1, Electrical Signals & Visualizing Neurons.** DUE: Feb. 9 Chapter **2, Membrane Potentials and Voltage-Clamping.** DUE: Feb. 16 Chapter **3, Propagation of the Action Potential.** DUE: Feb. 21 Chapter **4, Other Channels & Molecular Structure of Channels.** DUE: Mar. 1 Chapter **5, Synapses: Neuromuscular Junction.** DUE: Mar. 15 Chapter **6, Synapses: Neuron-to-Neuron & Metabotropic.** DUE: Mar. 29 Chapter **7, Generating Movement.** DUE: Apr. 5 Chapter **8, Eye and Retina.** DUE: Apr. 17 Chapter **9, Primary Visual Cortex.** DUE: Apr. 26 Chapter **10, Extrastriate Cortex.** DUE: May 3
Problems	Advice will be available (as a PDF file) on how teams can self-manage their work and assure that all members contribute appropriately to the group's effort.
Self-Assessment	Self-assessments of each team member's contributions early in the semester will help teams adjust their working styles. A second self-assessment at the end of the semester will allow individual grades to reflect the actual contributions made by each person to the team's overall work.

Table 1 (Cont'd). The collaborative writing assignment to create a series of illustrated chapters in Google Docs.

My intention was to read and comment on chapters soon after they were posted, but I soon fell behind. In the first year of this assignment, I delayed due dates until after I had responded to previous chapters, but the students later told me this was a mistake since it meant they were writing the next chapter too long after we had covered the topic in class. Thus, in the second year, when I again fell behind, the due dates remained fixed, although I readily granted extra time if a team requested it.

The commenting mechanisms in Google Docs are of mixed utility. Adding a comment to a highlighted phrase in the text is easy, as shown in Fig. 6 for a chapter with many problems. But it is not easy to cross out or revise specific language; initially, I adopted a convention of graying out text to indicate words that should be removed, and adding new words in red. This requires many steps (highlighting the text, changing the text color, etc), and eventually I did very little copy editing of that sort. Instead, I mostly limited myself to marginal comments and left the copy editing to the students. (This is what many teachers of writing recommend in any case: correct the specific flaws in an early paragraph but not thereafter.)

To add a summary comment at the end of a chapter, I highlighted the names of the students listed as the authors and editors, and attached my overall comment to that block of text. At least on the surface, the Google Docs assignment was a success. Teams wrote plausible chapters and seemed to be working hard together, arranging meetings to plan their work after class or lab, or exchanging comments in Google Docs. The writing project was clearly an integral part of their work for the course.

WORKING IN TEAMS

Anyone who has taught labs has watched students working in teams. In my course, students often are acquainted from previous courses, and they form lab partnerships that typically put very able students together, with less able students also together. Different styles seem to co-exist this way, and I was not inclined to interfere in their choices. For the collaborative writing teams, however, I was influenced by Oakley et al (2004), who suggest that in the real world, people do not get to choose their coworkers, and thus that it is important for students to learn to work with anyone. Persuaded to try this approach, I created the

Let's consider again visualizing neurons. An effective method used is backfilling the neuron through the axon with cobaltous chloride (Fig. 18). In this technique, the neuron takes up the solution by diffusion and over time labels the neuron's complete region of synapses in the neuropile of the ganglion.

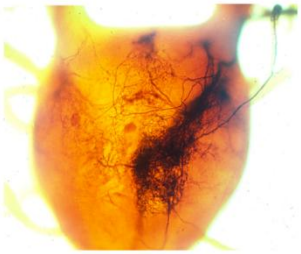

Figure 18. An insect ganglion with a single nerve placed in cobaltous chloride, which produces a backfill effect via diffusion that allows for the visualization of the neuropile.

The backfill technique can also be performed by injection, for example into a muscle, for retrograde transport from the synaptic terminal up the axon using such stains as horseradish peroxidase. An additional backfill method utilizes crystals of lipid-soluble fluorescent dyes exposed to the cell membrane, which diffuse laterally, allowing the surface of the neuron to be imaged (Fig. 19).

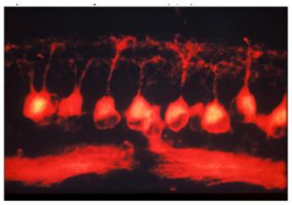

Figure 19. Retinal ganglion cells fluorescing due to exposure to lipid-soluble dyes that label membrane lipids. As the dye diffuses throughout the cell membrane, more of the cell surface can be visualized.

Immunohistochemical labeling can be used to target and label specific cells by primary antibody recognition of specified protein markers. A secondary antibody recognizes the primary antibody by isotype and binds to allow fluorescent visualization for wavelengths

Figure 5. A page from an early chapter, showing the placement and formatting of illustrations, captions, and text. In general, Google Docs was easy for students to use.

collaborative writing teams, putting seniors together with younger students, and distributing self-identified "good writers" among the different teams. This was not an entirely happy arrangement, as it turned out.

My insight into how students were working together came from a self-assessment form (Table 2), which I modified from a version suggested by Oakley et al. (2004). The self-assessment was administered as an email in the middle of the semester and again at the end. The form was confidential, and from the frank and often extensive quality of the answers, the self-evaluation seemed to be taken very seriously by every student in the class.

While some teams worked harmoniously together, others had conflicts brought about by substantial differences in diligence, expectations, and working styles. In some fortunate cases, individual ratings indicated great appreciation of other members of a team. For example, one student gave another 13 points (the average had to be 10) and a rating of "Very Good." She wrote: "K was such a great group member and it was wonderful working with her. She put forth a lot of hard work. Her writing for Chapter 5 was exceptional and I was very impressed. Even under the pressure of not having all the captions finished on time, she worked hard to finish her part and did a great job at that. Great communicator and hard worker, it was a pleasure working with her this semester."

In another very favorable comment from a different

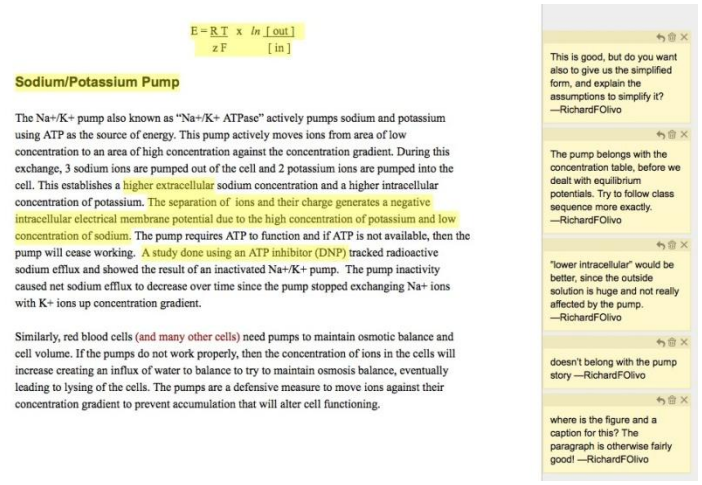

Figure 6. Marginal comments are associated with highlighted regions of text. Clicking a comment brightens its highlighted text.

team, a student received a rating of "Excellent" and 12 points: "J always tried to do the most on the chapters at hand, regardless of her job. Furthermore, we both got together and re-edited Chapter 5 to review material that she was unsure of. She was happy to do this and continued to put forth a great effort on her work in the chapters. Furthermore, she edited Chapter 6 as needed until late at night. She truly cared about this project and I was very thankful to have her help. Furthermore, with English not being her first language, I was even more impressed that she worked so hard to do her best in editing the chapters." I should note that the reviewed student (J) was very quiet in class and lab, and I would not have known about her diligence and skill if her teammate had not written this enthusiastic review.

In contrast, however, some ratings were disappointed and even harsh. Here is one where the rating was "Marginal" and the points awarded were a dismal 3: "I was very disappointed in the quality of H's work in recent chapters. Her failure to write captions and organize Chapter 5 in a timely manner put a burden on the rest of the group to finish the chapter on time. She also failed to complete her part (author) of Chapter 6 on time…. On top of that, the quality of writing and level of detail and accuracy was so low that the rest of the group and I had to stake a form of 'intervention' and confront her about the quality of her work.... I'm sad that I have nothing good to say on H's behalf for both assessments, but it was overall very difficult to work with H this semester and it was unfair for the rest of our group since we worked very hard throughout the semester." While it is clear this student caused difficulties for her team, the comments also suggest that the student may have benefitted from her classmates' intervention.

General comments about the writing project (the third section of the assessment form) also revealed some frustrations in working with teammates. A very diligent, hard-working student wrote at the end of the semester: "For the second half of the chapters, I continued to go back and re-edit the chapters extensively (particularly Chapter 6

Collaborative Writing Project: Self-Assessment Form

Please reply to this email in the next few days (just to me; your reply is confidential) by filling in the spaces below, basing your assessment on your current team and the chapters that you wrote together. [This self-assessment was adapted from an article in the Journal of Student Centered Learning, vol. 2, no. 1, 2004.]

I. Self-Assessment of Collaborative Writing Team:____ (enter team letter A, B, C, or D)
Please enter the names of all of your team members, INCLUDING YOURSELF, and assess the degree to which each person fulfilled her responsibilities in completing the writing assignments. Assign a rating from the scale below, award points using the system described, and write a commentary for each team member, including yourself. Your assessment should reflect an individual's level of participation, effort, and sense of responsibility, not her academic ability.

RATING SCALE:
Excellent: Consistently carried more than her fair share of the workload.
Very good: Consistently did what she was supposed to do, very well prepared and helpful.
Satisfactory: Usually did what she was supposed to do, acceptably prepared and helpful.
Ordinary: Often did what she was supposed to do, minimally prepared and helpful.
Marginal: Sometimes failed to carry out her assigned role, not dependable.

POINT SYSTEM:
You have 40 points to distribute, but you may not give any team member 10 points. Some individuals must receive more than 10, and some less. The total should be 40 (30 for 3-person teams).

Assessments:
Name of team member: Rating: Points:
Commentary (DO NOT LEAVE BLANK!):

Name of team member: Rating: Points:
Commentary (DO NOT LEAVE BLANK!):

Name of team member: Rating: Points:
Commentary (DO NOT LEAVE BLANK!):

Name of team member: Rating: Points:
Commentary (DO NOT LEAVE BLANK!):

II. Regardless of any particular problems your team may have had, to what extent has the collaborative writing project helped you learn the content of our course? SCALE: (Very Useful) 7 6 5 4 3 2 1 (Not Useful)
Please enter a number: ____
Comments:

III. What suggestions would you make to improve the project?

Table 2. The self-assessment form emailed to each student at the end of the project's most recent year.

where E's part was simply a disaster) regardless of my job on the chapter. Furthermore, no one in the group took initiative in re-editing the earlier chapters based on your suggestions after I mentioned doing so a few times, so I went ahead and spent a significant amount of time re-editing and correcting all of the previous chapters, particularly in Chapter 2 where many more figures needed to be added. I could not have put more effort into this group project and have never worked so hard on a group project in college thus far." Was this ultimately a productive "learning experience" for this hard-working student, or was she being asked unfairly to compensate for students whose approach was less diligent than hers? The answer is not clear to me, and I have not ruled out allowing students to form their own teams in future semesters, even if strong and weak students may cluster in different groups.

Fortunately, there were also very positive comments about the over-all project. One student wrote: "I never considered myself a good writer (though my intention before deciding to become a Neuroscience major was to major in English Literature). I think, however, I was considered the 'good writer' of the group I was assigned. I think it's good that we were assigned this project -- I noticed my peers were struggling with writing and finding a

voice as a writer, which is both understandable (since we are science majors and not all of us are strong at writing) but also disappointing (since this is a liberal arts college and we should all really be well-rounded). We don't get much practice writing as science majors, and I think this course offered a range of graded work (exams as well as writing projects) which was a great opportunity to learn as well as presenting us with a new way of thinking about the material."

Another student, a self-described weak writer, wrote: "Editing other student's work was very helpful to me. I have a better understanding of when my sentence[s] are awkward." She added: "This class was a phenomenal experience and I learned so much more by having to write my own textbook." And finally, a mixed review from the only sophomore in the class: "This was a good idea, though more challenging than I expected. What you expect in the chapter is often not covered in detail in class, or in the book, making it that much harder to write the chapter. However, this could partly be due to my own note taking and understanding of the material. Writing these chapters showed me the holes that I had in my understanding, but not necessarily how to fix them. In the end, I think we got better at writing and formatting the chapters, and I found them useful as a study tool."

In the project's second year, the final self-assessment form (Text Box 2) included a quantitative scale asking "to what extent has the collaborative writing project helped you learn the content of our course?" The average response was 5.7 on a scale from 1 (not useful) to 7 (very useful), with two 7's and nothing lower than 4; that is, students responded positively to the assignment. This was borne out in their comments: "This was a great learning tool and helped me a lot;" "While it's very hard to churn these chapters out week after week, I do believe that they help cement much of the material in one's head;" "It was really good to have other people to work with because the concepts can be tough, and hearing explanations from other students was very useful."

In conclusion, my observations about the Google Docs assignment suggest that:

- Writing online worked well technically.
- The assignment to write chapters throughout the semester engaged students much more than the wiki assignment to summarize a single class.
- Students learned from collaboration.
- Grading the chapters made students take the assignment seriously.
- Grading took time, though not as much time as if each student wrote individual papers.
- Teamwork was sometimes frustrating for the best students.
- Weak students were helped by support from their peers.

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