



Science Writing, Wikis, and Collaborative Learning in the Laboratory

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Background – The Issues

- We try to make the laboratory experience inquiry-based, student-centered, and reflective of the science process
- We have students work in groups to design experiments, and collect and analyze data, BUT...
- we make them go separate ways to write a report
- Science is a collaborative process and writing is an important part of the collaborative process of science



- Students often fail to see the purpose of the lab report
- Students need to see report writing as an authentic science activity, where the process of writing provides an important opportunity to engage with the material...

We want to make substantive comments and guide their writing to truly encourage "writing to learn," but it is difficult to do with 3-4 reports from 75+ students!

Solution?: Collaborative lab reports would better reflect the science process

Problem: It's difficult to evaluate the contributions and participation of each student

Solution: WIKIS!

Educators have recently started to use wikis for collaborative work in chemistry (Elliott and Fraiman 2010) and engineering (Parker and Chao 2007)

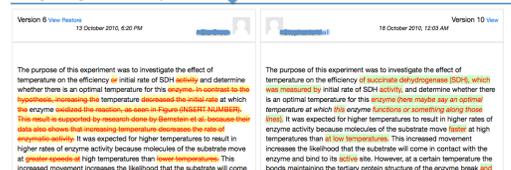
- Wikis are designed for creating collaboratively authored texts
- Wikis provide a better way to redistribute responsibility to all group members

Wikis store every change made to the document; the wiki's "history log" provides a way to assess individual contributions to the group report



The history log shown at right lists the various versions of the page. You can select any two versions to compare.

Below, you can see two versions being compared side-by-side:



Implementation

The course

- BIOL 183 is one of our two introductory biology courses. It is team-taught, and it's required for students majoring in Biology, Neuroscience, and Biochemistry. It is also taken by pre-health professions students.
- The class has one lecture section of 70-90 students, and multiple lab sections of 16-24 students.

Wiki logistics

- Used the wiki module in Moodle (our Course Management System). (There are alternative sources for wikis or collaborative authoring platforms (e.g., GoogleDocs), but since the lab part of the course uses Moodle heavily, we didn't want to force students (or instructors) to have to go to multiple web sites.)

- Students worked in groups of 3-4; each group sees (and can edit) only their own wiki.
- Wikis were used to write 4 different lab reports; the first report was for practice.

- Wiki templates were provided so there was a specific structure (i.e., separate pages for Introduction, Methods, results, Discussion, etc.)
- Students had organized roles:
 - Figure to the right shows the roles in a 3-person group (Bob, Carol, and Ted)
 - For the next report, the roles are rotated so they write different report sections.
 - One student is always the "PI", in charge of the overall flow of the report.

Wiki Section	Draft	Review process	Final Draft
Title	Group effort	everyone	Group effort
Abstract	Group effort	everyone	Group effort
Introduction	Bob	everyone	Bob
Methods	Carol	everyone	Carol
Results	Carol	everyone	Carol
Discussion	Ted	everyone	Ted
Literature Cited	Group effort	everyone	Group effort
Overall (PI) = Bob			

Grading

A student's grade = completed report grade X grade on the section they wrote X contribution to group report (based on report rubric) (based upon wiki posts and peer review grades)

- Quality (rather than quantity) of contributions is important in assessment (Nančovska Serbec et al. 2010). Contributions were evaluated on a 0, 1, 2-point scale.

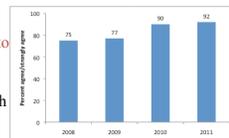
- "Contribution factor" based on total contribution value relative to the group's total contribution value
- Figure below shows Excel sheet that calculates "contribution factor," combines that with the peer review grades and the grade on their section of the report. These factors are then multiplied by the total report grade.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	
1																								
2																								
3	Group	SECTION	Abstract	Intro	Methods	Results	Discussion	Lit Cited	SUM	Factor	Peer Reviews	AVG Review	comments				Section AVG Grade ALL	Report Grade	Actual Grade	Actual %				
4	T, E, H, D, L, C, K, V, O, D								6	8.00	10	10	10	10			8.6	9.32	4	51.73	54	83.1		
5	R				1	1	2	2	4	1	6	11	14.67	10	10	10	10	10.9	6	60.68	60	92.3		
6	A, I (PI)				1	2	1	2	6	8.00	10	10	11	10.33			9	9.6	4	53.28	57	87.7		
7	M				1	1	1	3	7	9.33	10	9	9	9.333			6.3	8.73	5	48.43	52	80.0		
8	D				1	1	1	3	7	9.33	10	9	9	9.333										

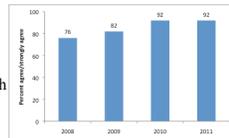
Assessment and Discussion

Student perceptions -- from end-of-semester evaluations; responses are on a 5-point Likert scale from (5) Strongly Agree to (1) Strongly Disagree. Chi-square test for independence was used to compare 2 years (2010-2011) with wiki use to 2 years prior (2008-2009) without wiki use (and with individually-written reports).

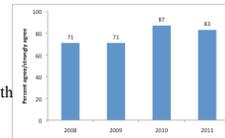
"The amount of work during lab sessions was appropriate to the time available."
% students agreeing was higher during the years with wiki writing (P = 0.004)



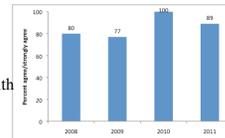
"The total workload for lab was appropriate."
% students agreeing was higher during the years with wiki writing (P = 0.001)



"The lab handout readings were clear."
% students agreeing was higher during the years with wiki writing (P = 0.011)



"Students had opportunities for extra help."
% students agreeing was higher during the years with wiki writing (P < 0.001)



Assessment and Discussion, continued

Student perceptions of group reports:

65% agreed: Relative to writing individual reports (as in BIOL 182 last semester), writing group reports helped my understanding of the concepts presented

64% agreed: Relative to writing individual reports, writing group reports helped me improve my own scientific writing

75% agreed: Relative to writing individual reports, writing group reports helped me think about the strengths and weaknesses of my own writing

62% agreed: Relative to writing individual reports, writing group reports helped my confidence in my ability to write scientifically

68% agreed: Wikis made it easy to collaborate in my group

Typical open-ended responses:

Positive:

"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."

Negative:

"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."

Conclusions

Student performance on assignments (lab report grades) was not affected by collaborative writing with wikis (t-tests showed no difference in report grades through the years). However, student perception was affected.

- This shift toward a more positive perception can increase student engagement (Neumann and Hood 2009).

With wiki writing, more students felt they had adequate opportunities to receive help, and that lab manual readings were clear.

- Collaborative writing with wikis leads to more peer learning. Students seemed to be satisfied with the increased help from their peers.

Literature Cited

Elliott, E., Fraiman, A. 2010. Using Chem-Wiki to increase student collaboration through online lab reporting. *Journal of Chemical Education*, 87(1):54-56.

Nančovska Serbec, I., Strnad, M., Rugele, J. 2010. Assessment of wiki-supported collaborative learning in higher education. *Proceeding of ITHET 2010; 9th International Conference on Information Technology Based Higher Education and Training*, Cappadocia, Turkey, 29th April - 1st May 2010.

Neumann, D., Hood, M. 2009. The effects of using a wiki on student engagement and learning of report writing skills in a university statistics course. *Australasian Journal of Educational Technology*, 25(3):382-398.

Parker, K., Chao, J. 2007. Wiki as a teaching tool. *Interdisciplinary Journal of Knowledge and Learning Objects*, 3:57-72.

Acknowledgements

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