The Chemistry of Facebook:
Using Social Networking to Create an Online Community for the Organic Chemistry Laboratory

by Jacob Schroeder and Thomas J. Greenbowe

Web 2.0 technologies, and specifically social networking sites such as MySpace and Facebook, have a very strong influence on the lives of millions of students (Thompson 2007), leading many educators to wonder what role, if any, social networking could have in education (Joly 2007). The 2008 Horizon Report suggests that educators should develop strategies to utilize social networking for educational purposes (New Media Consortium and EDUCAUSE 2008).

This recommendation is bolstered by data from a number of sources showing that these services appeal to students. The National School Boards Association (NSBA), for example, issued a report noting that students access their profiles as well as those of their friends on social networking sites nearly to the extent that they watch television (NSBA 2007, ¶2). The report also found that students already use social networking sites to support their education. Among respondents to the NSBA survey, nearly 60% of those who use social networking discuss education-related topics online, and more than 50% specifically discuss schoolwork. At the same time, 76% of parents surveyed expect social networking to help their children improve reading and writing skills. A survey at Kansas State University (KSU), summarized in a video produced by students, found that the typical KSU student reads eight books per year but views more than 2,300 Web pages and 1,281 Facebook profiles in that time (Wesch 2007). The near ubiquitousness of social networking sites suggests that these services offer tools that appeal to students and especially to those students who may be reluctant to participate in the face-to-face classroom.

In our own program at Iowa State University (ISU), a low level of student participation inside and outside introductory chemistry laboratory courses has been cause for concern. All ISU students have access to WebCT for every course for which they are registered. Previous chemistry instructors have encouraged students to use the platform's bulletin board and chat functions to discuss topics of interest, submit questions to other students in their courses, and engage in real-time discussions outside of class. But WebCT discussion features have been used rarely by students in these classes, and the level of interaction among students has been minimal. Instead, students have logged on to WebCT primarily to check their grades. In light of the much higher and more dynamic participation in social networking sites by members of the Iowa State University community, a course-related Facebook group seemed a viable alternative virtual environment through which students could communicate and interact.

Why Facebook?

According to the standards for science teacher preparation published by the National Science Teachers Association (2003), science teachers should strive to guide learning by facilitating students' conversations about scientific ideas. One goal of this recommendation is to help students articulate how they know, what they know, and how their knowledge connects to larger ideas, other domains, and the world beyond the classroom. While ISU has tried to achieve this kind of conversation by incorporating WebCT into its courses, the content-first nature of WebCT, which structures interactions around the course, the textbook, or the instructor (Maloney 2007; Downes 2007), seems to discourage students from using the platform to communicate and interact.

Facebook is currently the fastest growing social networking site (TechRadar 2008). Its users tend to come

from families who emphasize education (Boyd 2007), and it is the social networking site of choice for most college students (Thompson 2007). As of June 1, 2008, 35,454 members of the ISU community, including former and current students and staff and faculty members, were registered Facebook users. These findings suggest that Facebook may provide an alternative environment to facilitate student communication about coursework.

While research on the use of Facebook for educational purposes is somewhat limited, a recent survey of 677 college professors shows that nearly 50% of respondents who were familiar with social networking sites "feel such sites have or will change the way students learn" (Thomson Learning 2007, ¶2**).** Yet several news reports suggest a schism between students who actively use Facebook and educators or administrators looking to tap into a new audience (Beetham 2007; Guardian 2007; Roper 2007; Hass 2006; Woo 2005). Some students view faculty participation in Facebook as an encroachment into their own space; other concerns relate to issues of privacy and security (Sickler 2007). Such concerns were highlighted recently when the creator of a Facebook group was threatened with expulsion for allegedly providing a forum for students to cheat (Pagan 2008). Currently, law students at the University of Ottawa are suing Facebook, alleging 22 violations of Canada's Personal Information Protection and Electronic Documents Act (Lawson 2008; The Canadian Press 2008).

While these are valid concerns, the fact remains that students spend a significant amount of time interacting on social networking sites and Facebook offers a dynamic and unintimidating environment for students to communicate not only with the instructor or a small study group but also with all other students in the course. Our research into the effectiveness of Facebook as a communication and discussion tool has been exploratory and concerned with one primary question: Would students discuss chemical concepts outside of regular class time in a Facebook group more frequently than they did in WebCT?

Methods and Participants

This study took place during Fall 2007 and involved 128 undergraduate students enrolled in an introductory organic chemistry laboratory for non-chemistry majors. During the first meeting for each laboratory section, all students were given an invitation to join the Facebook group Chemistry 231L (Figure 1). The group was promoted as a community where students could discuss questions with one another as well as with Jacob Schroeder, the laboratory instructor; the teaching assistants; and the project librarian. Furthermore, the group was to serve as a place where students could compare results of their work with each other in order to identify trends in their data and to generate more precise results. Any registered Facebook member could view the group home page, which provided a description of the group and Schroeder's contact information, but to ensure that only students registered for the course were joining the group, membership required Schroeder's approval. Once approved, students were able to view and post to the discussion board, the wall, videos, photos, and posted items. As laboratory instructor, Schroeder served only as a moderator; he did not become "friends" with any members of the group during the term. By the end of the term, 52 students (about 41%) had joined the Facebook group.

All major components of the laboratory experience remained the same as in previous years. In addition to the three hours of weekly laboratory time, two graduate teaching assistants independently led separate, one-hour help sessions each week, and Schroeder held regularly scheduled office hours. The supplemental nature of the Facebook group was strongly emphasized; students were reminded that joining the group was entirely optional and were encouraged to check the WebCT forums first. Grades and course announcements were posted only to WebCT. The Facebook group functioned as an alternative space for student discussion outside of class, not a replacement for WebCT or any other course component.

The WebCT Forum

A general summary of student activity within WebCT for the entire term shows the login frequency and the length of time the average user stayed logged in (Figure 2). Activity spiked in September as the semester began but steadily decreased throughout the remainder of the term (Table 1). Compared to other WebCT tools, students made minimal use of the discussion board (Figure 3). The most frequently used feature in WebCT was Web Links, a collection of instructor-supplied links to potentially useful external Web resources. My Grades, which allowed students to see their scores for each graded assignment, followed. The discussion feature finished fourth with an average user time of only 58 seconds. Although we do not have hard data for WebCT use in prior semesters, this profile roughly reflects previous instructors' experiences with this course. These data could indicate that students preferred not to use these functions on WebCT for course-related communication or that they checked the discussion board but quickly went elsewhere if they did not immediately see anything new or useful.

Eight discussion topics emerged on the forum, generating a total of 17 posts, none of which occurred after September 30 (Figure 4). Posts in general followed a direct question-direct answer pattern. The second entry in the discussion thread for September (Figure 5) posed the most detailed question. This student asked if anyone could offer tips for naming a particular compound that was produced during an experiment. The instructor responded the next day because no one else in the class offered any suggestions. Similar questions were posted and discussed on the Facebook group discussion board.

The Facebook Group

The Facebook group (Figure 6), like the WebCT forum, was designed to be an informal venue for students to ask questions relating to their laboratory experiences and to find relevance and context for the results they obtained in the lab. In both the Facebook and WebCT environments, my contact information was posted directly on the group home page, allowing students to have a direct link to the instructor. One of the more beneficial features of Facebook proved to be users' ability to upload photos to complement associated text (Figure 7). This function allowed anyone in the group to respond to a comment, explanation, or observation with relevant diagrams, figures, or other graphics. The instructor used this function to draw chemical structures or step-by-step reaction mechanisms and to post spectral data that could be referenced while discussing questions that had been posted. In addition, the Post Item feature allowed any group member to post Internet links to any potentially interesting or relevant Web site (Figure 8). This feature was used primarily by the instructor, who posted links to the American Chemical Society's "Molecule of the Week," a visual representation of a molecule along with a brief description of its use. Some of the molecules presented were related to products students created in the laboratory.

Throughout the term, 20 topics generated a total of 67 posts to the Facebook discussion board (Figure 9) as compared to only 17 posts in the WebCT forum during the same period. None of the students who posted in Facebook posted in WebCT; the reverse was also true. This disparity highlights not only the amount of time students spent on Facebook but also how much more willing they were to take part in discussions. While the WebCT discussions generated only one or sometimes two responses, in Facebook, students posted ten messages dedicated to one topic on two separate occasions with other topics generating four to six posts.

A portion of one of the more discussed topics ("Question about lab #7") shows the level of detail provided in questions and the give-and-take nature of the discussion (Figure 10). A student started the discussion late in the afternoon, acknowledging that it was a bit late to ask a question (the report was due the next day). The student did not specifically ask for an answer but instead let other students see where she was having difficulty. A classmate responded to the question in 38 minutes, recommending a strategy the first student could try to solve the problem. Sixteen minutes later, the first student responded saying she ended up following the advice the first student suggested but was “just curious" and asked a follow-up question. A third student posted a question related to the topic but concerning a different compound seven minutes later. This exchange involved three separate individuals and four separate posts in a discussion that took little more than one hour. The instructor replied a day later with an additional suggestion.

Discussion

In this exploratory study, 59% of students did not join the Facebook group. This may be due to students not feeling comfortable using Facebook for class or not being Facebook members. It may be just as likely that students simply forgot or did not want to bother with the enrollment process or devote extra time to another online discussion forum. Because we do not know the specific reasons why students chose to participate in the Facebook group or not, we focused our analysis on the level of participation among those students who did join.

While only 41% of students in the course joined the Facebook group, the number of posts on Facebook was nearly 400% greater than on WebCT, and the postings themselves raised more complex topics and generated more detailed replies. Furthermore, the discussion on WebCT ceased at the end of September. Students did not indicate why they stopped using the WebCT discussion board, but this may indicate that students, receiving minimal feedback in the WebCT discussion forum, abandoned online communication entirely. Two students who posted in the WebCT discussion forum later joined the Facebook group, but they did not post anything in Facebook once there.

In comparison, the Facebook group did not experience this abrupt cessation, and its communication patterns were more complex. When an assignment was due in short order, students frequently used Facebook to communicate. Yet they never used the Facebook discussion board to appeal for answers; they used it to ask for assistance from the instructor or other students. Similarly, students did not give direct answers in their replies to their classmates. Instead, they explained how they were approaching the problem and offered suggestions.

We believe a major reason for the difference in use between Facebook and WebCT could be that students were already accessing Facebook for personal use and checked in on the group when they accessed Facebook for other reasons. The short access time for the WebCT discussion forum would indicate a similar behavior pattern; students simply checked for new topics when they logged in to check grades or assignments. Unfortunately, Facebook does not have a tool for tracking usage statistics, so this is only speculation.

A number of circumstances hampered my ability to collect additional data. We had no control over the content of end-of-semester student evaluation forms, so student input on the use of Facebook was not collected at this logical juncture. Similarly, exams were given as part of the lecture and not in the laboratory, so they were focused on concepts that were presented primarily in the lecture. Therefore, students' exam performance may not have reflected the usefulness of the Facebook group, which was focused on laboratory experiences. Finally, despite the significant usage of the Facebook forum, almost 60% of students in the course did not join the Facebook group. The reasons for this need to be more fully investigated.

Although this exploratory study did not collect data regarding student performance or ask students why they used Facebook or WebCT (or neither), these admittedly preliminary results do show a marked increase in student communication and participation outside of the class, something that was very much lacking before we offered the Facebook group. This study demonstrates that, at least for the course we examined, students used Facebook more frequently and more dynamically than they did WebCT. The next step, now that the primary issue of student participation has been examined, is a more thorough study exploring the value of Facebook as a venue for academic discussion.

Conclusion

This study leaves the door open for further research into how Facebook and other social networking tools

may be used as a discussion board or even as a bulletin board to post announcements. The academic impact of using Facebook needs to be explored more fully. In the context of a course structured like the one described here, in which the laboratory and lecture were viewed as two distinct courses and taught by two different instructors, such an exploration would require a degree of collaboration between instructors that was not present in this study. For instance, exam questions could be written to reflect the topics being discussed in the laboratory Facebook group. Various participation measures, such as frequency of postings, could be tracked and correlated to student performance on both laboratory reports and exams. Finally, student reactions and opinions could be collected as part of end-of-course evaluations.

Based on our preliminary results, we would encourage others to explore Facebook groups as a supplement to face-to-face classroom instruction. At the very least, the data suggest that students will use Facebook as an alternate mode of communication, particularly when deadlines approach. The results of this study may best be viewed as a case study, showing that for this specific group of students, Facebook proved to be a good medium for communication in the sense that students would use it. With proper promotion and management, other educators might also observe broader student engagement. In creating an online community within a platform familiar to and used by students, we discovered that students would discuss organic chemistry concepts with each other outside of class—an outcome seldom, if ever, observed on the WebCT boards.

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