

Carol Schuetz

# Not your parents' chemistry class

## Integrating library skills into the organic chemistry lab

This project is the result of a “teaching-circle” collaboration.<sup>1</sup> Our teaching commons group consisted of two chemistry graduate students, a reference librarian, and a faculty member from the English department. Over the course of three semesters, we developed, implemented, and assessed the effects of a radical transformation of the organic chemistry lab curriculum at Baylor University. Beginning with the spring 2007 semester and continuing through the spring 2008 semester, the curricular redesign has integrated a sequence of discipline-specific writing (WID), writing-to-learn, and information literacy activities, in addition to the traditional lab reports.

When our group met for the first time in fall 2006, our first thought was “What are we going to do?” Each member of the group came with different talents, so we wanted to do something that would be meaningful to each of us. We also decided we wanted to do something that would benefit the students with whom we had daily contact.

Several weeks after our first meeting, we learned that one of our chemistry graduate students, Tiffany Turner, had a real passion for chemical education. At the time she was the head teaching assistant for the organic chemistry lab (ochem lab). Under the current curriculum, students in the ochem lab had filled out a series of handouts and executed the assigned experiments to fulfill the expectations for the class. Turner felt there should be more to the lab besides handouts. Students, particularly ones who would be chemists, doctors, or educators,

should know how to research and write like professionals. After listening to Turner and having her ask about library instruction classes, we decided to work with her in adding information literacy and writing skills to the ochem lab curriculum.

### Purpose and goals

One of the most difficult challenges that we faced was the students' perception of the class. Advisors informed students that this was a class that could be taken during a busy semester or the semester before graduation. Students came thinking this class was an easy A and would require little preparation. We wanted to engage students more fully in the process of learning how to think and work in ways that will characterize their future professional identities. Through library instruction classes and a series of discipline-related writing activities, we wanted students to become more familiar with chemical scholarship and the research process. These activities were intended to expand students' experiences with researching chemistry scholarship, with reading chemistry articles, and with writing discipline-specific genres other than lab reports.

In order to accomplish this, we set several goals. These included:

- introducing students to the library and chemistry scholarship,

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- enabling students to make good (credible) information choices,
- introducing students to methods of locating credible information,
- expanding student research methodology beyond concepts learned in freshman classes,
- teaching students skills that will transfer to other classes, and
- fostering collaboration between faculty on campus.

Once we decided what we hoped to accomplish, we looked for standards to guide our future actions. Since the ACRL information literacy standards were known to the majority of our group, we selected two of these standards to be our guiding principles. These standards are:

- *Standard Two*: The information literate student accesses needed information effectively and efficiently.
- *Standard Three*: The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.

### **Class background**

In its original format, teaching assistants taught six sections of ochem lab during the fall and spring semesters. One section covering both summer semesters. Students attended a weekly one hour lecture and had six hours of lab time each week. Scantron quizzes were given at the beginning of each class and were graded by the respective teaching assistants for the section. Lab sheets were filled out while conducting the experiment and a post-lab sheet was filled out when lab had concluded. All experiments and lab sheets were graded by teaching assistants. A final was given during the lecture at the end of the semester.

### **Curriculum changes**

Beyond a basic exposure to techniques common to organic chemistry, we chose to focus on:

- understanding chemical concepts through writing (mechanisms, techniques, terminology),
- exposure to chemical literature and the process of discerning information (library use, database searching, deconstructing chemical articles, use of chemistry in the real world),
- critical thinking skills, and
- side goal: increase student confidence in the lab and in discussing chemistry.

Curriculum changes included the addition of library instruction and a number of course-related writing assignments. Library instruction was scheduled early in the semester in order that skills could be mastered and used during the semester. Writing assignments were tied to lab topics.

### **Into the library**

Visit 1: Prior to the first visit to the library, a questionnaire was given to students to gauge their level of knowledge about the library and information sources. These questions checked students' knowledge of the location of materials in the library, use of databases, and their understanding of information literacy.

This survey indicated that while many students had basic knowledge about the library, many used Google and Wikipedia as their primary sources of information.

In bringing five sections of ochem students to the library, we faced one big challenge. Our teaching classroom was only able to accommodate 24 students at one time. Since each section of ochem lab had 40 students, we decided to divide each section in half. Twenty students would receive classroom instruction and 20 students would participate in a library-related scavenger hunt. Each activity lasted for one hour, and then students switched activities.

Classroom instruction would introduce students to concepts such as how to distinguish peer-reviewed publications from general reader publications, when using Wikipedia is appropriate, when a more

scholarly source would be appropriate, and how to interpret citation information. After completion of the library instruction portion of the visit, chemistry teaching assistants gave the students a class assignment in which these skills would be applied.

The remaining students participated in a library scavenger hunt to familiarize them with library resources. The scavenger hunts were divided into four sections: reference resources, periodicals, electronic resources, and general library information. Questions in each section asked students to find information about reference books, locate periodicals, and locate service points and classrooms within the library as well as other pertinent information.

Visit 2: During next visit, we introduced students to electronic resources available through the library. In the first visit to the library, we found out that many students, while they may not use many of the databases that the library provides, felt comfortable with the electronic resources because they had used some during a freshman English class. These databases typically covered general topics and were not used specifically for chemical information. In this class, librarians introduced students to databases that were specific to chemistry. Instruction covered the following databases: Access Science, ACS Publications, RCS Journals, Science Direct, Scirus, and Web of Science.

Students were instructed on search strategies and special features of each database as well as developing a search question, locating terms/alternative terms, and developing a bibliography. This class led to the capstone assignment, which teaching assistants assigned students after this final visit to the library. Students were assigned a research paper in which they researched a procedure that had been covered in lab and then wrote about the procedure's importance in today's world. Methodology and resources from the library instruction classes served as resources for this project. This paper, along with other shorter writing assignments, comprised the student's writing portfolio on which part of

the semester's grade was based. All writing assignments were designed to give students more experience writing within their discipline as well as giving them a greater understanding of scientific publications.

### **Student feedback**

To gauge the effect the curriculum changes had on the students in these classes, we solicited feedback in two ways:

Following each class in the second library visit, we asked students for three pieces of information:

- 1) What was one new thing they had learned in this class?
- 2) Was there one thing they were still uncertain about?
- 3) General comments about the class.

In the last weeks of the lab, we held focus groups with each of the sections. The focus groups were held in an informal setting, and participation was voluntary. We questioned students about their research process and how that process differed after having taken this class. Students were asked about their use of the library and how they viewed library resources as potential information sources. In addition to these types of questions, we asked students about the changes in the curriculum to the ochem lab. Students were encouraged to comment on various aspects of the class and the new components. All comments were kept anonymous, and chemistry teaching assistants did not see any comments until after the end of the semester.

### **What we learned from this experience**

- Revamping a course doesn't occur in one semester. This was perhaps the hardest lesson to learn, and we struggled to remember that change doesn't happen overnight. As we worked through one semester, we had to learn what worked and what did not. We could apply these lessons to the next semester.
- Faculty buy-in and support are necessary. If your faculty does not see the value

in what you are doing, you can go nowhere really fast. Having your faculty behind what you are doing is key to the success of the program.

- Organization is key. Consistency of communication between teaching assistants, students, and professors is necessary, and this is where we had problems at times. With different teaching assistants for each section, students were sometimes told different information. We had to work to achieve consistency.

- Teamwork and collaboration is vital. The teaching commons group was an invaluable resource. Having faculty from different departments come together to collaborate on projects such as ours brings together a rich wealth of knowledge and experience.

- Students will rise up to high standards. The passing rate increased from 60 percent in summer-fall 2006 to 85 percent in spring-summer 2007.

- Emphasize team work and writing for understanding.

### **In closing . . .**

As has already been stated, the support of faculty when making these kinds of changes is very important. During summer 2008, two members of our teaching commons group left Baylor University. Both of these members were a driving force in what we had attempted to do, and they are greatly missed. At this time, we also had minimal support in the chemistry department, and so it was felt that what we had attempted would go away.

I am happy to report that this is not the case. Students who went through the change in curriculum went on to other classes, and their newly learned skills went with them. Word passed through the science departments about what the libraries could do and how this would improve students' abilities to do research, find more reliable information, and produce better papers. Professors from biology and chemistry contacted us about classes for their freshman students. In fall 2008, the professor for CHE 3238, our original class, contacted us about bringing

the ochem classes back to the library. It was a one-time visit to learn the databases, which we feel is a great step forward. A research exercise was produced for this class, and students will be writing a research paper at the end of the semester. These classes are evidence that through collaboration, library and information literacy skills can be cultivated in the most unlikely spots.

### **Note**

1. Thank you to my colleagues, Glenn Blalock, Tiffany Turner, and Eric Bauch.

### **References**

"Information Literacy Competency Standards for Higher Education," ACRL, [www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm](http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm). *ZZ*

### **Upcoming ACRL e-Learning opportunities**

ACRL is offering several e-Learning seminars and Webcasts this fall. Upcoming e-Learning opportunities include:

- Designing Specialized Online Information Literacy Courses in Higher Education (online seminar, October 19–November 6, 2009)
- The Role of the Librarian in Combating Student Plagiarism (live Webcast, October 20, 2009)
- Implementing Online Teaching and Learning: Using Moodle and Other Web 2.0 Features (online seminar, November 9–December 5, 2009)
- Electronic Collection Development for the Academic E-Library (online seminar, November 9–December 5, 2009)

All online seminars and Webcasts are eligible for the new ACRL e-Learning Frequent Learner Program. Register for three ACRL e-Learning offerings and receive a fourth registration free.

Complete details are available on the ACRL e-Learning Web site at [www.ala.org/ala/mgrps/divs/acrl/events/elearning/index.cfm](http://www.ala.org/ala/mgrps/divs/acrl/events/elearning/index.cfm).