

**Final Report
June 30, 2009**

**Preparatory Chemistry: *Evaluator-Integrated Book* for Distance
Learning and Blended Courses**

Category: Personal Teaching Improvement

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Participating Unit: The Center for Educational Software Development (CESD), Amherst.

Request Amount: \$8,000

Award Amount: \$4,000

1. Original objectives

To help students acquire the skills needed to succeed in general chemistry by:

Expanding the content of *ChemPrep*, an OWL short course for general chemistry, into a full-semester preparatory chemistry course delivered as an "evaluator-integrated book".

Creating a new distance-learning preparatory chemistry course for the UMass Chemistry Department using this content.

2. Activities and Deliverables

An experimental course proposal for *Chemistry 190A: Preparatory Chemistry* was submitted in February to the Chemistry Department Undergraduate Program Committee. *Preparatory Chemistry* will be a 3-credit course covering the basic science and algebra concepts needed for general chemistry and will be delivered through the OWL system. The proposal and syllabus for this course are attached.

A pilot test of the OWL-delivered American Chemical Society Examinations Institute diagnostic exam was conducted in June with a group of Chemistry 111 summer students. The feedback was very valuable for advancing the use of this exam as a mechanism for identifying students in need of preparatory work.

Content development for the preparatory chemistry course is ongoing. The chapter on electronic structure has been written and entered into OWL. Content for the chapter on energy has been written and will be adapted for OWL delivery.

3. Assessment

Once *Chemistry 190A* and the ACS diagnostic exam are in place, student achievement in general chemistry will be followed and correlated to scores in the course and on the exam. This information will be used to improve the preparatory course material. Judging by preliminary results with *ChemPrep*, the potential impact on student success is significant.

4. Issues

Writing of the chemistry content has proceeded, but entering this content into the creative new form of an "evaluator-integrated book" is on hold until OWL software engineers can develop the tools needed to support the authoring of questions imbedded within text. Without these tools it is hard to envision the most effective way to present material which, in turn, makes the writing of content that takes advantage of the new delivery, difficult. It is hoped that these tools will be available within the year.

The Chemistry Department carries a very large teaching service load, with increasing enrollments and a significant decrease in faculty. The offering of *Chemistry 190A* will be possible after the challenge of staffing our other courses is overcome.

5. Disposition of funds

Funds for the project were used to provide additional compensation to the author for preparatory chemistry content development in the summer of 2008.

6. Comments

The Academic Technology Grant Program has provided valuable seed money for curriculum development. Without such a program innovative projects would likely go unfunded and, perhaps, would not be undertaken at all. It is essential for the vitality of the undergraduate curriculum, and for the benefit of our students, that support be available from the University to nurture and grow creative teaching ideas. One way to achieve a large impact is to provide grant support for sabbatical projects tied to curriculum development. The University, students and faculty would all gain by such a program.

Chemistry 190A: Preparatory Chemistry

Experimental Course Proposal

February 9, 2009

Instructor

Beatrice Botch, Senior Lecturer II

Department of Chemistry

bbotch@chem.umass.edu, 413-545-4257

Course Description (*for course catalog*)

Introductory chemistry course to help students acquire the skills needed to succeed in general chemistry. Intended for students who are not confident of their preparation in mathematics and chemistry, and for students who have been away from high school chemistry for more than 4 years. Topics include: the structure of matter, energy, nomenclature, algebra graphs and logarithms, measurement and calculations, chemical reactions, acids and bases, aqueous solutions, oxidation reduction, light and waves, atomic electronic structure, chemical bonding and gases. Prerequisite: American Chemical Society Placement Exam given at scheduled times in the Chemistry Department. 3 credits. Delivered online. Midterm and final exam to be taken on campus.

Justification for offering course

Success in general chemistry is required for a range of majors from nursing and food science to chemical engineering and veterinary medicine. Many students arrive at the University without the necessary background in science or mathematics to succeed in general chemistry, either because of poor high school preparation or because they have been away from high school for a number of years. The Chemistry Department has no introductory course to bring these students up to speed. Students with a score of 19 or below on the math placement exam are currently required to take Math 101/102. No hard data has been collected to know if this indeed helps a student succeed in general chemistry.

In order to fill this gap I propose to offer a 3-credit, preparatory chemistry course, delivered through OWL. The course will cover the basic science and algebra concepts needed for general chemistry. Online presentation of the course will allow students to work independently, as schedules permit. This type of material, much of which is drill and practice, lends itself to online learning. It will also allow us to offer a new, much needed course, with less impact upon the already heavy service teaching load carried by the Department.

Weekly assignments and topic tests will assure that students do not fall behind. The OWL message system allows rapid interaction between students and instructor, 24/7. On-line "class time" will be scheduled weekly so the instructor may respond immediately to questions or enlarge on a topic. The instructor will also hold drop-in office hours for those who would like direct contact. On campus review sessions will be held before the midterm and final exams. Exams will be administered in a secure testing room (Chemistry Resource Center) at designated times. Students will be required (encouraged ?) to take the American Chemical Society chemistry placement exam prior to enrollment in the course.

To be offered Fall 2009 and/or Spring 2010, Summer 2010.

Chemistry 190A - Course Syllabus

2/9/09

Fall 2009

Instructor: Beatrice Botch, bbotch@chem.umass.edu

Course Description

Introductory chemistry course to help students acquire the skills needed to succeed in general chemistry. Intended for students who are not confident of their preparation in mathematics or chemistry, particularly those who have been away from high school chemistry for more than 4 years. 3 credits, delivered online through OWL.

Prerequisites/Co-requisites

Take American Chemical Society placement exam prior to enrollment.
Concurrent enrollment in Math 101/102 encouraged.

Schedule

- | | Topic |
|----|--|
| 1 | The Structure of Matter |
| 2 | Naming Chemical Compounds |
| 3 | Measurement and Calculations |
| 4 | Calculations involving quantities of matter |
| 5 | Chemical Reactions |
| 6 | Algebra, Temperature, Density, Graphs and Logs |
| 7 | Energy |
| | Midterm Exam |
| 8 | Acids and Bases |
| 9 | Aqueous solutions |
| 10 | Oxidation/Reduction |
| 11 | Light, Waves |
| 12 | Atomic Electronic Structure |
| 13 | Chemical Bonding |
| 14 | Gases |
| | Final Exam |

Course Details

You will work independently on weekly assignments delivered through the OWL system. Use the OWL message system to ask questions or get clarification of a topic. You can expect a response from me within 24 hours. At the end of each section you will complete a topic test. You will have an opportunity to review any material you missed and retake the test. I will hold regularly scheduled on-line hours, as well as drop-in office hours, for more direct contact. On-campus review sessions will be held before the midterm and final exams (location TBA). The placement exam and the midterm and final exams will be administered in a secure computer testing room (Chemistry Resource Center) at specified times.

Grading

OWL Work	100 pts
OWL Topic Tests	100 pts
Midterm Exam	100 pts
Final Exam	100 pts
Total	400 pts