CHALLENGES

- **Learners need timely feedback on homework assignments:** Many students are working during office hours and may not sit down to do homework until after midnight.
- **Wide range of skills and aptitudes** within the class, from those who need remedial help to learners at a higher level who want to move along more quickly.
- **Need to improve outcomes and foster understanding of the material**. This is both a national imperative and a personal goal for Donald.

SOLUTIONS

- OWL: Online Web Learning for Chemistry

RESULTS

- **Instant feedback** is available to students at any time of the night or day, using OWL, the homework solution developed by a team of chemistry educators at UMass Amherst .
- **OWL exercises are parameterized**. Students are allowed to retry problems that they answer incorrectly, but the values in the questions change each time.
- **Measurable improvement in grades**: Donald has noted a strong positive correlation between completion of OWL-based assignments and performance on the final, standard ACS exam (co-efficient of .9)

SUCCESS STORY

Donald Neu, Ph.D.

Associate Professor of Chemistry — St. Cloud State University

Improving Outcomes and Engagement in Chemistry Courses with OWL

Professor Donald Neu has been teaching Chemistry courses at St. Cloud State University in St. Cloud, Minnesota for nearly 20 years, including Preparatory Chemistry, General Chemistry, Chemistry and the Environment, Nuclear Chemistry, and Inorganic Chemistry. He joined the university in 1993, soon after earning his PhD from the University of Wisconsin-Madison, under the direction of Arthur B. Ellis, with specialties in Materials Chemistry, Nanotechnology, Scanning Probe Microscopy, and Nuclear and Radiochemistry. In addition to teaching, Donald has been creating instructional resources and technology-based tools for many years, first with the Institute of Chemical Education (ICE) at the University of Wisconsin-Madison, and more recently as a contributor to a first-year chemistry textbook.

Donald believes in the power of technology to help improve student performance and conceptual understanding in chemistry because he has seen the results — first-hand — in his courses. In 2004, he started using OWL from Cengage Learning, the online learning solution that was developed by UMass Amherst chemistry educators, with his Preparatory Chemistry, Chemistry and the Environment, and General Chemistry courses. Since he started using OWL, he has seen a measurable improvement in overall grades, as well as scores on the standardized American Chemical Society (ACS) exam.

COURSE STRUCTURE AND PARTICIPANTS

Approximately 70% of the students at St. Cloud State University work while attending school. Full-time students typically have part-time jobs; roughly 40% of Donald's students — both part-time and full-time students — hold full-time jobs while attending school. At St. Cloud State University, most of Donald's classes are taught onsite, but he has been teaching some sections of the Chemistry and the Environment course online for the past two years.

THE CHALLENGES

Donald teaches a diverse group of students in terms of backgrounds and levels of preparedness, so it is often a challenge to maintain learner engagement across all levels — from those who need remedial help, to learners at a higher level who want to move along more quickly. It can be challenging to address the individual needs of all of them, particularly as the number of sections and students that he is responsible for continues to grow. At the same time, Donald and his peers are under increasing pressure to demonstrate results — to help improve student outcomes.

"OWL goes beyond simply measuring; it empowers students."

Donald Neu, PhD.
Associate Professor of Chemistry
St. Cloud State University

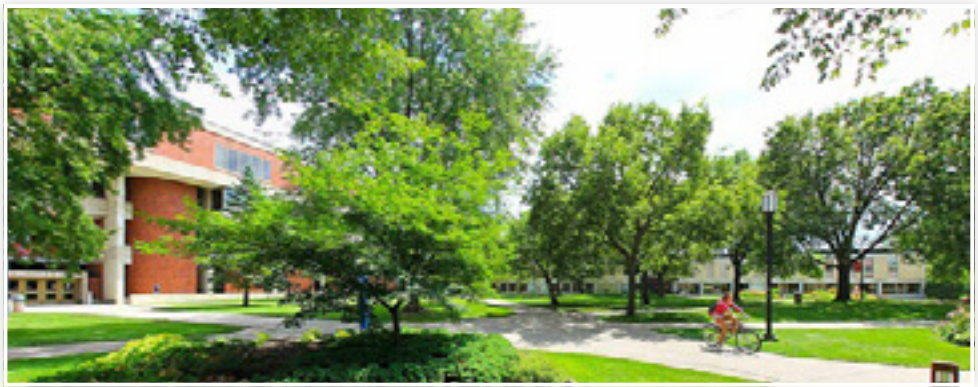
Many students are often doing homework at 2:00 AM, after completing evening classes, work shifts, or family responsibilities, and they need help at that time. Most of them cannot make it to his office on campus during office hours for advice on solving homework problems. Students tend to do the work that is assigned for credit first; they see the achievement of "points" as the ultimate goal. Donald's goal is to do everything in his power to ensure that his students truly learn and understand the material, so it is important for him to identify — and use — resources that can help him and his students achieve their respective goals.

THE RESULTS

Donald is always looking for the best set of online resources for his students, so that they can more easily learn and understand the material — and obtain useful feedback when they need it most — after hours, while completing their assignments. When Donald first saw OWL in 2004, he was immediately impressed with the fact that it had been created by a team of chemistry educators at UMass Amherst, incorporating the unique language, structure, and math of the chemistry discipline. "The department was using a homegrown solution at the time, but it was not as rigorously built. OWL is the best that I have seen so far, internally consistent, with rugged parameterized homework solutions and an extensive, rich set of resources." Students are allowed to retry problems that they answer incorrectly, but the values in the questions change each time the student attempts the same question. Students can continue working until they get full credit on assignments, learning the material in the process.

Since Donald started using OWL in conjunction with his courses, he has seen a measurable improvement in grades, a strong and consistent positive correlation between completion of OWL-based assignments and performance on the final, standard ACS exam (co-efficient of .9). For students in the middle B- and C-grade ranges, he has observed a noticeable improvement in success rates. In particular, students in the lower grade tiers of the class seemed to improve by a full letter grade. According to Donald, "OWL takes the position of an at-home tutor or a chemical advisor; it is not just another method of testing. The pedagogy of OWL can be compared to a learning assistant and is true-to-form. OWL goes beyond simply measuring; it empowers students."

St. Cloud State University
St. Cloud, Minnesota



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