



Pitt chemistry professor aims to keep classes fun, innovative

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By Byron Spice, Post-Gazette Science Editor

At the front of a large lecture hall at the University of Pittsburgh, Eugene Wagner is explaining the difference between ionic, metallic and covalent bonds to his general chemistry class. Lest this be confused with a scene out of "Introductory Science Hell," consider what happens next:



Joseph Grabowski in his lab at the University of Pittsburgh.
(John Beale, Post-Gazette)

Wagner tells his students to put on their 3-D glasses.

The lights go down and large, three-dimensional images of molecules, such as soccerball-shaped buckyballs and snake-shaped nanotubes, are projected at the front of the hall and seemingly rotate in space.

The hundred-or-so students become eerily quiet.

"That's what I call the 'golly-gee-whiz factor,'" said Joseph Grabowski, who watched with delight from the back of the hall.

The 3-D projection system was the idea of Pitt chemistry chairman Ken Jordan, but it was Grabowski, an associate professor of chemistry, who worked with undergraduates Angela Slampak and Steve Ascencio to put it together. The system went into use last fall in the chemistry department's newly renovated lecture halls.

The hope is that it helps students appreciate that, despite all of those two-dimensional figures in their textbooks, chemistry is a 3-D science and improve their ability to visualize complex phenomena. Whether that translates into better education is yet to be seen, Grabowski acknowledged, but he takes the hush that fell over the lecture hall as a good sign.

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"If it gets them more engaged in the lecture," he reasoned, "then I'm ahead of the game."

Since arriving at Pitt 12 years ago, Grabowski, 46, has done whatever he could as a teacher to stay a step ahead, producing a number of instructional innovations.

One of the latest is the world's first virtual mass spectrometry laboratory, a joint project with Mark Bier of Carnegie Mellon University.

Grabowski will be recognized for his role in these and other projects next month when he receives a Carnegie Science Center Award for Excellence in the university educator category.

"He has been instrumental in getting technology into the classroom," said Stephen Weber, a chemistry department colleague, noting the 3-D system in particular has opened the eyes of some faculty. Finding ways to grab and hold students' attention, particularly in large lecture courses, is an ongoing concern.

But that's not to say that all of Grabowski's technology is immediately embraced. "There's a bit of tension about all of this," Weber said. Chemistry professors have long been divided over the utility of straight lectures vs. "entertainment." Many worry about sugar-coating the subject matter, convinced that forcing students to struggle with problems and find the answers themselves results in lasting knowledge.

Grabowski maintained that updating the technology that instructors use doesn't necessarily make chemistry easy, but can help today's students relate better to the subject.

"I think that the students have grown up in a media-rich world" and are comfortable with computer models, such as the 3-D projection system, he said. One student, for instance, remarked that after seeing the 3-D display in class, he was inspired to go home and fiddle with stick-and-ball models, devices long used by chemistry instructors to help students visualize molecules.

In addition to technical innovations, Grabowski has taken the lead in developing an intensive summer program for students who attend smaller colleges that, unlike Pitt, are not major research centers. He also has devised a Web site to help undergraduates learn about faculty research projects in which they can participate.

"I think it's really important for the students to get engaged in the university's scholarly activities," said Patricia Beeson, associate dean for undergraduate studies in the College of Arts and Sciences. So when she was looking for someone to serve in the newly created post of director of undergraduate research, Grabowski "was an obvious choice," she added.

It was research, after all, that convinced Grabowski to become a chemist. Raised in Baltimore, he attended the University of Maryland-Baltimore County with every intention of becoming a physician. But he soon realized he wasn't cut out for pre-med.

"I couldn't stand the other pre-meds," he recalled. "All they cared about was grades." But then he got involved in a research lab. "I just fell in love with research."

He also met and fell in love with his future wife, Paula, at the Baltimore campus and both then went to the University of Colorado for graduate studies. Paula Grabowski is now a professor of biological sciences at Pitt. They have a son and live in Edgeworth.

His own research interests focus on physical-organic chemistry and particularly the use and development of mass spectrometers -- devices that can identify elements and compounds by weighing atoms or molecules. One project would allow people to exhale into a machine called a chemical reaction mass spectrometer and obtain an analysis of their breath, which might be used to evaluate health.

Because he is comfortable building instruments for his research, many of his efforts to improve teaching also have involved technology. One system he developed is a Web-based Jeopardy! game, that quickly converts review quizzes into multimedia games. Grabowski will often separate his classes into teams that vie for prizes by playing the game.

His latest project addresses one of his biggest complaints with today's textbooks -- the solutions manual. The manual provides answers to the student exercises in each chapter and most students can't resist looking. "It's teaching them to recognize a correct answer," rather than how to correctly answer.

So he has gathered thousands of organic chemistry questions and answers from tests and quizzes he and his colleagues have assembled over the last 10 years and is combining them into a single database to be called "PittLearn." Once it's up and running, perhaps this fall, teachers will be able to custom design Web-based quizzes; students must attempt to answer each question before the system will show them the answer.

Assembling such databases is often beyond Grabowski's own computer skills. But even as he adapts teaching methods to his computer-savvy students, he often takes advantage of that savvy, enlisting those same students to help him produce the new teaching tools.

"It's like they've died and went to heaven when I tell them to do these things," he said.

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