Thompson Center for Learning & Teaching

September 2014 Volume 3, Issue 1

Faculty focus

Highlighting innovation in teaching at UM-Flint

Playing with Proteins: Culturing Student Research

by Jennifer Ross

Joe Sucic, Professor
Biology

"Science is all about asking questions," states Joe Sucic, a molecular biology professor. Questions engage students, stimulate thinking, and demonstrate interest. Yet, for Sucic, encouraging his students to ask questions is not quite enough. In order to become good scientists and researchers, Sucic's students must not only formulate questions, but also attempt to answer them through experimentation. By involving his students in all steps of research, Sucic deeply engages them in the process and starts preparing them for the ins and outs of scientific research.

Students in the laboratory portion of Biology 467/567 and 468/568 Molecular Biology of Prokaryotes and Eukaryotes, respectively, have long had the opportunity to engage in student research and gain valuable skills such as critical thinking and problem-solving. Yet, despite advances in technology and the field of molecular biology, the courses had not been updated since their inception. Last year Sucic, who earned his Bachelors at Thiel College in Pennsylvania and completed his Masters and Doctorate at Virginia Tech, applied for the TCLT's Faculty Development Teaching Grant in order to update and restructure these two labs.

According to George Kuh, the goal of undergraduate research "is to involve students with actively contested questions, empirical observation, cutting-edge technologies, and the sense of excitement that comes from working to answer important questions." During his TCLT-sponsored visit to campus in 2012 José Cruz, the Vice President for Higher Education Policy and Practice for the Education Trust, further explained Kuh's findings, reporting that of all the high-impact educational practices, student-faculty research produced the most gains in deep learning, the level of academic challenge, active and collaborative learning, and student-faculty interactions.

Sucic redesigned the labs with "state-of-the-art methodology as the centerpiece of each course." Using a grant from the TCLT, Sucic purchased new lab equipment and supplies to jumpstart the improvements. Some of the components were "self-sustaining" in that they are able to be placed into cells, cooled, and used in later semesters.

Sucic states that of the two redesigned labs, winter semester's 468/568 worked best, though both proved beneficial for developing students' research skills. During fall semester Sucic and his students encountered many technical difficulties,

Playing with Proteins (continued)

and Sucic admits, "That semester is still kind of a work in progress." However, he reports that these snags offered students valuable learning experiences: "The problems gave students experience with troubleshooting, which is an extremely valuable skill in the sciences. It also gave students firsthand experience with 'real science,' where the overwhelming majority of experiments don't usually 'work' as expected." The lab instructors are planning to brainstorm potential solutions to address the technical difficulties, but Sucic states that other than tweaking a few things to improve results, they "might not change much." The experiences students encountered in the BIO 467/567 lab, technical difficulties and all, opened up group discussion and gave students an important glimpse into scientific research. Sucic explains, "It's a little bit of a culture shock to learn things don't always work the way you expect them to." Preserving some of the difficulties in the BIO 467/567 lab will help students adapt as they contend with this shock.

In terms of projected outcomes, the redesign work for winter semester's lab "was considerably more successful." Sucic and his students even discovered some "really interesting results." During the experiments, some of the groups induced changes to their protein strands that enhanced, rather than impaired, the protein's function. Sucic says that these results could lead to a publication if he and his students can generate enough data to show that these results are legitimate.

The BIO 467/567 and 468/568 labs are so valuable to microbiology, molecular biology and biochemistry students because of the heavy slant toward research. Students gain hands-on experience with lab techniques, and the guided research projects help them to see how science is performed in the laboratory setting. "It's really important for students in science to look at a research agenda to find out how to go from a big question to a result," Sucic explains. "Labs like this make our students really marketable" because students have gained the ability to piece together a progression of experiments. They are able to keep the broad research goal in mind while also examining what they've done so far, what sorts of results they have received, and visualizing what they should do next.

For Sucic, teaching "keeps me young at heart." While he demonstrates his commitment to teaching through his work redesigning classes, incorporating new technology and research methods, and engaging his students in class material and research, his dedication to students shows through when he talks with them. He says, "When a student comes to my office with a question and can talk through it and gain an understanding, it's really rewarding . . . When I hear from them a year, two years, three years later, and they tell me how well they're doing . . . to me there's just no feeling in the world like that. It's awesome."

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