

The sound of science

How an undergraduate researcher harmonizes his interests in music and physics

by Jennifer Tidball

Jeff Murray's transition from professional drummer to scientist and teacher followed a natural rhythm.

After several years in Nashville as a professional drummer who toured with country stars Martina McBride and Sara Evans, Murray decided to attend Kansas State University to pursue a bachelor's degree in physics education.

"There's a real rush to playing on a stage," said Murray, junior in physics education, Topeka, KS. "But there's just as big a rush when sitting down with a student and helping them go from hating science to loving it. That's when you know you're on the right path."

As an undergraduate researcher, Murray is improving physics education. He is studying how visual cues and feedback can develop students' problem-solving skills.

The project is part of National Science Foundation-funded research that involves the departments of psychological sciences and mathematics at K-State. Murray's faculty mentor is Sanjay Rebello, professor of physics.

"In working with Jeff, it is clear that he is not doing research just to get a line on his résumé, he is doing it because he is truly interested in what we are doing and its applications to science, technology, engineering and mathematics, or STEM, education," Rebello said. "Jeff is curious about the details of the research and asks good questions that often make the rest of us think."

For the project, the researchers used an eye tracker to observe the eye

movements of problem solvers and determine where their eyes went while solving a problem. Murray used these observations to develop effective visual cues and hints to solve the problem.

While the goal of the research is to help students remember concepts and ideas that they already know, the challenge is helping students without giving them the answer, Murray said.

Murray also is studying how feedback can help students understand physics concepts. All too often students only learn the "how" of science and never learn the "why," Murray said.

"Our research shows that it is not only good to be told if you're wrong or right, but it's also good to have to explain why," Murray said. "In that explaining process you gain a greater depth of understanding."

Results so far show that the visual cues and feedback are helping students and can improve online learning and tutoring systems, Murray said.

"A lot of learning is transitioning to online where there isn't a physical teacher or a physical classroom," Murray said. "If we can innovate these ideas into an online tutoring system, it will be similar to having the instructor there to give students feedback."

THE NEED:

To attract strong students with scholarships to physics and support their undergraduate research.

TO HELP:

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Murray presented the research at the National Association for Research in Science Teaching conference in March in Pittsburgh. He received a student research travel award from the College of Arts & Science to support his trip. Murray also received an undergraduate research award from the college for his project.

"I'm extremely grateful for this financial support because it has allowed me to not have to work an additional job," Murray said. "I am able to focus on my research, which has given me the opportunity to excel."

Murray also has been involved in numerous undergraduate programs in the college, including the McNair Program, the Developing Scholars Program and the Research Experiences for Undergraduates program, where he studied fiber optics.

His research experiences have inspired him to pursue a doctorate in physics education so that he can continue to help others.

"Even my motivation to play music was to make people happy," Murray said. "I wanted to help them and maybe make them forget about a tough situation or inspire them to do something. It's the same way with teaching. I want to offer something that helps somebody."

