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Vanderbilt courts rural students for STEM

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Aspirnaut's "beaming science labs" is a hands-on, inquiry-based hour-long science lab presented via Skype. (Photo: Anne Rayner)

Cody Stothers always knew he'd go to college because his grandmother, who raised him, constantly told him he needed to get a degree. A resident of Sheridan, Arkansas, with a total population of less than 5,000, Stothers is part of the first generation of his family to finish high school and go onto college.

Education research has shown many students in rural high schools don't aspire to a four-year university to earn a degree. In fact, as few as 77.5 percent actually graduate from high school, according to [a national report by the nonprofit organization The Rural School and Community Trust](#).

At the end of his junior year at Sheridan, Stothers didn't know which university he'd attend or what field he'd study. Then in the summer of 2009 he got a phone call that would put him on a path toward becoming a scientist.

"I had been selected to come to a summer program at [Vanderbilt University](#) because I had been identified as a [excellent] science student by my high school," Stothers said.

Vanderbilt's Summer Research Internship is one part of the nonprofit [Aspirnaut](#) program designed to engage rural students in STEM education. The idea behind the internships is to give these students who have an aptitude for science a chance to work in a research lab, find out what it's like to go to college, and then go back to their high schools to help mentor other students.

For eight weeks Stothers conducted research in the lab of Billy Hudson, a professor of medicine at Vanderbilt University's Medical Center.

"I was working on a drug Pyridorin for diabetic nephropathy, working with an NMR (Nuclear Magnetic Resonance Spectroscopy) to develop a mouse model for what that drug was doing for the metabolism of mice. That drug is now in late-stage clinical trials. It was a lot of on-the-job learning."

"We worked from 9–5 and we frequently had lunch speakers, ranging from your average physician to the dean of the medical school and Stanley Cohen, who received the Nobel Prize. That was fantastic," Stothers said. "We also had a campus tour and weekend of activities that gave us a bird's eye view of how college worked. There were a ton of enrichment activities that were interspersed. Huge culture shock, but I ended up loving it."

The experience translated into Stothers choosing to pursue a double major—molecular and cellular level biology and philosophy—at Vanderbilt. Among more than 400 applicants, Stothers, now in his junior year, was one of only seven students granted early admission to Vanderbilt's School of Medicine.

Science via Skype

During his senior year of high school, Stothers got involved in other components of the Aspirnaut program. One is the Online Bus, which turns a school bus into a high-tech commute. Outfitted with Internet access, laptop computers, and age-appropriate online educational programming, students on what is frequently referred to as "the magic school bus" are able to spend the 1–1.5 hours riding to and from school focused on enrichment activities tied to their curriculum.

“It was relatively new technology, especially for Sheridan,” Stothers said. “They had a lot of technical issues at first, so I would ride the bus with them twice a week to troubleshoot any problems and help kids with their homework.”

Stothers also helped his school set up Aspirnaut's “beaming science labs,” a hands-on, inquiry-based hour-long science lab presented via Skype. A complete kit of materials is sent to the school (at no cost) in advance of a regularly scheduled class that is taught by a Vanderbilt professor or graduate student. All the school has to do is link to the lesson via the Internet. The classroom teacher serves as the lab assistant.

“We’re providing the curricular materials. We’re providing pre-questions, post-questions,” says Julie Hudson, program director and cofounder. “The materials are shipped to them, or they decide they can find most of what they need there if they have the time. We make these supplies pretty cost-efficient. After a trial period, the school district usually picks up the cost of the supplies. The lab sheets or other materials are sent to them electronically ... and then on the day of (the class) they just have to connect us with the technology. (The teacher is) in the room to help troubleshoot, to help keep students moving forward and deal with behavioral issues and safety.”

The fact that students and professor are hundreds of miles apart doesn't matter to the students -- love the Skyped science program, Stothers said.

Engaging elementary, middle schools



(Photo: Courtesy of the Aspirnaut program)

But Aspirnaut is more than just a high-tech school bus, Skype science class, and internship provider. There are also online courses for students in grades 6–12 (with an online teacher) that can lead to college credit, and the program also offers college guidance and mentorship. College students like Stothers can volunteer to teach a science class, help prepare lessons, or serve as mentors for younger students, all of which fulfill community-service requirements.

Hudson says, “The flagships are this videoconferencing to engage early and often in middle and elementary school and then the Summer Science Research Internship. There are many other moving parts, but if we can have impact in this space, it will have and has had significant impact on the students.”

More than 800 elementary and middle-school students have participated in videoconference science classes and bus programs. To date, 43 high school students completed the internship program. Of those, 15 are still in high school and 28 graduated (none have dropped out); 27 are in a college or a postsecondary training program, with 25 studying a STEM-related discipline. The original goal of seeing 50 percent of the students enter STEM fields is well exceeded by the current 89 percent total. Hudson believes the number will decline over time, but is pleased that the program theory has been proven in practice.

The next goal for Aspirnaut is to find other universities willing to take on and replicate this successful STEM education model created over the past five years. While the program can adapt to

meet the unique needs of any community, the foundation of the success won't change, according to Aaron Fidler, the internship's biology teacher, researcher and now graduate student at Vanderbilt. That foundation is student engagement.

“One of the underlying goals of having grad students and postdocs is we're able to bring people in who are experts in that field, who can go off on tangents. I know I've had many a videoconference lesson where we have not finished the lab. When a student starts asking questions, the worst thing you can do is stop them from asking more questions. Unless we need to move on—and this is in the internship lab or on videoconferencing—if there are questions, I will answer and let them go down whatever path they want because that's what they're interested in,” Fidler said.