Madison Dodd *(left)* and Jessie Smith *(right)* study acids and bases in an Aspirnaut lab project in the Poyen City School District in Arkansas.

Photo by Anne Rayner

From One-Room Schools to Ph.D.s

Aspirnaut helps poor kids reach for the stars

By Margo Pierce (writerdiva.com)

A teenage boy from an abusive home decides to quit high school at age 16. He doesn't see any escape from physical and emotional violence other than getting a job to make enough money in order to get out. He lives in a community where most of the kids he goes to school with are also poor. And no economic development plan, if one existed, would make a dent in the poverty because so few locals even finish high school. No, leaving is the only viable choice.

A concerned teacher helped that boy—who could have been from any poor community—grow up to earn a Ph.D. in biochemistry and become a professor biochemistry, pathology, microbiology and immunology, doing groundbreaking research in the molecular basis of kidney disease. That boy, who came from rural Arkansas, is Billy G. Hudson, the co-founder of Aspirnaut, an education outreach program designed to help the other Billy Hudsons of the world.

"In early 2000 I got interested in thinking more about the history of where I came from, knowing that, to the extent I've been successful, why? And what could I do to help some other people?" Hudson says. "I got involved in the history of education in this remote, backwoods place in Arkansas that, for me, is becoming an example about what happens in rural education."

What he learned about the consolidation of 11 one-room schools into the Sheridan School District is that kids there can spend up to three hours a day on a bus. Along with his wife, Julie Hudson—a physician, assistant vice chancellor for health affairs at Vanderbilt University and co-founder of Aspirnaut—the renowned scientifist decided to leverage his expertise to help rural students.

"By many measures, U.S. students are not where they should be relative to the resources invested in their education. Why is that?" says Julie Hudson. "Why would a country that's enterprising and creative … have a student body that is so lagging by international and even our own national standards in math and science preparation? And how does one begin to address that?

"For us, it started with rural students. The need is everywhere—it's in urban and rural schools—but in rural schools it seems that the resources invested probably have a higher return on investment."

Serving as the program's director, Julie Hudson has been a driving force behind the development of this multi-faceted outreach effort using science, technology, engineering and math (STEM) to connect with kids at risk of not getting the education they need. Aspirnaut is described as a "K-20 pipeline," with the various components of the program assisting students from kindergarten through college to achieve their education goals.

Techno-buses

The "On-Line Bus" kicked it all off. Two school buses were outfitted with flat-panel computer monitors connected to online, age-appropriate educational programming. While kids rode to and from school, they participated in supplemental instruction coordinated with their school curriculum. Older students used laptops and the Internet to take advantage of supplemental resources or take online courses. But the advanced-placement and college-prep courses weren't just about filling time. Each student creates a personalized program to help her achieve the goals she sets.

Delving further into rural education, the Hudsons learned that a key component was missing: hands-on, inquiry-based learning.

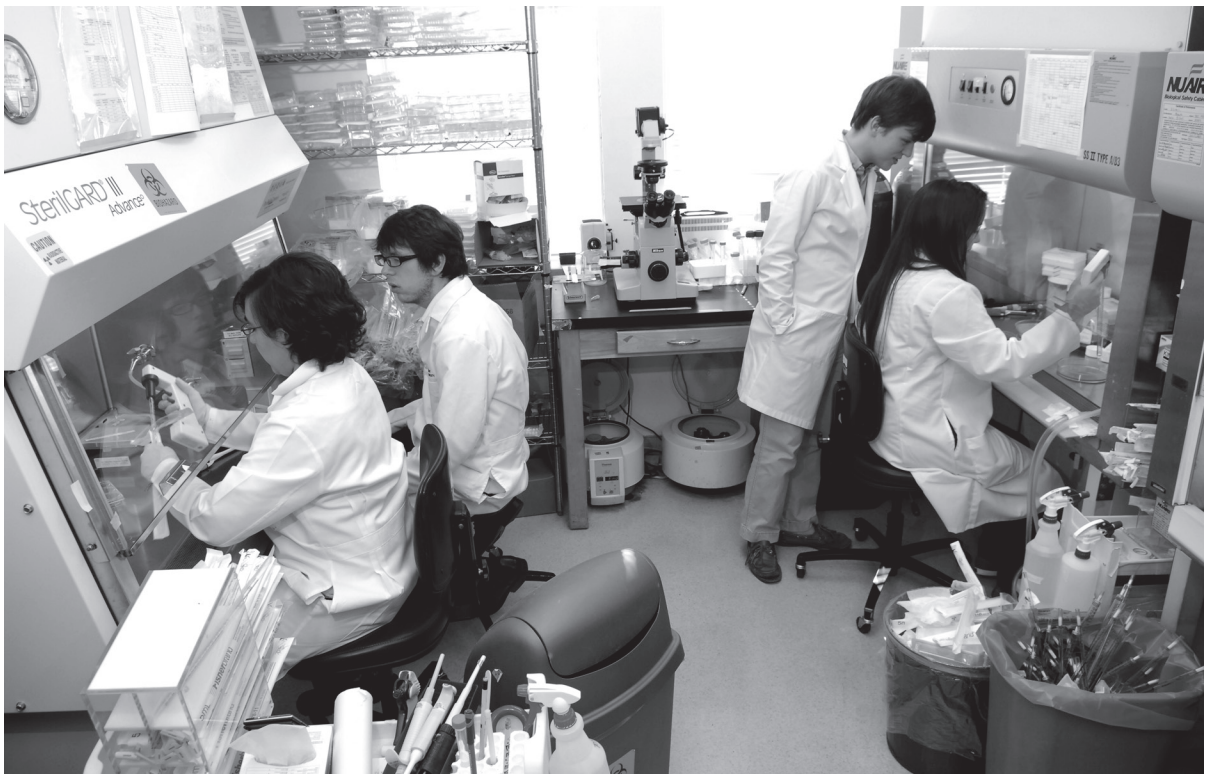
"This piece we didn't anticipate," Julie Hudson says. "There's such a need for hands-on, inquiry-based science. Using the application of doing something hands-on to teach fundamental concepts and then to teach the higher concepts around critical thinking ... and then going full-circle and applying it back to our lives: 'Why do you care about this?'

"A lot of teachers are not trained in science or math or engineering. Their degree's in elementary education. They probably took some science and math in college but not enough to feel comfortable generating the level of content that's needed to do the hands-on piece. It's not so different in sixth through eighth grades. Teachers don't have time. They have so many other layers of accountability now that they just don't have time to add that piece in."

This need gave rise to the use of video conferencing to teach STEM labs in rural schools. Using "Beaming Science Labs," volunteer teachers at Vanderbilt University work with teachers in a rural school to develop themed lesson plans once a week for 25-38 weeks throughout the school year.

Aaron Fidler helps develop the lesson plans for schools in Omaha, Arkansas, Maine, North Carolina and Tennessee. His title is "research assistant," but Fidler also teaches some of the beamed science labs. He says the students grow to love the program as much as he does, but they start out skeptical.

"You see this sort of cautious, wariness from the students. It's sort of like some stranger coming into their school—they're very reserved, they're very quiet.



Summer research interns working in Billy Hudson's lab at Vanderbilt University. *Photo by Anne Rayner*

You don't see that in bigger schools, (where) when you go in, they see more outsiders," Fidler says. "After a few times with them, you see them start to open up. They sort of take you in, and then all of a sudden they accept you. Then they're really excited. You ask them questions, and all their hands are up.

"I come from a very rural area, so living in the city now I've been able to take my experiences of being in a big university in a big city and relate that to myself when I was that age. That's been very useful in trying to help the students understand some concepts.

"At the end of the day they want to ask you about you. They'll ask me, 'What's your favorite food? What do you like to do?' 'What does a scientist do?' They think you just wear a lab coat, wear thick-rimmed glasses and you pour green solution into red solution."

The teachers in the school also benefit.

"Everybody's not an expert in everything. In some situations, you have some teachers who aren't necessarily trained in biology or chemistry, but they have learned enough that they can teach it," Fidler says. "The teachers are very happy to not have to take on that aspect of teaching. Maybe they don't feel comfortable with it, maybe they don't like it. They can't really get it across. I've seen them get excited about science, just like the students get excited. That's one of the goals of the program, to help the teachers understand it better and allow them to be able to take what they learned from that lesson and apply it next time."

Whole new world

For students identified as having a strong interest in or aptitude for science, the summer internship program at Vanderbilt University is an opportunity for students to experience life in a city, live on a college campus and work in a busy laboratory. In addition to working in Billy Hudson's lab under Fidler's supervision, the students attend daily lunch seminars that introduce them to people and professions they would never encounter back home. Add after-hours activities such as behind-the-scenes tours of campus facilities and urban outings to museums and other activities, and the importance of obtaining an education is readily apparent.

Many rural students in the Aspirnaut program are the first generation in their families to graduate from high school, according to Julie Hudson. And for those going onto college, they could also be that first generation.

"While you may think that you are going to join the family business or you may think that … you're going to manage the Sonic or work at WalMart, we know that there are a finite amount of those jobs, so what are the rest of you going to do?" Hudson says.

"People are not completely blind to those issues in rural communities, especially those that have seen a great decline in population over the past 10 or 20 year. They especially know that issue and know that something has to be done differently on behalf of their children—and in some communities, their grandchildren."

Cody Stothers is one of those students breaking out of the rural rut. Raised by his grandmother just a few miles from where Billy Hudson grew up, Stothers was told from the time he was a little boy that he would go to college. But he wasn't exactly sure what he wanted to study or where he'd go to college until the summer between his junior and senior years in high school.

Stothers was selected to be part of the pilot group for the summer internship program.

"It probably changed my life," he says. "Being interested in science and wanting to have more opportunities, coming here was fantastic. It was opening my eyes to a whole new world. All of that before college gave me a sense of responsibility, because I was getting paid to get stuff done and not just loafing around. That helped, giving me purpose.

"I was sold from the beginning. I think it's wonderful. The few years I've been involved I can see—not only in myself, but in other people who have been through the program—how much difference it's made. The last three summers I've been an RA (resident assistant) for the summer for the high school students coming. I have special attachment to them because I spend eight weeks in the summer getting to know them and being able to see the difference in their lives; it's really rewarding to me."

Rich and deep

At Vanderbilt, Stothers is now studying cellular biology and philosophy, a double major, and is one of seven students granted early admissions to the school's medical college, out 200 who applied. He helps prepare the lab kits sent to the schools before the science labs, occasionally teaches a class and hopes to stay involved with Aspirnaut into the foreseeable future.

It is this passion for learning that translates into student success. Approximately 600 students have participated in the beamed science labs, and 43 students have participated in the summer internships over the past four years. Of those, 28 have completed high school (no dropouts). All but one of the 28 are in post-secondary training programs; and of those, all but 25 are in STEM-related disciplines. The remainder of the 43 students are still in high school.

"We try to bring as much opportunity to bear to groups, individuals, teachers as we can once we engage," says Julie Hudson. "We intend for it to be a long-term partnership. It's not a single isolated episode of being there for one lab and not again. Whatever the district and students and teachers request is what we try to match, based on what they have need for."

But the need throughout U.S. schools is greater than any single program can handle. That's why Aspirnaut is constructed to be a model for other universities to adopt. Any post-secondary institution willing and able to share their expertise with under-funded K-12 schools needing STEM resources can adopt the elements of the Aspirnaut program to suit the needs of their local schools.

"This is one approach to tackle this issue of STEM achievement in the United States in K-12," Hudson says. "We focus on partnering the resources—this university faculty and students and staff who are rich and deep in science, that expertise—with the local rural classroom, its teachers, students and administration. It's that simple.

"It's then thinking bigger and broader. You've impacted 43—great! It's only 43. It's a model, so there isn't any reason why this can't be replicated at any number of private universities and at public universities."

Aspirnaut is developing a partnership with the University of Maine and is in discussions with other universities to adapt the program to the needs of their communities. The Aspirnaut program, now entering its fifth year, is continuing to test and refine various components, such as a new series of teaching-training classes for those doing the beamed science labs.

Stothers recognizes that many people know how big the STEM education solution is, but he also hopes those same people will also see "how big the solution is."

"Even though we're not in every single state in the country or every single town, we've already made such a huge difference in the lives of individual people, and that's what really matters at the end of the day," he says. "Taking someone and giving them an opportunity they wouldn't have had otherwise—that's what really matters, and I think that's what we're getting really good at doing."

Julie Hudson believes Aspirnaut could provide that same kind of opportunity for poor urban students because the untapped experts just down the road at a local university are just as out of reach for those kids. The problem is the lack of infrastructure to support bringing the expertise into the schools. Billy Hudson smiles when he talks about how a rural school program is "pioneering" the way to better education.

"It is growing. Exciting things are happening," he says. "We're doing things that are showing the way. You don't perfect it all, but you're showing what can be done."