“You might want to hold on to something,” Lupe Medina tells me, steering his 40-foot bus onto a narrow bumpy road. We are 18 miles from the Mexican border in South Texas, headed to La Villa High School.

Equipped with 12 lab workstations for up to 24 students, and thousands of dollars worth of laboratory tools, the bus is a mobile lab from the University of Texas–Pan American (UTPA), in Edinburg, funded with HHMI grants in 2004 and 2008. The lab has logged more than 10,000 miles traveling to hundreds of disadvantaged schools in the Rio Grande Valley—bringing real-world bioscience to more than 4,000 elementary, middle, and high school students each year as part of UTPA’s community outreach program.

La Villa High School stands alone, surrounded by farms and empty fields. It’s just 15 miles from the UTPA campus but a world away when it comes to educational resources. The school’s 185 students are all first-generation Mexican Americans. As with most public schools in rural Texas, La Villa’s science budget is very limited. Its students do not have access to high-tech lab facilities. That’s where Medina comes in—or drives in—with his lab on wheels.

Each week he visits a different high school, spending three days leading students and their teachers in hands-on experiments in DNA fingerprinting, replication, forensic analysis, and gene expression.

An entomology instructor at UTPA since 1999, Medina’s been taking the mobile lab to schools along the Mexican border for the past five years. He’s a teacher, a driver, and a self-taught mechanic. And he was a migrant, just like the students.

“I see myself in them when I was their age. I was curious, and our school didn’t have the necessary means to pursue that education,” he says. “Out there in the fields, I was more intrigued with all the cool insects that were around me.” He took a real interest in studying insects in high school and pursued entomology at UTPA. “It showed me that science was a way out; I didn’t have to be a migrant all my life,” he says. “And I try to instill this in them.”

He arrives at La Villa and begins to outfit each workstation on
the bus with micropipettes, solutions, spectrophotometers, centrifuges, thermocyclers, rubber gloves, and cheek swabs. A group of ninth graders approaches the bus and rummages through a box of white lab coats that Medina launders with bleach at his home.

These students may not think of themselves as budding scientists, but Medina tells them otherwise. “Once you put on your lab coats and step inside my lab, you are scientists.”

This week the students are DNA detectives investigating genetic evidence left at a crime scene. They extract DNA from their own cheek cells, replicate it by means of a process called polymerase chain reaction (PCR) analysis, and separate the DNA fragments by using gel electrophoresis—all tools of the trade in today’s crime labs.

“I was kind of nervous. It was my first time,” says ninth grader Maria Martinez. Although her experiment didn’t go well today, it still piqued her interest. “I’ll need to get more cheek cells next time.”

“I tell them it doesn’t matter if your science experiment didn’t work,” Medina says. “That’s science. I just hope that this helps them develop a passion for something that they want to do.”

Maria says she might study criminology in college and is considering the field of forensic science. “From what I’ve seen on TV, they go to crime scenes and start looking at DNA. But it’s actually a lot more detailed than what they show on TV.”

To get young scientists like Maria into the pipeline requires engaging them early and often, says John Trant, dean of UTPA’s College of Science and Mathematics and director of the university’s current HHMI grant. “And the best way to get them engaged is to get their hands on the equipment, on the ideas,” he says. “That’s how we’re going to get our physicians, our next layer of faculty, and our graduate students.”

That Cool Factor
CityLab set up the first classroom-in-a-lab program in 1992. A centralized biotech learning lab for high school students and teachers at Boston University School of Medicine, CityLab was funded by HHMI from 1994 to 2003.

In 1998, CityLab created its first MobileLab to take the show on the road and reach more high school students. Soon mobile labs sprang up in Connecticut, Georgia, North Carolina, South Dakota, Maryland, and Missouri. An informal alliance of mobile labs called the Mobile Laboratory Coalition emerged in 2003 and now serves as the umbrella organization for about 26 mobile lab programs across the United States and in Chile, Hong Kong, and Switzerland.

The Rio Grande Valley’s population growth outpaces almost every other corner of America. Yet, the UTPA mobile lab is the only one of its kind in Texas, and Medina cannot meet all the visit requests he receives from schools. Trant is trying to persuade other universities in Texas to start mobile lab programs, perhaps one day forming a consortium of mobile labs across the state. But for now, Medina is on his own.

The university will soon merge with its sister campus, the University of Texas at Brownsville, to become the second largest Hispanic-serving institution in the country. UTPA is already one of the top three producers of STEM (science, technology, engineering, and mathematics) degrees in Texas and plans to build its own medical school in two years. The new school will need highly skilled researchers, technicians, and investigators.

“I think of future scientists being born in that lab,” says Paul Duke, head of the science department at La Villa. When he arrived at the school in 2006, the students had a 24 percent passing rate in science. Today, the rate is 88 percent. Duke brings what he learns in his graduate studies at UTPA, and he brought the mobile lab to the school, which visits two or three times a year. “They have some sophisticated equipment there that we couldn’t possibly fund and keep in our labs here,” he adds.

“Plus, the mobile lab has that cool factor,” he adds. “It’s something new, it’s not the same everyday classroom setting.”

How to Be Everywhere?
HHMI has funded mobile lab programs at UTPA, the University of North Carolina at Chapel Hill, Georgia State University, and Harvard University and is currently funding programs at University of Cincinnati, New Mexico State University (NMSU), and University of Pittsburgh. All the labs engage students in hands-on bioscience, covering topics such as genetic engineering, infectious disease, forensics, DNA, and human health.

The NMSU mobile lab, which travels vast expanses between remote communities, has visited nearly 3,500 students at 25 schools in the past two years. Sixty-six percent of the students were underrepresented minorities. “It’s a chance to engage these students and open some doors, and eyes, to career paths that might not have been obvious to them,” says Michèle Shuster, codirector
of the HHMI grant at NMSU.

Raena Cota, NMSU’s Mobile Molecular Lab outreach scientist, has just returned from a two-and-a-half-week, 1,000-mile trip to three high schools. Instead of housing the labs in a bus, she packs the equipment into large crates, transports them in an SUV, and sets up the lab kits inside science classrooms for a week of hands-on experiments.

The students’ most requested experiment, Cota says, involves genetics and the ability to taste a bitter flavor. “We give them a paper with a chemical on it, and the first time they put it into their mouths they completely freak out,” she says. “A lot of them who claim they are strong tasters are actually weak tasters.” Students use PCR and gel electrophoresis to determine their genotypes, the genetic make up of their cells.

Cota has traveled more than 8,000 miles in the past year and says the hardest part of her job is turning down requests for visits. “It feels disappointing because I want to be everywhere at all times.”

To deal with this problem, NMSU created the Access to Science Center, which trains high school teachers to run their own mobile labs. “We’re trying to expand the number of students we’re reaching by helping teachers become less dependent on us,” says Ralph Preszler, director of the HHMI grant at NMSU.

A high school teacher attends a series of training workshops at NMSU to become certified; then the university loans the teacher a mobile lab kit to take back to the classroom. Last year, eight teachers independently ran activities in 22 classes with 544 students, 73 percent of whom were underrepresented minorities.

“They’re expanding the reach beyond what the mobile lab can do,” says Shuster. “Teachers get reenergized and reinvigorated.”

And the mobile labs are catching on with the students. After going through the program, the majority of the students—62 percent—reported being interested in taking science classes in high school, and 39 percent reported an interest in majoring in science in college.

“If you teach someone, the more they want to learn,” Cota says. “I want to bring something to the students that they’ve never seen before.”

Back in Texas, UTPA has decided to make the HHMI mobile lab its own. It began funding the program last semester and has budgeted $283,000 to run the lab over the next four years—including lab supplies, bus repairs, Medina’s salary, and that special box of white lab coats. — ROBERT GUTNIKOFF