

Ask, Listen, and Learn

Before they could plan effective programs, partners in a model science-teaching collaboration had to learn how to hear one another.

Walter E. “Skip” Bollenbacher had the best of intentions. In 1989, brimming with ideas for improving science education at North Carolina’s historically minority universities, he won a grant from HHMI’s undergraduate science education program to go out and do it.

But Bollenbacher, a professor of biology at the flagship University of North Carolina at Chapel Hill, had forgotten to do one thing: to find out what the historically minority institutions themselves wanted and needed.

“I was very skeptical” when Bollenbacher came calling, recalls Ronald Blackmon, dean of the school of mathematics, science, and technology at Elizabeth City State University. “I had seen this kind of thing before. A big institution with few previous ties to minority universities thinks it has the prescription for improving science education, and they try to give us that medicine. Usually they just pay lip service and go away when things don’t work.”

That’s probably what would have happened, Bollenbacher admits, if he hadn’t stopped talking and started listening.

“We learned very quickly not to prescribe and not to assume that what we thought they needed was what they actually wanted,” says Nancy T. Barnes, one of the first staff members Bollenbacher hired. Instead, they began to talk with science faculty at historically minority institutions—an ongoing dialogue that evolved into a successful consortium, the Partnership for Minority Advancement in the Biomolecular Sciences (PMABS). Barnes, now one of PMABS’ associate directors, collaborates with university partners to advance underrepresented students into science careers.

VARIATIONS IN THE MESSAGE

PMABS began to offer summer research fellowships at Chapel Hill for science faculty

from the historically minority universities. The program was later expanded to include students from those institutions as well. To help transfer what the professors had learned back into their institutions, PMABS developed a cornerstone course, “Frontiers in the Biomolecular Sciences,” which focuses on advances in cell, molecular, and developmental biology. And when program participants suggested that labs would complement the course’s seminars, PMABS secured a second grant from HHMI to provide the needed equipment.

Here, too, the key was to listen to the message—and to make note of its variations. “Science departments in these colleges had different curricular emphases, so it made no sense to give everyone the same box of tools,” says Barnes. Johnson C. Smith University in Charlotte, for example, needed inverted microscopes to pursue that school’s focus on cell biology, while other institutions needed research-grade equipment for new molecular biology courses.

Marilyn Sutton-Haywood, associate vice president for academic affairs at Johnson C. Smith, was impressed by PMABS’ openness and restraint. She expected the scientists from Chapel Hill “to tell me what to do. But PMABS acts as a real facilitator to all of us.”

When PMABS found that some of the lab equipment wasn’t being used due to time constraints on faculty, the staff learned that the universities needed additional skilled hands in order to be able to deliver engaging labs. Only two partners—North Carolina Agricultural & Technical State University and North Carolina Central University—had graduate students to assist with teaching undergraduate labs. So PMABS established research assistantships to train undergraduates to play that role.

This program has been as rewarding to the research assistants as it has been to the partner universities. For Jan Lee Santos, the time spent as an undergraduate research fellow at the University of North Carolina at Pembroke changed his life. UNCP was originally a teachers’ college for the Lumbee tribe

ABOARD DESTINY *On a big blue and white bus known as Destiny, 24 students from North Carolina’s Bartlett Yancey High School learn the scientific steps to differentiating sickle cell from normal hemoglobin. So far, nearly 9,000 students have conducted experiments on the traveling science laboratory. Demand is so great for the popular PMABS outreach program that a new bus, Discovery, will soon hit the road.*



(and to this day, one in five students there is Native American; another 22 percent are African American). Thanks in large part to his PMABS fellowship, Santos became hooked on research. He's now pursuing a Ph.D. in molecular biology and genetics at Texas A&M University.

The PMABS consortium has also been working to provide stronger science teaching to ensure that new fields are taught at the minority universities. Through a National Institutes of Health-supported program called Seeding Postdoctoral Innovators in Research and Education (SPIRE), PMABS began training postdoctoral scientists to be top-notch researchers and teachers, placing them for a third of their training on the historically minority campuses to teach and be mentored by outstanding teaching faculty. So far, 21 SPIRE postdocs have spent at least a year each teaching at these institutions, and many plan to stay; two have already accepted tenure-track faculty positions.

C. Dinitra White, a SPIRE postdoc, is coming full circle from her career as an undergraduate at Johnson C. Smith. She had

decided to become a researcher while taking lab classes at the university, and went on to Michigan's Wayne State University for a Ph.D. in microbiology. Now she is heading back to Johnson C. Smith, intent on teaching there in a full-time position. "I want to teach in a small historically minority university," she says, "because I know that is where I can have the greatest impact on students."

SPIRE alumnus Brian Rybarczyk, now one of PMABS' Ph.D. scientists, is developing and teaching videoconferencing courses, bringing such Chapel Hill classes as "Molecular Basis of Disease" to students at three partner campuses so far.

Another PMABS innovation is what Bollenbacher calls "change agents"—Ph.D. scientists who specifically want to contribute to providing historically minority university students a comprehensive science education. Again, PMABS turned to NIH for support in hiring seven scientists, having one at each partner institution to teach courses, mentor students, integrate technology into the respective learning cultures, and help attract students into bioscience research careers.

Change agents, SPIRE postdocs, and other PMABS-supported initiatives have brought 53 courses to approximately 1,200 students across North Carolina, in subjects that otherwise would have been unavailable to them. In the next five years, Bollenbacher expects PMABS courses to reach triple that number of students. "In essence, we will have one huge, interconnected, statewide biology department that can offer any student any subject, either on their campus or through our electronic distributed-learning network," he predicts.

A BUS NAMED DESTINY

While the PMABS consortium was busy fortifying college-science learning, it also realized the extent of the changes needed to help high schools in North Carolina to prepare students for college level science. "We need to do more than reform science education," Bollenbacher explains. "We need to *transform* it. That language is very important. Would you collaborate with me if I said I was going to reform you? But we can transform together."

He described a pilot transformation project in Caswell County, a rural area with a high population of minority students. To bolster low student performance (as charac-

terized by the state), PMABS provided educational specialists to work with teachers, parents, school administrators, and community leaders. "We helped them examine the realities of life in their community and their schools," Bollenbacher explains. "Do the teachers have classes of 25 or 45? Do they teach 50-minute periods or 90-minute blocks? Do they have labs? Whose expectations are they trying to meet, and what are those expectations?"

PMABS brought Destiny to Caswell County. Funded by the pharmaceutical giant GlaxoSmithKline, whose operations are based in North Carolina, Destiny is a mobile lab—a 40-foot bus—that accommodates 24 students at 12 lab stations. The program has trained almost 1,000 teachers in 95 of the state's 100 counties. Almost 9,000 high school students have conducted experiments on the bus, which is so popular that it will be joined in May by another bus, Discovery, funded by NASA.

"The only thing wrong with Destiny is that it doesn't visit us often enough," says Ophelia Willis, a director of instruction for the Caswell County schools. "It provides instruction and equipment that rural school systems cannot afford. If we need anything else, I feel we can just call on UNC Chapel Hill. They are there for us 100 percent." Bollenbacher agrees: "The goal of the program is to provide a powerful visual image of what science education must be, and we are here to support schools' efforts to put that science in the classroom."

PMABS may soon become a national model for science education. Robert N. Shelton, executive vice chancellor and provost at UNC Chapel Hill, wants to establish an institute of science learning to help scientists and professors in other disciplines use some of the most successful teaching models, including Bollenbacher's. "A lot of the problems we have in higher education are so big, it will take this kind of collaborative model to solve them," says Shelton.

Although pleased by the praise for PMABS' program, Bollenbacher makes one thing clear. "We don't provide solutions," he explains. "We provide opportunities, resources, and a perspective that empowers people to do it the way it works best for them. The only way to do this is to ask, listen, and learn."

—RENEE TWOMBLY

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