SOMETIMES small seeds—and big dreams—can take root to solve seemingly intractable problems.

Johnny Appleseeds *of* Science

by Jennifer Boeth Donovan

ANN L. CHESTER KNOWS what it feels like, and what can happen, when kids don't believe in themselves. She remembers the sting of a mistake made in her own childhood, when a school administrator misread her test scores and placed her in a class for low achievers.

"They told me I wasn't college material," Chester recalls. "They told me my future held a job as a seamstress or a gas-station attendant." Her response was predictable. "I stopped trying to get good grades. I cut up in class and was sent to stand in the corner. That was not like me at all."

Illustration By David Brinley

Even after her mother convinced the school to revisit those test scores and Chester was moved into a high-achievers class, the self-doubt was hard to overcome. "It took me forever to regain my academic performance level," Chester says. She eventually did, however, excelling in college and earning a Ph.D. in biology. But, she notes, "if six weeks of that kind of expectation and treatment could have such an effect on me, think what a lifetime of it could have on anyone."

As a teacher at West Virginia University (WVU) in Morgantown, Chester was thus moved by the vast, unrealized potential she saw all around her. Nearly 20 percent of the residents of this small Appalachian state live in poverty. Fewer than 15 percent of West Virginians have college degrees, despite the enormous need there for qualified health-care workers and other trained professionals.

To help change the situation, Chester took charge of a federally funded campus program to draw minority and disadvantaged undergraduates at WVU to careers in science, medicine, dentistry, and pharmacy. Despite her best intentions, however, it didn't work. "We weren't getting [minority and disadvantaged] students," she recalls. They were washing out of the educational system long before they got to college. "And we weren't keeping the ones we did attract."

After this disappointing start, Chester rethought her approach and set new goals. She wanted to reach students at a younger age to support their interest in science and give them confidence in their own abilities to succeed. The program had to reach back into the high schools. And it had to root itself in the communities it served, not at the university in Morgantown.

With her new vision and determination to change the status quo, Chester, like other visionary educational mavericks, put modest resources to work to make enormous changes. And that's exactly what HHMI hopes its grantees will do with its funding. "We want to plant seeds that will grow into a new and more effective kind of science education," says Peter J. Bruns, HHMI vice president for grants and special programs.

With the blessing and guidance of Robert M. D'Alessandri, vice president of WVU's Health Sciences Center, Chester crafted a plan for the Health Sciences and Technology Academy (HSTA), including after-school science clubs in local communities plus a summer program on the WVU campus, where high school students could work in research labs and meet potential role models.

WVU won a competitive $175,000 grant from HHMI to establish HSTA in 1994 in Kanawha and McDowell counties. Kanawha, home to West Virginia's capital of Charleston, has a mostly urban population. McDowell, in the southernmost part of the state, is

"THEY TOLD ME I WASN'T COLLEGE MATERIAL" ANN CHESTER RECALLS. "THEY TOLD ME MY FUTURE HELD A JOB AS A SEAMSTRESS OR A GAS STATION ATTENDANT." HER RESPONSE WAS PREDICTABLE.

A Home on Campus

AT CALIFORNIA STATE UNIVERSITY, Long Beach (CSULB), the late Jim Jensen, then dean of the College of Natural Sciences and Mathematics, saw a need in the early 1990s for a place on campus that science students could call home. His vision was of a safe haven where students could feel they belonged and find a firm footing in the sciences, whether they were starting as freshmen or transferring—as many at CSULB do—from a community college. So he applied and received a $750,000 education grant from HHMI in 1991. JENSEN'S DREAM HAS GROWN into the James L. Jensen Student Access to Science and Mathematics Center, where entering freshmen can go on a "science safari," a weekend on-campus orientation program to introduce science-related campus resources and opportunities, and transfer students can learn about natural science majors at the university. Through the center, hundreds of students have found research opportunities and gotten advice about science careers from faculty and peer mentors. The center has become something of a science umbrella, coordinating eight student programs, including the National Institutes of Health-funded Access to Research Careers and Bridges to the Baccalaureate, and the National Science Foundation-funded Louis Stokes Alliance for Minority Participation.

mostly rural. Both counties have large percentages of economically disadvantaged people.

Steve Starks, publisher of a statewide minority newspaper and leader of West Virginia's African American community, jumped on Chester's bandwagon. "In HSTA, I saw hope for students who might otherwise fall by the wayside," he says. "I saw exposure to information that can put them in a position to succeed in life."

With Starks in her camp, Chester earned the trust of his constituents. She also reorganized the local boards that ran the programs in each county so that they might intimately involve parents, teachers, and community leaders.

"Ann was able to develop remarkable rapport with the African American community," says D'Alessandri. "She was able to identify community leaders, and she invited them to run their own programs. Ann works from a collaborative model, not a hierarchical one. She not only considers the opinions of those she's working to serve, she welcomes them."

The reforms quickly paid off. In 1995, the W.K. Kellogg Foundation added $2 million to the HSTA coffers, citing strong community-based support as a major factor in its decision to help fund the program. With this additional funding, Chester expanded HSTA to 10 of West Virginia's 55 counties.

But she wasn't satisfied. She kept applying for grants, building the program, and success bred success. Soon the Coca-Cola Foundation added another $200,000, and before long the Robert Wood Johnson Foundation, the Claude Worthington Benedum Foundation, and the National Institutes of Health joined in supporting HSTA. In 1999 and 2003, HHMI awarded new competitive grants to WVU's HSTA program.

Chester and her community-based boards even took on state government, approaching the West Virginia legislature with an audacious proposal: tuition waivers for HSTA students at state colleges and universities. It took three years and countless visits to legislators by HSTA students and their parents, but in 1997 the legislature unanimously approved tuition waivers at any state college, university, or professional school for any student finishing all four years of high school in the HSTA program.

Today, HSTA is active in 26 West Virginia counties, where 124 community residents serve as members of volunteer governing boards. Nearly 800 students and 80 teachers participate in local science clubs, an annual statewide research symposium, and summer programs at WVU and other West Virginia university campuses. Another 750—more than two-thirds of whom were the first in their families to go to college—have completed the program and are attending college, university, or graduate or professional school. In May 2006,

*"I FELT SURE THAT IF I BUILT SOMETHING THAT ADDRESSED [THE NEEDS OF STUDENTS WHO WERE MISSING OUT]," **DAVID BYNUM** RECALLS, "INSTITUTIONAL AND FINANCIAL SUPPORT WOULD FOLLOW." HE WAS RIGHT.*

Learning from Mistakes

SOMETIMES SEED MONEY CAN can serve a very different purpose—teaching educators what not *to do. Hope College in Holland, Michigan, wanted to involve minority middle and high school students in science. With a $750,000 grant from HHMI in 1991, it tried to develop a middle school recreation program, research clubs, and summer research on campus for high school students. "IT DIDN'T WORK VERY WELL, and we didn't get another HHMI grant, though not entirely because of our inability to sustain this effort," says James Gentile, then a biology professor and HHMI program director at Hope. "But we knew how important it was to reach minority students early. So we sat down and said, 'How can we do this more effectively, with less money?'" recalls Gentile, now president of the Research Corporation, a private foundation based in Tucson, Arizona, that supports college-level basic research in the physical sciences. HE CREDITS THE VISION AND INITIATIVE of Todd Gugino, director of Hope's chemistry laboratories, with helping the college shift gears and launch a science camp in 1998, initially funded through the parents of the students who participated. The camp has been such a hit with west Michigan kids and their families that almost 700 campers will attend this summer, many with scholarships underwritten by local companies and private donors, reports Gugino, who directs the program. "It is a wonderful example of staff working together to keep a vision alive until it could develop into a sustainable initiative that really works well in the Hope environment," says Gentile.*

HSTA students earned 68 bachelor's degrees, 10 master's degrees, and 3 doctorates. Emme Chapman, from remote Hodam Mountain, received the HSTA's first medical degree.

According to a 2006 study by the Bureau of Business and Economic Research at WVU, students who go through HSTA can expect to earn annual salaries on average almost $26,000 higher than their parents.

Turning On Students—and Teachers

WEST VIRGINIA ISN'T the only place where one person's resolve and a little seed money are changing lives. At the State University of New York, Stony Brook (now Stony Brook University), David Bynum found himself teaching biochemistry and cell biology in a community where enormous gaps existed between haves and have-nots, and the latter were largely absent from his classroom—and, more specifically, from science education and careers. Feeling a need to reach out to a more diverse group of potential science majors, he borrowed a lab to offer summer research opportunities to disadvantaged students at two nearby community colleges.

Using his first HHMI grant (awarded in 1994), Bynum then remodeled and outfitted two labs at Stony Brook specifically for his purposes. He developed a summer residential research program for students from three high schools in economically disadvantaged districts, and he turned another campus laboratory into a teaching center where middle and high school students could conduct hands-on biotechnology experiments. In the program's first year more than 4,000 students participated.

Bynum also created three courses and several workshops for biology teachers. Demand was so great for these courses that he sought and received New York State approval to offer a master's degree in biology teaching rooted in hands-on science. Eventually, he parlayed an HHMI grant of $1 million into more than $10 million in external funding and complete buy-in from the university.

"David is just phenomenal," says Shirley Strum Kenny, president of Stony Brook University. "It is incredible how he is able to bring kids to a love of science. He started small, and he built step by step. He's low-key and unassuming, but he knows where he wants to go, and he never wavers."

Bynum says he realized in the early 1990s that "science in the United States was grade A, while science education was more like a C. Improving science education and providing more opportunities for students who traditionally had missed out was clearly in the individual and national interest. I felt sure that if I built something that addressed those needs, institutional and financial support would follow. Besides, it's such satisfying work."

Bynum won the 2002 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. True to form, he used the $10,000 prize to generate more than $100,000 in fellowships for prospective science and math teachers who do their student teaching in districts designated "high-need."

More than 80 percent of the 127 school districts of Long Island (where Stony Brook is located) now participate in Bynum's programs.

Kenny credits it all to Bynum: "He is growing our scientists of the future." ■

A Role Model Who Brings Snacks

HOLLY MITCHELL GREW UP IN CHELYAN, West Virginia (population 950), where her father worked for Appalachian Power and her mother was a homemaker. Holly wanted to go to college, but she didn't see how. Her parents never had, and money was tight. As a freshman in high school, Mitchell heard about a new science club and decided to check it out. At monthly meetings, she and her classmates in the Health Sciences and Technology Academy's (HSTA) first program learned about health, nutrition, and exercise. "We did cool science projects and had amazing cultural experiences," says Mitchell. She'll never forget the club's trip to the National Great Blacks in Wax Museum in Baltimore, for instance, her first time that far from home without family.

"HSTA TAUGHT US TO BE ACCOUNTABLE for our own success," she says. "We learned to say 'when I go to college,' not 'if.'" And HSTA showed them what college was like. Mitchell spent two summers on the sprawling campus of West Virginia University (WVU) in what she calls "the big city of Morgantown," taking classes, working in labs, talking with scientists and health-care professionals, and living in the dorms. By the time she graduated from high school in 1998, the West Virginia legislature had passed a tuition waiver that enabled her to enroll at WVU. "It wasn't even scary," she recalls. "I'd been there before; I knew my way around." MITCHELL MAJORED IN PSYCHOLOGY and earned a master's degree in public health. She felt so strongly about HSTA and its mission that she returned to Kanawha County to serve as an HSTA field-site coordinator, just a few miles from her childhood home, helping the younger brothers and sisters of her HSTA classmates find ways to achieve their own dreams. "I just treated them with respect and helped them find resources," she says. "Sometimes I also brought snacks." SHE RECENTLY CHANGED JOBS, moving to the Center for Organ Recovery and Education, serving southern West Virginia, educating hospital staff and their communities about organ donation. "I would never have had the confidence and networking skills to do this if I had not been part of HSTA," she says.