BUILDING SOLID BRIDGES

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COMMUNITY COLLEGE STUDENTS INTERESTED IN PURSUING SCIENCE ARE ON SURER FOOTING, THANKS TO WELCOMED SUPPORT.

RYAN DOSUMU-JOHNSON

had a big decision to make the spring after his 18th birthday: apply for a promotion with RadioShack or enroll in classes at a community college. Though he came from a well-educated family—his father is a doctor and his sister a medical anthropologist—in high school he barely eked out a C average. But, craving an intellectual challenge, he decided to give school another try, and in the fall of 2003 he enrolled in classes at southern California's Orange Coast College.

This spring, Dosumu-Johnson faced an altogether different kind of choice: enroll in the joint M.D./Ph.D. program at Harvard University and the Massachusetts Institute of Technology (MIT), or accept admission to the tri-institutional program at Weill Cornell Medical College, Rockefeller University, and Memorial Sloan-Kettering Cancer Center.

Clearly, school suited him just fine.

Dosumu-Johnson's story offers a lesson to educators as they search for the next generation of scientists: don't forget community colleges.

A handful of educators have built "bridge programs" between community colleges and four-year institutions. The Bridges to the Baccalaureate program that steered Dosumu-Johnson toward a Ph.D. is based at the University of California, Irvine, and includes an undergraduate summer research program at the university. It's one of dozens of similar initiatives administered by four-year colleges and universities to help community college science students successfully transition to four-year institutions.

The funding for such programs comes from organizations, including HHMI, the Virginia-based Jack Kent Cooke Foundation, the National Science Foundation (NSF), and the National Institutes of Health (NIH). These institutional programs are experimenting with different formulas to see what it takes—in addition to financial aid—to find and nurture future scientists among the ranks of community college students.

Teasing apart the winning components of these endeavors is no simple task. The strategies and goals are as diverse as the students, who often are from groups underrepresented in the sciences. But lots of close attention and advising for the students, plus a hands-on research experience, appear to be essential. And for students like Dosumu-Johnson, these efforts are well worth the investment.

"The range of student talent at community colleges is extraordinary," says Chris Craney, director of undergraduate and sponsored research at Occidental College, a four-year private college in Los Angeles. In the mid-1980s, Craney, a chemistry professor, started a summer research program at Occidental for community college students interested in science. Over the years, he drew from a variety of funding sources, including HHMI. He says some of his best students transferred to Occidental via the research program.

"It tapped a talent pool that's often overlooked," he says.

Two-year colleges have long been undervalued in two significant ways. First, they lack federal support. Although community colleges serve nearly half the undergraduates in the country, the federal government provides them with less than one-third of the funding that it gives public four-year colleges, according to a report released in May by the Brookings Institution.

Second, their students are not always accepted at four-year institutions with open arms. Harvard and Princeton currently do not accept any transfer students, says Emily Froimson, director of higher education programs at the Jack Kent Cooke Foundation, a private organization that provides assistance to low-income students. At highly selective schools that do accept transfers, a shrinking handful come from community colleges. A national study partially funded by JKCF and published in 2006 found that, between 1984 and 2002, the number of transfer students accepted at elite institutions dropped from 10.5 percent of entering students to 5.7 percent.

Those schools that do accept transfer students generally do so simply to make up for attrition rates, and once accepted, students often receive inadequate financial aid, according to Froimson.

"That's not a very proactive approach," she says.

At the same time, Froimson notes, research has demonstrated that high-achieving, low-income students are more likely to graduate if they attend selective schools.

Chances are, many more will attempt this route as families turn to community colleges to cut education costs for their baccalaureate-bound kids. Indeed, enrollment in community colleges has swelled during the economic downturn, making bridge programs increasingly important

FOR RYAN DOSUMU-JOHNSON (LEFT), A SUMMER RESEARCH EXPERIENCE MADE POSSIBLE BY A COMMUNITY COLLEGE BRIDGE PROGRAM OPENED HIS EYES TO A CAREER IN SCIENCE. SOME BRIDGE PROGRAM DIRECTORS, LIKE UNIVERSITY OF MIAMI'S MIKE GAINES (RIGHT), KEEP STUDENTS ON TRACK WITH LOTS OF TALK AND ADVICE.

for giving students a rich and inclusive educational experience.

A CHANCE TO DO RESEARCH

One of the most common components of bridge programs is undergraduate research. Program directors say it's an effective way to engage students in science and to help them figure out whether research is for them.

For Dosumu-Johnson, it dramatically altered his goals.

At Orange Coast College, he loved his science classes but hadn't really been introduced to research.

"The teachers were amazing," he says. They knew the subject matter, they were passionate, and they engaged and challenged students to understand science, not just memorize facts, he says.

Though he developed a deep appreciation for science, Dosumu-Johnson didn't realize that a career in scientific research was even a possibility from where he stood. His community college professors had Ph.D.s, but they weren't active research scientists.

"Most students don't have a perception of what's out there, of what's available in science and math," says Melanie Gill-Shaw, a coordinator at Eastfield College in Dallas County, Texas.

Community colleges emphasize teaching more than scholarly output. Professors carry heavy teaching loads compared with their four-year counterparts, leaving little time or incentive to do research (see sidebar, page 31). Often, their campuses can't afford maintenance or expansion of lab space, according to an article last fall in the Council on Undergraduate Research journal.

Dosumu-Johnson was considering taking a job as an emergency medical technician the summer before he transferred from Orange Coast to the University of California, Los Angeles (UCLA), when he received an invitation to apply for the NIH-funded bridge program at UC Irvine. If accepted to Irvine's program, he would receive a stipend, neutralizing the money issue. Curious to learn more about research, he applied, landed a spot in the program, and found a laboratory at Irvine to host him.

Dosumu-Johnson says that hands-on experience sparked his interest in research as a career. In the lab, he was encouraged to troubleshoot problems that arose during experiments instead of just doing what he was instructed in "cookbook"-style experiments with predetermined results.

"It was an amazing experience on multiple levels," he says. He presented his summer research project in San Francisco at a conference of the American Association for the Advancement of Science. He'd never been to the Bay Area or to a scientific meeting bustling with people who thrived on research. Despite his inexperience in the conference environment, the chance to network led him to meet the UCLA professor who became his mentor when he later transferred to the four-year school.

Gill-Shaw at Eastfield College agrees that research experience is a big plus. She received an NSF grant to increase the number of students majoring in science, technology, engineering, and math (called STEM fields). The program places students in research settings at the Big Thicket National Preserve in Saratoga, Texas, and at the University of Texas Southwestern Medical Center at Dallas.

Dosumu-Johnson: Mark Harmel Gaines: Jeffrey Salter

VENEZUELA NATIVE ALEJANDRA MENDOZA (LEFT) CREDITS THE UNIVERSITY OF MIAMI'S BRIDGE PROGRAM FOR POINTING HER TOWARD A PH.D. PROGRAM IN DEVELOPMENTAL GENETICS. OCCIDENTAL COLLEGE CHEMISTRY PROFESSOR CHRIS CRANEY (RIGHT) SAYS SOME OF HIS BEST STUDENTS TRANSFERRED FROM COMMUNITY COLLEGES VIA A BRIDGE RESEARCH PROGRAM.

The results have been promising. During the three academic years before the program was implemented, Eastfield's STEM enrollment hovered at about 2,100 students. After the program's kickoff, enrollment jumped to 2,401. In 2007–08, the number of STEM students topped 3,500.

SUPPORT AND ADVICE

Intensive peer and administrative support make a difference as well, according to bridge program students and program directors.

Students who participate in peer groups develop strong bonds and help each other meet the demands of the rigorous curricula. The peer group can relieve the family and life pressures that weigh on the students.

Former bridge scholar Alejandra Mendoza says she became very close to her support group of Miami–Dade College students, all enrolled in the University of Miami program.

"We really did become a family," she says.

Advice from faculty, staff, and administrators can be just as potent. When the program novelty has worn off, doubts bubble to the surface, says Paul E. Hertz, professor of biological sciences at Barnard College and head of a bridge program that partners with LaGuardia Community College. Barnard's summer program, which has been fully funded by HHMI since 1992, brings LaGuardia students to live on campus. Every year about a week into the session, they start telling themselves they don't belong there, he says.

"We usually work through the issues," he says, adding that more than 70 percent of the scholars who go through Barnard's program transfer to four-year institutions including Barnard and Columbia University. Most pursue science or science-related degrees, says Hertz.

That's substantially better than national averages. Among community college students who intend to obtain a bachelor's degree, on average only about one-third ultimately transfer to four-year institutions, according to a 2001 report from the National Center for Education Statistics.

"Part of the problem is that advising comes late," says Becky Wai-Ling Packard, associate professor of psychology and education at Mount Holyoke College in Massachusetts. Packard's research focuses on first-generation college students in STEM fields. Many are community college students, who, she says, think they don't have time to seek out advisers for information. More than 75 percent of full-time community college students have jobs, according to the American Association of Community Colleges, and 83 percent of part-time students are employed.

Even the most determined student is often uninformed when it comes to transferring, for example, says Packard. A large portion of community college students who plan to transfer do not talk to anyone at a four-year school about prerequisites and transfer credits, she says.

When transfer time comes, they might find they have to retake a class or two because they took the wrong class at the community college.

"Students don't have time or money to retake a class," Packard says. Having the right credits is more problematic for would-be science students. Some of their required classes have to be taken in a certain order, Packard explains. And often,

Mendoza: Chris Jones Craney: Darcy Hemley

the classes are offered only one semester of the academic year—for example, Biology I is offered in the fall and Biology II in the spring. If students miss or have to retake one of the classes, they might not be in a financial position to wait another year for it to be offered again.

Community colleges and four-year institutions sometimes attempt to address transfer issues with articulation agreements, which are designed to make curricula the same at the partner institutions. With the exception of a few states, such as California, that have developed a well-oiled transfer mechanism, Packard says these agreements can be signed and filed away with no follow-up—and no effect.

Bridge program directors, like Mike Gaines at the University of Miami, go heavy on the advising. Gaines makes a point of talking to students and their teachers regularly.

"I started seeing Mike [Gaines] as a father figure," says Mendoza. "He was really involved and always catching up with us."

Bridge partnerships like the one at Miami–Dade College and the University of Miami make students' transition from one to the other seamless by, for example, making sure there is no room for uncertainty about transferring credits.

"Both sides have totally bought in," says Carter Burrus, director of the honors college on Miami–Dade's north campus.

Almost all the students who participate in the Miami bridge program—supported by grants from HHMI, NSF, and NIH—transfer to four-year institutions, including highly selective colleges and universities, Gaines says.

"I've lost students to Stanford—that's not such a bad thing," he quips.

The program, which Gaines spearheaded in 1994, supports about 15 new students per year. Most complete bachelor's degrees in the sciences. More than a quarter go on to Ph.D. programs, Gaines says, and about 30 percent go to medical school.

Mendoza credits the Miami bridge program for propelling her to New York University, where she is working toward her Ph.D. in developmental genetics. She had moved to the states from Venezuela in search of a science education and career.

"I was sure once I got here I could find good opportunities, and it ended up being true," she says.

Dosumu-Johnson says the UC Irvine bridge program was largely responsible for lighting his research ambition. In his final year at UCLA, he earned a spot in the HHMI Gilliam fellowship program, which provides full support for up to five years toward a Ph.D. for outstanding students from underrepresented groups in the sciences.

He could be working in retail—but this summer, he is on his way to becoming a physician-scientist at Harvard and MIT. ■

FOR THE PROFS

Though bridge programs focus on student development and assistance, the University of Miami and Occidental College offer something for community college teachers as well. ¶ Miami hosts one faculty member each semester in a research lab to keep the hands-on and inquiry aspects of science fresh. Occidental, a private four-year college in Los Angeles, has taken this idea a step further and recently made research by community college faculty a top priority. ¶ "There is good evidence in the literature that says if faculty stay active scholars, they are more effective teachers than those who rely on what they learned 'X' number of years ago," says Chris Craney, head of Occidental's bridge program. ¶ Chemistry professor Dennis Mitchell from Los Angeles City College says it worked for him. Last year, he became the first of two community college faculty members to receive support from Occidental's HHMI grant. Becoming a teacher, he says, didn't mean he was done learning. ¶ "I talked to Chris and came up with my own project," says Mitchell, who studied the use of porphyrins for solar energy storage. "The amount of insight you get [from research] is incredible. Chemistry is more than just what's in the book." ¶ This summer, Asmik Oganesyan, a chemistry instructor at Glendale Community College, became the second teacher to take advantage of the experience offered by Occidental's program. Her students are seeing the benefits. —*C.S.*