

BRIDGES TO THE BACCALAUREATE PROGRAM AT J. SARGEANT REYNOLDS COMMUNITY COLLEGE AND VIRGINIA COMMONWEALTH UNIVERSITY

D. NEELY-FISHER

J. Sargeant Reynolds Community College, Richmond, Virginia 23285

Abstract

This paper describes a research apprenticeship to encourage and to inspire minority students to major in disciplines that lead to careers in biomedical research.

The Challenge

The National Institutes of General Medical Sciences, National Institutes of Health (NIH) Bridges to the Future programs are designed to encourage individuals underrepresented in the sciences to pursue careers in biomedical research. In 1997, the percentage of doctorates awarded to United States citizens in science, engineering, and mathematics (SEM) fields included 84.2% Whites, 2.2% Blacks, 3.2% Hispanics, and .03% Native Americans [1]. In *Wanted: A Better Way to Boost Numbers of Minority Ph.D.s*, Jeffrey Mervis writes that, though the challenge to produce more minority Ph.D.s was made over ten years ago, the numbers remain low for all but Asian Americans (6.8%). Although 23% of our population is comprised of underrepresented individuals, only 4.5% of them hold scientific doctorates [1].

Anti-affirmative action referendums in several states, such as California's Proposition 209, have further exacerbated the problem. Also dismaying are the results from the Alfred P. Sloan Foundation's *Project Talent Flow* that indicate that minority enrollment in higher education in the SEM disciplines actually is declining [2]. *Project Talent Flow*, a study initiated to determine why scientifically talented Black and Latino students do not choose careers in the SEM fields, found that this decline in interest occurs after enrollment in college [2]. Results confirm that, while a lack of encouragement from SEM faculty contributed somewhat to the decline in interest in SEM careers, the overwhelming factor appeared to be a feeling of alienation among the students created by the restrictive nature and difficulty of college-level SEM work [2].

Meeting the Challenge

One of the key transition points for success in biomedical research careers occurs when students transfer to a baccalaureate institution. The goals of the NIH Bridges to the Baccalaureate program are to nurture students' interests in research careers at associate degree-granting institutions and to increase the likelihood of success for these students once they transfer to

baccalaureate degree-granting institutions. Our particular partnership, between J. Sargeant Reynolds Community College (JSRCC) and Virginia Commonwealth University (VCU), uses an intensive research apprenticeship to encourage and inspire minority students to major in disciplines that lead to careers in biomedical research.

The JSRCC/VCU Bridges program follows minority students from their entrance into JSRCC, nurturing their interest in scientific research with hands-on activities in an employee-employer relationship with research faculty mentors from VCU. The student's transition to VCU is eased by early introduction to, and interaction with, research faculty mentors who monitor their progress from their entrance at JSRCC to their graduation from VCU with the Bachelor of Science degree.

Recruiting faculty volunteers has not been problematic. We originally asked ten professors to come on board, and only one turned us down due to heavy involvement in other projects. Since then, everyone we have asked has joined us. Most researchers who already work with undergraduate students in their labs are very open to the idea of mentoring Bridges students. And, once they have worked with our students, they appreciate having the opportunity to be part of the program. Benefits are also accrued by the mentors: researchers have extra help in the lab for two years, and given the unpredictable nature of grant funding, this helps ease the pressures of hiring outside help.

JSRCC is a three-campus institution that enrolls 10,761 students and currently offers 25 two-year associate degree programs, 19 one-year certificate programs, and 47 career studies certificates. The JSRCC-VCU Bridges to the Baccalaureate program is housed at the downtown campus of JSRCC (JSRCC-DTC). This campus is located within the city of Richmond, at Eighth and Jackson Streets, across the street from the Virginia Biotechnology Research Park and the Health Sciences campus of VCU. A total of 3,091 students were enrolled at JSRCC-DTC in the fall of 1999: 48.9 % of those students were African-American, 44.6% were White, and 6.5% were categorized as Other [3]. The Carnegie Foundation ranks Virginia Commonwealth as a doctoral/research university-extensive. It consists of a medical and academic campus, both of which are located within an easy commuting distance to JSRCC.

Participant Requirements

Students selected to participate in this program must belong to one of the groups considered underrepresented in the sciences: these groups include African-Americans, Hispanics,

Native Americans, or Pacific Islanders. In order to be admitted into the program, they must attend JSRCC and have a high school or college grade point average of 2.5. Participants sign contracts agreeing to complete the Associate of Science degree at JSRCC and to transfer to VCU to pursue the bachelor's degree in a discipline that will lead to biomedical research careers. Although we cannot require a student to attend VCU, the contracts provide a means of ensuring student cooperation and participation. It also provides the student with an "easy out": if they feel they cannot maintain their contractual obligations, they can be released from their agreement.

Upon entering the program, students are paired with a research mentor at VCU and are trained as research assistants in the mentor's laboratory. Mentors work with a research assistant for one and a half years and, potentially, for an additional two years when the student transfers to VCU. Research mentors also receive \$1,000 per year in replacement supplies for agreeing to work with the students. As research assistants, the students are paid as employees, working in the laboratory from eight to fifteen hours per week during the academic year and up to forty hours per week during the summer months. In addition to learning the basic research techniques in their mentor's laboratory, students complete a research project of their own and present their results to the Virginia Academy of Science (VAS) at the end of their second year in the program.

Apprenticeship Model

Bridges students are trained to work in the laboratories by either their mentors or by another trained student working in the mentor's laboratory. This type of nurturing and attention is usually reserved for graduate students, although it has been successfully used to introduce undergraduates to the research experience. Bridges students meet weekly with the project coordinator from VCU throughout the entire length of the program, either formally in class or informally. They use this time to discuss their research and any other problems they might have encountered during the week. Cross-institutional activities have both students and faculty moving between schools: this fosters relationships among the faculty and provides the program participants with an added sense of security when they transfer to VCU.

Students receive a VCU identification card that gives them unlimited access to the school's library and Internet resources, as well as free access to VCU's transportation services. Other student benefits include the use of a laptop computer for the length of their undergraduate career, paid Internet access at home for two years, in addition to mentoring at both institutions. JSRCC received \$350,000 for the first two years of this program from the NIH, with a sub-award

going to Virginia Commonwealth University. A successful renewal application provided funding for an additional three years to recruit up to five new students per year.

Formal Training in Research Methods

In addition to working in a research laboratory for one and a half years, students receive formal training in three specialized courses that focus on research methods. The first course, *Introduction to Biomedical Research* is taken at VCU's medical campus and helps develop students' critical thinking skills. The students are required to attend a series of seminars given by different biomedical researchers and to use ideas from each presentation to devise how they might solve a particular medical problem. The students found this first course taken outside the community college setting to be particularly intimidating.

Not only were they taking a course at a senior institution for the first time, they were also attending classes with graduate students. Plenty of handholding occurred in order for the students to reach an understanding that they were just as capable of succeeding in this course as were the graduate students. The same factors that initially intimidated them provided them with an additional boost of confidence once the course was completed.

The second course, *Introduction to Instrumental Analysis*, is team-taught by faculty from both institutions at JSRCC. The students learn to use basic laboratory equipment, such as gas chromatography, and infrared and ultra-violet spectrophotometry. They also bring their laptops to class and learn how to use the latest computerized probe-ware to conduct and analyze the results of chemistry experiments.

During the last semester of the program, students take *Introduction to Research Methods*. This is a course taught by VCU faculty at JSRCC. Students learn how to statistically analyze and graphically represent the data they have generated in their laboratory projects. They also prepare their presentations for the VAS during this course.

Lessons Learned

In the fall of 1998, ten young J. Sargeant Reynolds Community College women (eight African-American and two Hispanic) eagerly signed contracts agreeing to work in scientific research laboratories at Virginia Commonwealth University. Within the first two semesters of the program, five of the students dropped out. The principle investigators and faculty mentors were not prepared for this action. One very young, talented chemistry major dropped out because of a

conflict with child-care and child-rearing. A second student dropped out because of legal difficulties and at least two other students were not prepared for the time commitment that a program like this requires. Although the initial attrition was disappointing, we learned that students with complex life styles that include families and full-time jobs were not as likely to be successful in this particular program.

This realization led to the reorganization of the structure of the program to allow interested students to participate at different levels. Students that are not quite academically prepared or cannot make the necessary time commitment participate only in the weekly meetings and seminars. Students who have achieved the appropriate grade point average, who do not require additional developmental courses, and who are prepared to make the time commitment are given research positions.

Successes

The stamina, grit, and determination of the successful participants have, from time to time, overwhelmed us. A single mother of five completed the requirements for both an Associate of Science in social science and in science. She is currently working at JSRCC as a laboratory specialist, supervising the preparation of all of the science teaching laboratories. She is also a part-time student at VCU. A second student continued to work at her full-time job the entire time she was in the program. She used her personal leave-time and weekends to complete her research assignment. Through persistence and hard work, she earned a scholarship for tuition, as well as authorship on a publication from the laboratory in which she worked. Two other graduates have been hired to work as part-time laboratory technicians at JSRCC. Five students successfully completed this program in the spring of 2000 by presenting electronic posters at the VAS [4]. ■

References

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- [2] B.C. Clewell and S.V. Brown, "The Non-SEM Field Choices of Black and Latino Undergraduates With the Aptitude for Science, Engineering, and Mathematics Careers," *Making Strides: Research News on Minority Graduate Education*, **1**(1) (1999) 8-11.
- [3] *Statistical Profile Book*, J. Sargeant Reynolds Community College, 1 Richmond, VA.
- [4] J. Sargeant Reynolds Community College Web Page, <http://www.jsr.vccs.edu>

INTERVIEW WITH DEBORAH NEELY-FISHER

Q. What career path did you follow to reach your present position? Is this what you originally aimed for, or were there a few twists and turns that brought you here?

A. My high school career was a disaster; I liked partying and playing and never did any school work. Add to this the fact that I was the first member of my immediate family to complete college and you have an individual who really was clueless about college and career choices! I started out wanting to be a writer, but I hated the criticism of my writing so I decided biology was a better choice. I could sit in the back of the room, take good notes, and make good grades. I had decided at that point that I wanted to go to vet school, but after one day of volunteering in a vet's office, I almost fainted from the smell and realized quickly that this would probably not work out as a career choice.

Eventually, I had the opportunity to do research in a lab at VCU and I had several really good developmental biology courses that used hands-on, inquiry-based labs that made me think and learn in new ways. This encouraged me to continue in science as a graduate student. After I graduated, I had the opportunity to continue to do research as a laboratory technician where I got involved in writing papers, as well as portions of grants. I enjoyed the challenge, but needed to add the responsibility of teaching labs to help pay the bills. Although I enjoyed teaching labs, I was so shy (no one ever believes this part of the story) that it took me several years to get up the courage to teach lectures at VCU. So my career path to teaching at a community college was anything but straight. I think that being involved in community college education continues to offer me challenge after challenge and that is why I enjoy it so much.

Q. Have you been involved in similar programs before? Was there a particular moment, or stimulus, that caused you to begin this project?

A. I grew up during the '60s and '70s and really believed in the Civil Rights Movement. I still get chills when I hear Martin Luther King's speeches. I know that many minority children who are located within my college's service area live in poverty and that their K-12 education does not always prepare them for college. In a sense, I think that my own experience was similar, but maybe for different reasons. Even in this anti-affirmative action climate that we are in, I feel like I am doing the right thing and am trying to address one of our society's inequities. These kids are not exposed to much science, engineering, and technology, and they certainly do not

have access to role models in their classrooms, or even at their local colleges and universities, who could introduce them to these types of careers. If I had not had the opportunity to participate in an undergraduate research experience, I might have left the field and worked at something else.

Q. Have there been any unique or unexpected consequences for you resulting from your project?

A. I think that working on this project has made me even more aware of the fact that many students who come from lower socioeconomic backgrounds lack access to a K-12 education that will prepare them for college work. They are not exposed to the different career paths in science, engineering, technology, and research. Even as adults, transportation issues limit these students; many rely on public transportation. Unfortunately, our city bus line does not extend far into the more suburban areas. Programs located out of their geographic range are, therefore, off-limits to them since they can't get there. At my college, this includes all of the engineering programs. I am pleased to report that we are finally beginning to address this problem. Equal access to educational opportunities and career paths must be considered since we, as a country, have decided that affirmative action programs are no longer needed at our colleges and universities.

Q. Are you able to identify the greatest lesson you have learned and the rewards you have gained through working on Bridges to the Baccalaureate program? What is the greatest benefit you see coming to students, and to teachers, through their engagement with this project?

A. I believe that the greatest benefit of this program is yet to come, and I believe that it will benefit everyone, not just our underrepresented students. I think that undergraduate research programs can be used to excite students about science, engineering, and technology, but I also believe they can serve as a bridge between science faculty at two-year and four-year institutions. If you expand undergraduate research to include all scholarly activities and service learning projects, I think we can develop an educational infrastructure that will connect the K-12 school systems to community colleges and to universities, thus involving faculty who will participate more easily in ways that are meaningful to them.