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# Training Future Scientists the Posse Way

Borrowing from the language of the Old West, inner-city youth sometimes refer to their groups of friends as 'posses.' In academic circles, New York's successful Posse Foundation has given the word a new meaning: a group of inner-city high school students trained as leaders and role models, then enrolled at top colleges and universities.

This fall, a creative chemist at Brandeis University in Waltham, Massachusetts, will collaborate with the Posse Foundation to create posses specially designed to equip students to succeed in the sciences.

Last year, Irving R. Epstein, a chemistry professor at Brandeis University, was selected as one of 20 Howard Hughes Medical Institute professors -- research scientists who are changing the way science is taught to undergraduate students. After carefully reviewing 150 applications, HHMI selected 20 professors and gave each professor $1 million to implement their innovative ideas. Epstein is using a substantial portion of that money to create science posses, taking advantage of innovations that have worked elsewhere, to increase and sustain diversity in science and higher education. In particular, he will focus on drawing in students from groups that are traditionally underrepresented in the sciences.

"We want to take kids who, on paper, look like they can't succeed in science, and help them to do just that," says Epstein.

Several national reports have noted the distressingly few African Americans, Hispanics, and Native Americans in the scientific workforce, despite vast efforts to entice such students to pursue science degrees. These students' absence from the sciences severely limits our country's scientific and technological potential, Epstein says. "It's not just the diversity of faces that matters, it's the diversity of ways of looking at the problem. It's important to get people who don't all think the same way."

“It is not an exaggeration to say that the underrepresentation of African Americans, Hispanics, and Native Americans in the scientific workforce is becoming a national crisis,” he writes in a commentary published in the June, 2007, issue of *Nature Chemical Biology*.“Concerns for economic survival, social justice and scientific excellence all argue that we cannot afford to have a substantial segment of our population excluded from the scientific endeavor, particularly since the solutions to many of our most important problems — energy, environment, health, and water, for example — require scientific expertise and creativity.”

Epstein believes he has a partial solution to the problem. To engage and retain a diverse group of students in the sciences, he is implementing innovative methods of combating the forces that typically push students away: boring classes, inadequate preparation, and lack of a science-specific support community.

The most ambitious component of his plan is modeled on the Posse program, which has helped more than 1,500 students with diverse backgrounds thrive at academically demanding colleges and universities. The honor program selects posses of 10 inner city high school seniors with academic potential and leadership abilities, prepares them with academic and life skills, and provides mentors and regular support on campus. Members of each posse learn from and support one another, and Posse Scholars, now at 26 colleges and universities across the country, including Brandeis, graduate at a better than 90 percent rate. They succeed in classrooms and often become campus leaders who reach out to other minorities and the overall community.

"For all its success, however, Posse does not produce scientists," Epstein writes in his commentary. "In a typical Brandeis posse of 10, three or four students may start out taking general chemistry, but, even in a good year, only one will complete a science major. Our experience is typical of other Posse schools."

So Epstein is blending into the Posse model features specifically designed to help students flourish in the sciences. He is working with the Posse Foundation to cultivate a network of high school science teachers that will help identify students well suited for the program. They are also developing a system of dynamic assessment to further the selection process. Another Epstein twist: a two-week summer college prep "boot camp" on campus and a paid job in a research lab from the start.

Epstein notes that for students who attend high schools with weak science programs, the intellectual demands and time commitments needed to succeed

in university science courses can often exceed expectations. The boot camp is meant to bridge that gap. Through the job program, Epstein aims to increase students' support network by introducing them to the community provided by a scientific research group. A similar program worked to retain most science students from disadvantaged backgrounds in an HHMI-supported program at Harvard University, Epstein notes.

Epstein is starting small. The program will begin recruiting high school students in New York City, where the Posse Foundation's infrastructure is the strongest, in September, 2007, for a Science Posse that will start at Brandeis in the fall of 2008. “This is a sort of pilot project,” Epstein explains. Two posses of students will complete their undergraduate degrees at Brandeis as part of the pilot program. “We'll develop the program, see if it works, iron out the kinks. If we're successful, the Posse Foundation is prepared to go nationwide with Science Posses.”

As a complementary effort to engage all students in the excitement of science, Epstein is revamping the general chemistry class at Brandeis. The best scientists, Epstein says, are fourth graders, whose curiosity inspires them to ask questions of the natural world. And so his goal is to revive the curiosity and wonder that first lures students into science, but often fades as they are subjected to dull courses and a deluge of facts to be memorized.

"Chemistry doesn't have to be off-putting,” says Epstein, whose own research focuses on glowing circles, bright spirals, and other complex patterns arising from chemical reactions that resemble those in biological systems. “By being somewhat creative in how it's taught, it's possible to draw in more underrepresented minorities and people from the population as a whole."

One strategy he has in mind is to introduce video games that help students learn chemistry. The video games are in the early planning stage at the MIT lab of Eric Klopfer, who specializes in using games as teaching aids for middle school, high school, and college level students.

Knowing that classroom demonstrations can spur the desire to learn more than diagrams and slides, Epstein is infusing his course with engaging activities. For example, he is revising his lecture on the electronic structure of atoms. Instead of showing pictures of atomic spectra, Epstein will stick electrodes in vegetables that have marinated in different solutions and run an electric current through them. The excited sodium electron in pickles glows orange as it settles back down. A zucchini soaked in a cobalt solution glows blue. A lithium solution imparts a red aura. “And you get the extra added excitement that the instructor might electrocute himself or the pickle might

blow up," Epstein says.