SCIENCE EDUCATION

U.S. Programs Ask Faculty To Help Improve Schools

Federal officials admit that two new partnership programs are only one step in training better teachers and raising test scores

This month the National Science Foundation (NSF) will unveil guidelines for a new $160 million program to improve math and science education in the nation's elementary and secondary schools. The effort builds on the latest buzzword in science education: partnerships. In this case, the intended partners are university scientists and local school districts. But don't look for poorly trained teachers to suddenly turn into math whizzes or for low-scoring U.S. students to become number one in the world. "It's going to take years and years, and there are no magic bullets," says Judith Ramaley, who took over the foundation's $975 million education directorate in August. "This is still a research initiative."

That candor may be unusual for a federal official. But education researchers and educators—who generally support the new program—say that it's the right attitude for these yet-to-be-formed partnerships. The idea, proposed by President George W. Bush last spring in his first budget request to Congress, is for university scientists to help bolster the skills of undergraduates preparing to become teachers and mentor professionals who seek additional training. The partnerships are the latest twist in a decade-long "systemic reform" effort at NSF, now winding down, that prodded states and cities to make structural changes in how math and science are taught—with uneven results (*Science*, 4 December 1998, p. 1800). Ramaley expects the new program to grow significantly over the next several years and become NSF's flagship education effort.

Colleges of education currently train most of the nation's precollege teachers, and relatively few students who major in science or math go into teaching. That bifurcated system has contributed to a shortage of teachers in most technical subjects and has produced a generation of teachers with inadequate training in science and math, say Ramaley and Susan Sclafani, who will oversee a similar but much smaller program at the Department of Education (DOE) (*Science*, 4 January, p. 24). "Last year in Texas we certified 330 people to teach math, [but] in Houston alone, with just 5% of the state's student population, we had openings for 100 math teachers," says Sclafani, counselor to Secretary of Education Rodney Paige, the former superintendent of Houston city schools who brought Sclafani with him to Washington, D.C.

Ramaley, who fostered various town-gown partnerships during stints as president of Portland State University in Oregon and the University of Vermont in Burlington, says that the goals of the new programs are clear: "We want to reduce the number of teachers teaching out of field [without the appropriate degree], increase the availability of material that engages students, and raise the number of students taking courses that prepare them for college." Science educators are eagerly awaiting the rules for the NSF competition. (Check www.ehr.nsf.gov for the announcement.) Applicants for the 5-year awards will have considerable latitude in defining how to meet those goals, Ramaley says, and the school district–university partnership may also include other universities, museums, professional societies, businesses, and other institutions. DOE plans to get out a similar announcement by mid-March.

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But a clear vision doesn't eliminate the obstacles, Ramaley admits. "We've learned over the past decade that you need sturdy leadership, clear goals, and hard evidence that guides your intervention. But we haven't learned how to disseminate good practices, [scale up] prototypes, and sustain the effort in the face of leadership transitions, departing teachers, high student mobility, and competing political agendas." There's also the ever-present problem of money. "For most cash-strapped districts, the only source of new funds is external," she says. "However, we also expect districts to show how they plan to continue these reforms once the federal dollars go away."

Those in the trenches point out several more potential pitfalls. "Creating a sustainable partnership is not a trivial exercise," says Margaret Cozzens, vice chancellor for academic affairs at the University of Colorado, Denver, and a former head of NSF's elementary and secondary education programs. "Each side has something to offer, but if one side tries to dominate, then the other may end up losing interest." George Miller, a chemistry professor at the University of California, Irvine, who has participated in NSF-funded partnerships to help minority students and in a statewide teacher-training program, worries that research scientists might not be attuned to the needs of students in low-performing schools. "Most of them didn't attend such schools," he notes. "The idea that students would simply not do their homework would boggle their minds; their first reaction would be to just flunk them!"

More knowledge isn't the only thing that many teachers lack, say science educators. "One thing we've learned from the systemic reform projects is that math and science expertise is necessary but not sufficient," says Iris Weiss, head of Horizon Research Inc., an evaluation firm in Chapel Hill, North Carolina. "You also have to know how to reach the kids." Good lab materials and appropriate technical support are also key ingredients. "You need someone to keep the fish alive and provide new seeds," says Philip Sadler, who heads science education programs for the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts. "That doesn't require a Ph.D., but you need to love science."

Ramaley and Sclafani hope after 5 years to have a database of exemplary practices that local districts will mine. But some researchers worry that intense political pressure to show immediate gains in student performance will push NSF to favor tried-and-true remedies rather than innovative approaches. Even positive results might be hard to interpret, warns assessment expert Jere Confrey of the University of Texas, Austin. "Before we can replicate successful programs," she says, "we must be able to understand why something worked."

—JEFFREY MERVIS