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RESEARCH BRIEF

Is the Federal Government Facing a Shortage of Scientific and Technical Personnel?

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The federal government relies on scientific and technical personnel to perform critical functions in many areas, including national defense, homeland security, health, space, transportation, and agriculture. Recently, concerns have emerged in federal policy circles that this workforce is aging and that available talent to replace it may be in short supply. Given the potential seriousness of such a shortage, the Office of Science and Technology Policy in the Executive Office of the President asked the RAND Corporation to study the issue and make recommendations.

A RAND study team examined three topics:

- Trends in the overall U.S. scientific, technical, engineering, and mathematics (STEM) workforce that might affect the federal STEM workforce
- Trends and issues for the federal STEM workforce
- Policy mechanisms for influencing the size and quality of the STEM workforce.

The study team reviewed the relevant literature and data and interviewed STEM managers at selected federal agencies, including the National Aeronautics and Space Administration (NASA); the National Institutes of Health (NIH); the National Science Foundation; the Departments of Agriculture, Energy, Defense, Homeland Security, and Transportation; the Office of Management and Budget; and the Office of Personnel Management.

The study found no consistent and convincing evidence that the federal government faces current or impending shortages of STEM workers. However, existing data are uneven and do not support comprehensive analysis, especially of future requirements. Given widespread concern among managers that personnel shortages and skill gaps may become a problem, the federal government needs to monitor this issue closely and assemble more-complete and more-consistent STEM workforce data.

Abstract

There is no clear evidence that the federal government faces impending shortages of scientific and technical personnel. However, there are concerns among federal research managers that personnel shortages and skill gaps could emerge in the near future. To monitor this important segment of the workforce, the federal government needs to keep more-complete and more-consistent data.

Background: U.S. STEM Workforce Shows No Sign of Impending Shortages

There have been recurring concerns over the past two decades that the demand for STEM workers in the United States might exceed the available supply. If these concerns prove to be correct, this situation would hinder the federal government's ability to recruit and retain quality STEM workers.

The analysis found that despite concerns about potential shortages of STEM personnel, particularly in engineering and information technology, there is little evidence of such shortages in the past decade or on the horizon. Economic indicators, notably the low levels of unemployment and rising wages that one would expect to accompany shortages, have failed to materialize. Likewise, "underemployment patterns"—for example, indications of STEM workers involuntarily working out of their fields—suggest that underemployment of STEM workers is relatively high compared with that for non-STEM workers. Engineering is the one exception—underemployment in this field appears to have been lower than that for non-STEM workers.

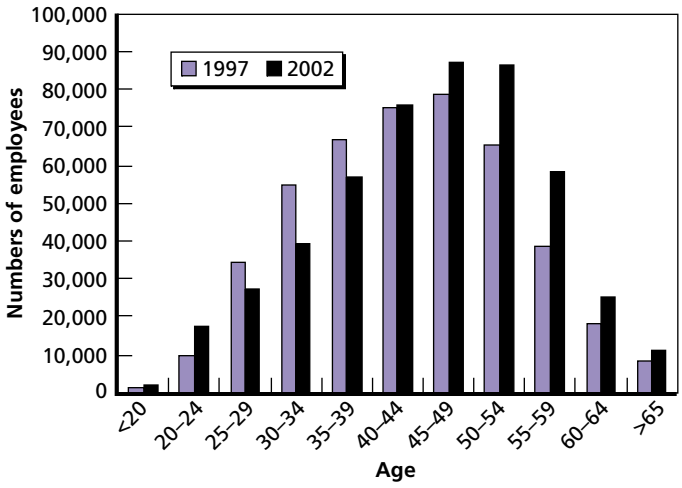
These indicators suggest neither an inadequate supply of STEM workers for the nation's current needs nor shortages in the near future.

The Federal STEM Workforce: No Clear Shortages, but Data Limitations Cloud Understanding

For federal STEM managers, a key concern is the aging of the federal STEM workforce. Data from the Office of Personnel Management confirm that this workforce is growing older. For example, the percentage of Department of Defense STEM workers eligible to retire will more than double by 2012, and both NASA and NIH anticipate similar trends.

However, federal STEM workers tend to work longer past retirement age than many other workers, and hence, retirement eligibility does not necessarily imply a shortage. Furthermore, notwithstanding agency concerns about a dwindling STEM workforce, the turnover rate for federal STEM workers is lower than the rate for the equivalent workforce in industry. In addition, the federal government tends to hire relatively older workers. For example, 70 percent of government hires in 2002 were over the age of 30, and a substantial number of older STEM workers were hired by the federal government between 1997 and 2002 (see the figure).

The Federal STEM Workforce Is Aging



SOURCE: Office of Personnel Management *FedScope* database (available at http://www.fedscope.opm.gov/index.htm).

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Policy Mechanisms: Filling the Pipeline and Shaping the Workforce

Historically, federal policy—both for its own STEM workforce and for the nation's writ large—has emphasized education and training programs to create a pool of scientifically and technically trained workers. If the number of STEM positions or their attractiveness is not also increasing, these measures to increase the number of STEM workers may create surpluses, manifested in unemployment and underemployment. Only recently have federal agencies begun to implement policies to manage the STEM workforce more directly. Workforce incentives are becoming more prominent as a way of attracting and retaining high-quality STEM workers. Some agencies have had success with these techniques and others anticipate using them more aggressively. NASA and the Centers for Disease Control, for example, have obtained special authority to offer salaries above typical federal rates.

A Clearer Picture of Federal STEM Requirements Requires Better Data

Understanding of future federal STEM workforce requirements is limited by inadequate forecasts based on, at best, rough projections of current needs. The difficulty is complicated by the federal government's growing propensity to contract out STEM work, which decreases the in-house, civil service requirement. No adequate data or forecasts exist for this process, either.

The study recommends improvements in current federal data collection that involve counting and describing both "spaces"—the requirements for workers with specific sets of skills—and "faces"—qualified persons actually filling the spaces. These data improvements—when embodied in specific data with specified sources and methods—would permit statistical models to forecast federal STEM workforce trends in a comprehensive and timely manner and also permit comparisons of needs with personnel. Improved data would also support better-informed policy decisions regarding the STEM workforce and allow more-informed training and career choices by students and their advisors. Both manpower shortages with their attendant risks for the nation and surpluses with their costs and disruptions for trained workers could thereby be minimized. ■

This research brief describes work done for the Office of Science and Technology Policy by RAND Science and Technology Policy Institute and documented in *Will the Scientific and Technical Workforce Meet the Requirements of the Federal Government?* by William P. Butz, Terrence K. Kelly, David M. Adamson, Gabrielle A. Bloom, Donna Fossum, and E. Mihal Gross, MG-118-OSTP, 2004, 120 pages, $20, ISBN: 0-8330-3529-0, available from RAND Distribution Services (phone: 310-451-7002; toll free: 877-584-8642; or email: order@rand.org). The RAND Corporation is a nonprofit research organization providing objective analysis and effective solutions that address the challenges facing the public and private sectors around the world. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors. **RAND**® is a registered trademark.

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