

EXECUTIVE SUMMARY

INTRODUCTION

Science and technology have been and will continue to be engines of US economic growth and national security. Excellence in discovery and innovation in science and engineering (S&E) derive from an ample and well-educated workforce – skilled practitioners with two- and four-year degrees and beyond, researchers and educators with advanced degrees, and precollege teachers of mathematics and science. The future strength of the US S&E workforce is imperiled by two long-term trends:

- Global competition for S&E talent is intensifying, such that the United States may not be able to rely on the international S&E labor market to fill unmet skill needs;
- The number of native-born S&E graduates entering the workforce is likely to decline unless the Nation intervenes to improve success in educating S&E students from all demographic groups, especially those that have been underrepresented in S&E careers.

The National Science Board has examined these issues and finds that national-level action is needed to ensure our country's capacity in S&E in an increasingly competitive and changing global labor market. The Federal Government has primary responsibility to lead the Nation in a coordinated response to meet our long-term needs for science and engineering skills in the US workforce.

The scale and nature of the ongoing revolution in science and technology, and what this implies for the quality of human capital in the 21st century, pose critical national security challenges for the United States. Second only to a weapon of mass destruction detonating in an American city, we can think of nothing more dangerous than a failure to manage properly science, technology, and education for the common good over the next quarter century.

U.S. Commission on National Security/21st Century (2001)

RECOMMENDED NATIONAL POLICY IMPERATIVE

The Federal Government and its agencies must step forward to ensure the adequacy of the US science and engineering workforce. All stakeholders must mobilize and initiate efforts that increase the number of US citizens pursuing science and engineering studies and careers.

The National Science Board findings and recommendations to achieve this imperative through broad-based efforts with other stakeholders follow.

FINDINGS AND RECOMMENDATIONS

UNDERGRADUATE EDUCATION IN SCIENCE AND ENGINEERING

RECOMMENDATION:

The Federal Government must direct substantial new support to students and institutions in order to improve success in S&E study by American undergraduates from all demographic groups.

The Federal Government should:

- Ensure that scholarships and other forms of financial assistance are available to well-qualified students who otherwise would be unable to attend school full time to pursue an S&E major;
- Provide incentives to institutions to expand and improve the quality of their S&E programs in areas in which degree attainment nationwide is insufficient;
- Provide financial support to community colleges to increase the success of high-ability students in transferring to four-year S&E programs in colleges and universities; and
- Expand funding for programs that best succeed in graduating underrepresented minorities and women in S&E.

ADVANCED EDUCATION IN SCIENCE AND ENGINEERING

RECOMMENDATION:

Federal support for research and graduate and postdoctoral education should respond to the real economic needs of students and promote a wider range of educational options responsive to national skill needs.

Federal strategies should:

- Ensure that Federal stipends for graduate and postdoctoral students provide benefits¹ and are competitive with opportunities in other venues;
- Invest in innovative approaches to doctoral and masters education that prepare students for a broad range of disciplinary and cross-disciplinary careers in academia, government, and industry; and
- Provide consistent, long-term support for high-quality disciplinary and interdisciplinary doctoral training programs in S&E.

KNOWLEDGE BASE ON THE SCIENCE AND ENGINEERING WORKFORCE

RECOMMENDATION:

To support development of effective S&E workforce policies and strategies, the Federal Government must:

- **Substantially raise its investment in research that advances the state of knowledge on international S&E workforce dynamics;**
- **Lead a national effort to build a base of information on:**
 - 1. The current status of the S&E workforce,**
 - 2. National S&E skill needs and utilization and**
 - 3. Strategies that attract high-ability students and professionals to S&E careers.**

PRECOLLEGE TEACHING WORKFORCE FOR MATHEMATICS, SCIENCE AND TECHNOLOGY

RECOMMENDATION:

In partnership with other stakeholders, the Federal Government should act now to attract and retain an adequate cadre of well-qualified precollege teachers of mathematics, science and technology.

To make precollege teaching more competitive with other career opportunities, resources must be provided to:

- Compensate teachers of mathematics, science and technology comparably to similarly trained S&E professionals in other sectors;
- Reinforce the profession of teaching as an important and rewarding career and include teachers as an integral part of the scientific and engineering professions;

¹ Fringe benefits, especially for health care.

- Support classroom training and expedite teacher certification of scientists and engineers from professions other than teaching;
- Support in-service training to enhance classroom skills and subject matter expertise; and
- Support programs in teacher preparation at institutions that succeed in integrating faculty and curricula of schools of engineering and science with schools of education.

To improve effectiveness of precollege teaching, stakeholders must collaborate to:

- Support outreach efforts to K-12 by science and engineering professionals to motivate high-quality curricular standards and expand content knowledge for classroom teachers; and
- Support research on learning that better informs K-12 mathematics and science curricula and pedagogy development.

US ENGAGEMENT IN THE INTERNATIONAL SCIENCE AND ENGINEERING WORKFORCE

RECOMMENDATION:

During the current reexamination of visa and other policies concerning the mobility of scientists and engineers, it is essential that future US policies:

- **Strengthen the capacity of US research universities to sustain their leadership role in increasingly competitive international S&E education;**
- **Strongly support opportunities for American students and faculty to participate in international S&E education and research; and**
- **While enhancing our homeland and national security, maintain the ability of the United States to attract internationally competitive researchers, faculty and students.**