

SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH (STEM) EDUCATION

SPIE, the International Society for Optics and Photonics, supports efforts to build a better America through STEM education and the **Educate to Innovate** campaign. **We urge Congress to support the Administration's FY 2012 Science, Technology, Engineering, and Math (STEM) education budget request for the Department of Education, National Science Foundation (NSF), and the Department of Energy (DOE), NASA, and a new proposed Advanced Research Projects Agency — Education (ARPA-ED), which includes:**

- \$100 million for the new consolidated Department of Education and National Science Foundation (NSF) to prepare 100,000 science, technology, engineering and math teachers for America's classrooms.
- \$20 million for the NSF's WIDER Program (Widening Implementation & Demonstration of Evidence-based Reforms).
- \$198 million for NSF's Graduate Research Fellowship (GRF) Program to support development of the Nation's future scientists, and funding for 2,000 new GRF awards.
- \$3.4 billion across all federal agencies to support STEM education programs — a decrease from FY 2010 enacted levels.
- \$4 billion funding for the Race to the Top (RTT) competition that fuels local innovation by funding STEM education at the state level through local institutions, businesses, museums and "anchor" schools.
- \$66.4 million for STEM Ed-related programs at NASA.
- \$90 million for creation of an Advanced Research Projects Agency – Education (ARPA-ED) to drive transformational improvement in education technology and education.

SPIE recognizes that strong science, technology, engineering, and math education programs are vital to our nation's economic growth and job creation. We must begin to reduce the deficit and begin to live within our means. But we must be smart about how we go about it. Strong STEM education programs will help build the foundation needed to achieve energy security and to sustaining our global leadership in science.

SPIE supports the overall goals of the Administration's 2012 budget, which aim to prepare 100,000 STEM teachers over the next decade. These goals result from the September 2010 recommendations of the President's Council of Advisors on Science & Technology (PCAST) included in the **Prepare and Inspire: K-12 Education in Science, Technology, Engineering, and Math for America's Future** report.

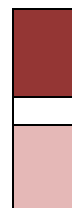
The Administration's FY 2012 budget invests \$3.4 billion in STEM education programs. This level is below the enacted level for 2010, reflecting the need for disciplined choices that cut back on lower-priority programs to make room for targeted increases. The **Educate to Innovate Campaign** was announced by President Obama in November 2009 and continues with the President's FY 2012 budget request. At a time of diminishing U.S. capacity to produce competitive talent for the 21st century global economy, SPIE believes investments in STEM education are of highest priority.

At current rates, the U.S. is not developing adequate quantities of STEM talent needed for 21st century economic and scientific leadership:

| Mathematics Literacy Scale | |
|----------------------------|------------|
| COUNTRY | SCORE |
| Shanghai-China | 600 |
| Singapore | 562 |
| Hong Kong- China | 555 |
| Korea, Republic of | 546 |
| Finland | 541 |
| Switzerland | 534 |
| Japan | 529 |
| Canada | 527 |
| Netherlands | 526 |
| New Zealand | 519 |
| Belgium | 515 |
| Australia | 514 |
| Germany | 513 |
| Estonia | 512 |
| Iceland | 507 |
| Denmark | 503 |
| Slovenia | 501 |
| Norway | 498 |
| France | 497 |
| Slovakia | 497 |
| Austria | 496 |
| Poland | 495 |
| Sweden | 494 |
| Czech Republic | 493 |
| United Kingdom | 492 |
| Hungary | 490 |
| Luxembourg | 489 |
| United States | 487 |
| Ireland | 487 |
| Portugal | 487 |
| Spain | 483 |
| Italy | 483 |
| Greece | 466 |
| Israel | 447 |
| Turkey | 445 |
| Chile | 421 |
| Mexico | 419 |

| Science Literacy Scale | |
|------------------------|------------|
| COUNTRY | SCORE |
| Shanghai-China | 575 |
| Hong Kong-China | 549 |
| Finland | 554 |
| Singapore | 542 |
| Japan | 539 |
| Korea, Republic of | 538 |
| New Zealand | 532 |
| Canada | 529 |
| Estonia | 528 |
| Australia | 527 |
| Netherlands | 522 |
| Germany | 520 |
| Switzerland | 517 |
| United Kingdom | 514 |
| Slovenia | 512 |
| Poland | 508 |
| Ireland | 508 |
| Belgium | 507 |
| Hungary | 503 |
| United States | 502 |
| Czech Republic | 500 |
| Norway | 500 |
| Denmark | 499 |
| France | 498 |
| Iceland | 496 |
| Sweden | 495 |
| Austria | 494 |
| Portugal | 493 |
| Slovakia | 490 |
| Italy | 489 |
| Spain | 488 |
| Luxembourg | 484 |
| Greece | 470 |
| Israel | 455 |
| Turkey | 454 |
| Chile | 447 |
| Mexico | 416 |

- The U.S. Department of Labor predicts that jobs requiring science, engineering, and technical training will increase 34% between 2008 and 2018.¹
- The Science & Engineering (S&E) Workforce has grown at an average annual rate of about 6.2% since 1950.
- About 174,000 S&E Doctoral Degrees were awarded worldwide in 2006, of which about 30,000 (17%) were in the U.S. More than half of the S&E doctorates awarded in the U.S. went to non-U.S. citizens in 2006.
- The 2009 Programme for International Student Assessment (PISA) results ranked the U.S. 23rd in science with a score of 502, well below Shanghai, China (575), Finland (554), Hong Kong, China (549), Singapore (542), Japan (539), Korea (538), and New Zealand (532), and just one point above the average score on this subject area of 501. In math, the U.S. fared even worse, ranking 32nd on the PISA test with a score of 487; 10 points below the average score (497) of the 65 participating countries.



- =Average is higher than the U.S. average
- =Average is not measurably different from the U.S. average
- =Average is lower than the U.S. average

SPIE is the largest international not-for-profit society in optics, photonics and imaging. Together with our 16,000 individual members and 450 corporate members, the Society seeks to build a better world with light through scientific education and innovation. www.spie.org

1. U.S. Bureau of Labor Statistics, *Occupational Outlook Handbook, 2010-11 Edition*.