Congressional Research Service

# An Analysis of STEM Education Funding at the NSF: Trends and Policy Discussion

**Heather B. Gonzalez**
Specialist in Science and Technology Policy

April 9, 2012

**Congressional Research Service**
7-5700
www.crs.gov
R42470

**CRS Report for Congress**
*Prepared for Members and Committees of Congress*

# Summary

Federal policymakers have a longstanding interest in science, technology, engineering, and mathematics (STEM) education that dates to at least the 1st Congress. In its contemporary construct, this interest largely focuses on the connection between STEM education and the U.S. science and engineering workforce, which, in turn, is often perceived as instrumental to national security and the U.S. economy.

The National Science Foundation (NSF) is a key component of the federal STEM education effort. Several inventories of the federal STEM education portfolio have highlighted NSF's important role—both in terms of funding and in the number and breadth of programs. The NSF is also the only federal agency whose primary mission includes supporting education across all fields of science and engineering. As such, funding for STEM education at the NSF impacts not only the agency, but also the entire federal STEM education effort.

Congress reduced enacted funding levels (from the prior year) for NSF's main education account in both FY2011 and FY2012. Those year-over-year reductions followed several years of varying funding, as well as changes in the distribution of the Foundation budget that reduced funding for the main education account as a percentage of the total NSF budget. For the most part, these changes appear to result from a combination of holding the main education account more-or-less constant while applying most of the Foundation's FY2003-FY2011 budget growth to the main research account. However, in constant dollar terms, it appears at least some of the increase in funding for research activities during the observed period may have come at the expense of education activities.

It is not clear if these funding changes reflect evolving congressional and Administration policy priorities and an intentional prioritization of research over educational activities at the NSF or if they reflect the cumulative impact of funding decisions made in response to specific conditions in specific fiscal years that happen to have had this effect. Further, the significance of these changes for NSF's STEM education and research missions—and for the overall federal STEM effort—depends, in part, on how they fit within the broader policy context. In particular, it depends (among other things) on how policymakers perceive and assess the policy rationale behind STEM education funding at the NSF; the character of NSF's STEM education activities; the Foundation's role in the federal STEM education portfolio; and the impact of changes in NSF's education account on the Foundation's other primary mission, research.

This report analyzes NSF funding trends and selected closely related STEM education policy issues in order to place conversations about FY2013 funding in broader fiscal and policy context. It concludes with an analysis of potential policy options.

# Contents



## Figures



## Tables



## Appendixes



## Contacts

# Introduction

Federal policymakers have a longstanding interest in science, technology, engineering, and mathematics (STEM) education. In its contemporary construct, this interest is largely driven by concerns about the national science and engineering workforce, which is often believed to play a central role in U.S. global economic competitiveness and national security. The U.S. STEM education system is the primary domestic source of the national science and engineering labor supply.[1]

Given the often cited connection between STEM education and key national priorities, federal policymakers generally pay close attention the U.S. STEM education system and have established a wide-ranging STEM education effort. A December 2011 report from the National Science and Technology Council (NSTC) found 252 STEM education "investments"[2] totaling $3.4 billion in FY2010 across 13 federal agencies.[3] Federal STEM education funding is concentrated at three federal agencies—the National Science Foundation (NSF or the Foundation),[4] the Department of Education (ED), and the Department of Health and Human Services (HHS). Of these, the NSF has the most STEM education funding and largest number of programs. The Foundation is the only federal agency whose primary mission includes supporting education across all fields of science and engineering. As such, the NSF is a key component of the federal STEM education portfolio.

Although the NSF plays a key role in the federal STEM education portfolio, education funding at the Foundation has decreased as a percentage of the total NSF budget since FY2003. Further, Congress reduced enacted funding levels for the Foundation's main education account in both FY2011 and FY2012.[5] The significance of these reductions to (1) NSF's education and research missions and (2) to the overall federal STEM education effort depends—in part—on how these changes fit within historical funding trends at the Foundation. This report analyzes those trends—

[1] A second source, immigration, is the primary non-domestic source of the U.S. science and engineering labor supply. As the debate about STEM education funding at the NSF principally reflects concerns about domestic sources of STEM labor, this report will not address immigration. For more information about foreign workers, see CRS Report R41704, *Overview of Immigration Issues in the 112th Congress*, by Ruth Ellen Wasem.

[2] The NSTC report defines a federal STEM education investment as, "A funded STEM education activity that has a dedicated budget of more than $300,000 in FY2010 and a staff to manage the budget. This budget may be part of a budget for a larger program. Activities that are one-time or irregular expenditure [sic] of overhead funds are excluded." Executive Office of the President, National Science and Technology Council, Committee on STEM Education, Fast-Track Action Committee on Federal Investments in STEM Education, *The Federal Science, Technology, Engineering, and Mathematics (STEM) Education Portfolio*, December 2011, p. 5, http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem__federal_stem_education_portfolio_report.pdf.

[3] Previous inventories of the federal STEM education portfolio found between 105 and 204 programs at between 13 and 15 federal agencies. (For example, see U.S. Government Accountability Office, *Federal Science, Technology, Engineering, and Mathematics Trends and the Role of Federal Programs*, GAO-06-702T, May 3, 2006, http://www.gao.gov/products/GAO-06-702T.) Estimates of the federal STEM education effort vary as a result of the different methodologies used by different auditors. There are, however, certain trends that stand out even when auditors come to different conclusions about the specific number of programs, amount spent, etc. The key role that both NSF and ED play in the federal STEM education effort is a consistent finding across all audits.

[4] This report refers to the National Science Foundation as the "NSF" or "the Foundation."

[5] Compared to prior years. Funding at the NSF is distributed between accounts that primarily support research and accounts that primarily support STEM education. However, these missions are highly interrelated. STEM education ultimately enables the conduct of research and research is, by its very nature, often educational. Nevertheless, funding for these two missions supports different activities.

and addresses selected STEM education policy issues—in order to place the conversation about FY2013 funding for the NSF in broader fiscal and policy context.

### Methodology, Sources, Data, and Notes

This report examines actual funding for the NSF from FY2003 to FY2011—and, where possible, estimated funding for FY2012[6]—in current and 2012 constant dollars. Congress provides appropriations in current dollars, so current dollar funding data align with annual appropriations measures and congressional actions; while constant dollar data adjust for the effects of inflation and provide insight into purchasing power. This report also analyzes the distribution of total NSF funding by appropriations account, which is how Congress funds the Foundation, and by character class, which shows actual obligations and adjusts for co-funded programs that draw from more than one appropriations account but serve the same program or activity. Over time, changes in the distribution of funding may reflect changing policy priorities.

Several other introductory points should be noted.

- This report uses the following terms for the major appropriations accounts at NSF: "RRA" or "main research account" for Research and Related Activities, "EHR" or "main education account" for Education and Human Resources, "MREFC" or "main construction account" for Major Research Equipment and Facilities Construction, "AOAM" for Agency Operations and Awards Management, "NSB" for National Science Board, and "OIG" for Office of the Inspector General.
- This report uses the following terms for major activities: "R&D" or "research activities" for research and development-related activities,[7] "E&T" or "education activities" for education and training-related activities, and "NIA" for non-investment activities. Non-investment activities are primarily administrative activities (e.g., travel and compensation costs for proposal review panelists).
- The analysis in this report is based on budgetary data from the NSF's annual budget requests to Congress from FY2005 to FY2013 and from information provided to CRS by the Foundation. Appropriations account data comes from the "Overview" sections of the NSF requests; funding data by character class comes from the "Quantitative Data Table" sections.
- CRS adjusted the appropriations account data for FY2003 to FY2005 to reflect the transfer of the Experimental Program to Stimulate Competitive Research (EPSCoR) between major accounts. This analysis treats EPSCoR as a research account program for all years in the data set.

[6] "Estimated" funding levels for NSF in FY2012 differ from enacted levels. At the major account level, the difference is largely attributable to a $30.0 million transfer between the main research and construction accounts. (Congress authorized this transfer in P.L. 112-55.) The NSF also generally reports funding levels for sub-accounts as "estimated." This is because Congress typically appropriates to the Foundation at the major account level, not at the sub-account level. NSF, therefore, estimates sub-account level funding in its published budget.

[7] Definitions of the term "R&D" may be found at http://www.nsf.gov/statistics/randdef/.

- NSF adopted its current appropriations account structure in 2003. FY2003-FY2011 are the most recent years for which actual funding data are available and comparable.
- NSF programs are often co-funded (e.g., funded by two or more appropriations accounts). Budgetary data that are broken down by character class adjust for co-funding and provide insight into what NSF actually spends on a given activity.
- Funding levels for FY2009 and FY2010 do not include funding from the American Recovery and Reinvestment Act (ARRA, P.L. 111-5) because the NSF treated these funds as supplemental in its budget calculations.
- To generate constant dollar (e.g., inflation-adjusted) data in FY2012 dollars CRS adjusted the Office of Management and Budget (OMB) deflator published in Table 10.1 of the OMB's *Historical Tables* and accessed on March 19, 2012.
- Data used in this report may be found in **Appendix A** and **Appendix B**.

# Historical Funding Trends at NSF

## By Character Class

One way to look at the NSF's budget is to break it down by character class.[8] According to the NSF, its two primary activities are research and development (R&D) and education and training (E&T). The NSF also has a category for what it calls "non-investment activities," or NIA, which pays for items such as proposal review panel travel and compensation costs, invitational travel, and other administrative activities.[9] Unlike appropriations accounts, which show how Congress provides funding to the Foundation, the character class perspective adjusts for co-funding (i.e., when programs are supported by more than one appropriations account) and provides insight into total funding for the Foundation's two primary missions (e.g., research and STEM education).

**Figure 1** shows how NSF current dollar obligations for E&T and R&D activities changed between FY2003 and FY2011. (See also **Appendix B**.) In general, funding for R&D activities trended upwards while funding for E&T trended slightly downward. Although R&D obligations increased more-or-less steadily during the observed period, E&T obligations fluctuated between a high of $941.3 million in FY2004 and a low of $782.7 million in FY2006. Median E&T obligations during this period were $856.2 million.

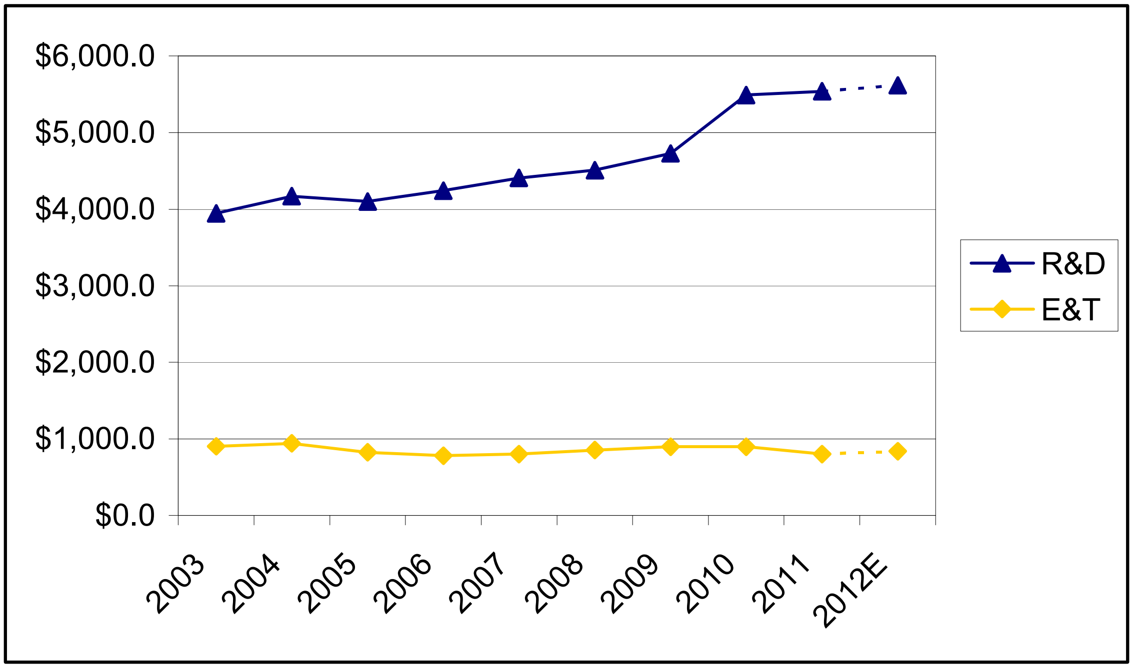
The total current dollar increase in NSF obligations between FY2003 and FY2011 was $1.543 billion, or 28.7% more than the FY2003 baseline. During this time, R&D activities increased by $1.593 billion and E&T activities decreased by -$100.9 million. In other words, E&T obligations were lower in FY2011 than they were in FY2003, while over 100% of the Foundation's total budget growth during the observed period went to R&D.

[8] NSF adheres to Office of Management and Budget, *OMB Circular A-11*, for its character class definitions. For more information, see http://www.whitehouse.gov/omb/circulars_a11_current_year_a11_toc.

[9] As the purpose of this report is to examine NSF's investment activities, it excludes NIA trends.

**Figure 1. NSF Obligations by Character Class (Current)**

FY2003 to FY2011 actual and FY2012 estimate, in millions, rounded




**Source:** CRS calculations based on data provided by the NSF.

**Notes**: Dotted lines show relationship between actual and FY2012 estimated funding levels.

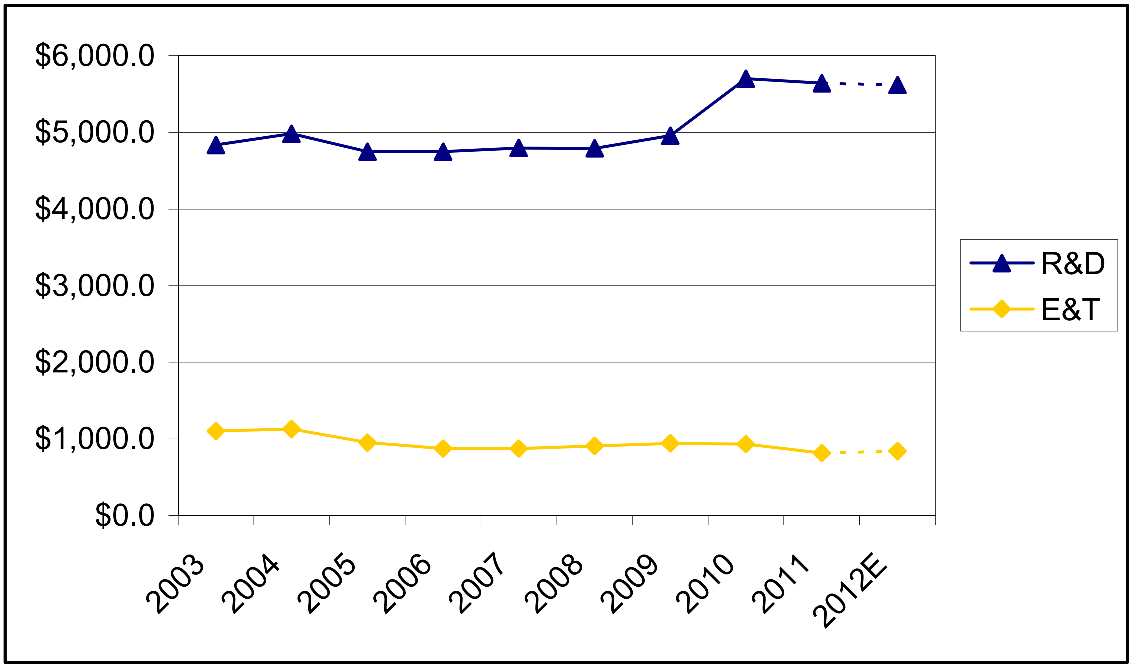
**Figure 2** shows FY2003 to FY2011 R&D and E&T funding in constant dollars. The constant dollar trends look similar to the current dollar trends. R&D activities increased by $803.2 million, while E&T activities decreased by $289.9 million. Total constant dollar growth in the NSF budget during this period was $456.6 million. Given that the R&D function grew in excess of 100% of the total constant dollar increase, and that E&T had a negative net gain during the same period, it appears that at least some of the constant dollar growth in R&D activities may have come from the reductions in E&T.

However, unlike the FY2003-FY2011 current dollar trends, when expressed in constant dollars, R&D activities appear to have experienced a relatively flat period of funding from FY2005 through FY2008. This effect is not readily observable in the non-inflation adjusted **Figure 1**. The sharp increase in R&D funding over FY2003 levels appears to have begun coincided with the second year of funding under the America COMPETES Act (P.L. 110-69).[10]

[10] The America COMPETES Act (P.L. 110-69) increased authorized funding levels for targeted accounts at the NSF, National Institutes of Standards and Technology laboratories and construction, and the Department of Energy, Office of Science. For more information see CRS Report R41819, *Reauthorization of the America COMPETES Act: Selected Policy Provisions, Funding, and Implementation Issues*, by Heather B. Gonzalez; and CRS Report R41951, *An Analysis of Efforts to Double Federal Funding for Physical Sciences and Engineering Research*, by John F. Sargent Jr..

**Figure 2. NSF Obligations by Character Class (2012 Constant)**

FY2003 to FY2011 actual and FY2012 estimate, in millions, rounded




**Source:** CRS calculations based on data provided by the NSF.

**Notes**: Dotted lines show relationship between actual and FY2012 estimated funding levels.

The distribution of NSF obligations by character class, as a percentage of the total NSF budget, also changed between FY2003 and FY2011. As **Table 1** shows, the percentage of the NSF budget dedicated to E&T activities generally decreased and the percentage of the NSF budget dedicated to R&D activities generally increased between FY2003 and FY2011. This is consistent with the previous finding that most of the total increase in NSF funding during the observed period went to R&D. Some of the increase in the percentage of the NSF budget dedicated to R&D may have come from NIA. (See Note, **Table 1**.)

**Table 1. Distribution of NSF Obligations by Character Class (% of Total)**

FY2003 to FY2011 actual, FY2012 estimate, and average

| Activity | FY2003 | FY2004 | FY2005 | FY2006 | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012E | Average ('03-'11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| R&D | 73.5% | 73.7% | 74.8% | 75.1% | 74.9% | 74.1% | 73.1% | 78.7% | 80.1% | 79.8% | 75.3% |
| NIA | 9.8% | 9.6% | 10.2% | 11.0% | 11.5% | 11.9% | 13.0% | 8.4% | 8.3% | 8.3% | 10.4% |
| E&T | 16.8% | 16.7% | 15.0% | 13.9% | 13.6% | 14.1% | 13.9% | 12.9% | 11.6% | 11.9% | 14.3% |

**Source:** CRS calculations based on data provided by the NSF. Data and calculations available upon request.

**Note:** In response to direction from the Office of Management and Budget, NSF reclassified certain NIA obligations as R&D in FY2010. It is likely that pre-FY2010 R&D levels are higher than represented here, but the amount of the difference is unknown. NSF indicates that there may be a coding problem in the FY2008 E&T numbers, such that some R&D activities may be improperly assigned to the E&T account.

## By Appropriations Account

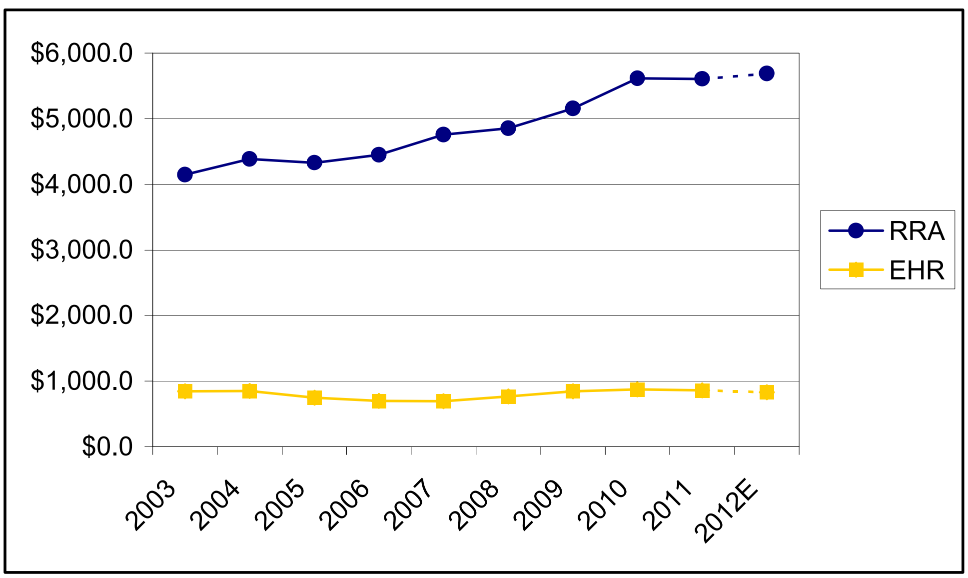
As previously described, Congress provides funding to the NSF via appropriations accounts. Analysis of major account trends, therefore, tends to align more closely with historical congressional action and prior year appropriations measures than does analysis by character class. This section will focus on changes in congressional appropriations for the RRA and EHR accounts since these accounts are the primary sources of support for NSF mission activities.

Congress increased current dollar appropriations to the NSF by $1.543 billion, or 28.7%, from $5.369 billion in FY2003 to $6.913 billion in FY2011. (See **Appendix A**.) Of the total increase in current dollar appropriations during the period, 94.9% or $1.465 billion, went to RRA while EHR increased by $15.4 million, or 1.0%.

Both RRA and EHR experienced current dollar reductions from the prior year in FY2005 and FY2011. (See **Appendix A**.) However, other than these years, **Figure 3** shows the RRA account increased overall during the observed period. As a result, FY2011 funding for RRA was 35.3% more than in FY2003. EHR funding varied during the observed period. That account saw year-over-year reductions from FY2005 to FY2007 and increases from FY2008 to FY2010. Congress reduced the main education account again in FY2011 and FY2012. In current dollars, reductions to EHR during the observed period appear to be steeper, and take longer to return to the pre-reduction level, than reductions to RRA.[11]

**Figure 3. NSF Funding for RRA and EHR (Current)**

FY2003 to FY2011 actual, FY2012 estimate, in millions, rounded




**Source**: CRS calculations based on data provided by the NSF.

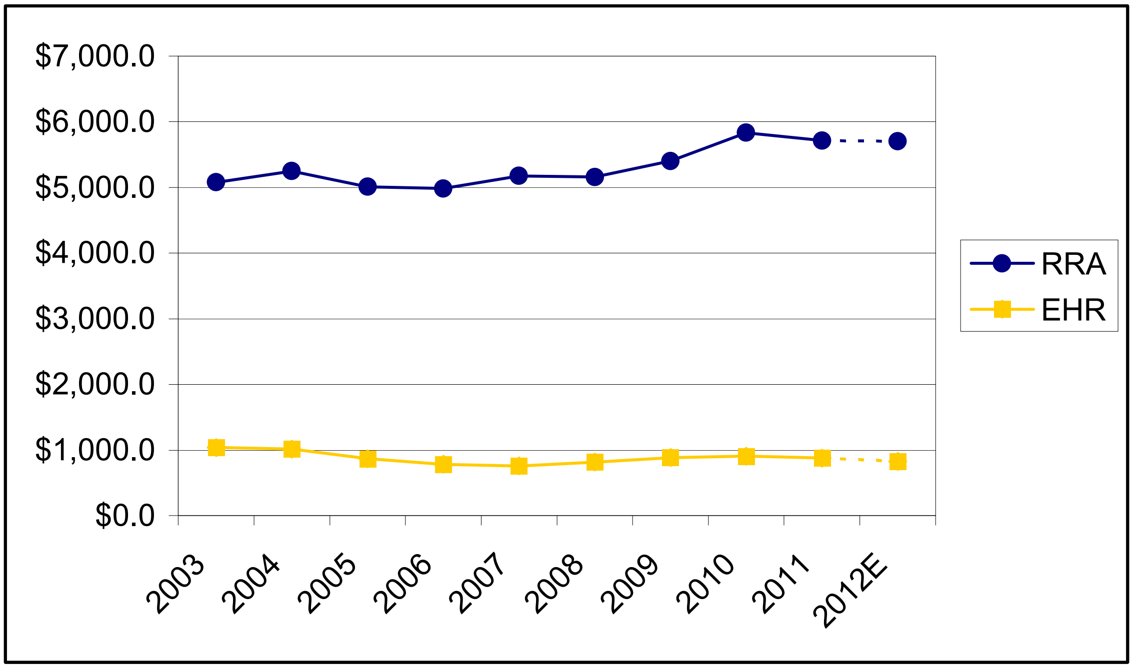
**Notes**: Dotted lines show relationship between actual and FY2012 estimated funding levels.

[11] For example, in FY2005, both RRA and EHR experienced reductions. The decrease in RRA was $59.4 million, or 1.4% percent below the FY2004 level of $4.388 billion. The following year (FY2006) Congress returned the RRA account to the FY2004 level and increased beyond it. By contrast, the FY2005 decrease to EHR was $99.7 million, or 11.7% of the FY2004 level ($849.9 million). Congress did not return EHR funding to FY2004 levels until FY2009.

As shown in **Figure 4**, the constant dollar value of NSF's main research account was higher in FY2011 than it was in FY2003, while the constant dollar value of the main education account was lower. Total constant dollar funding for NSF increased by $456.7 million (6.9%) between FY2003 and the FY2011. The main research account increased by $631.3 million (more than total growth) during this period, while the main education account decreased by $160.0 million. This suggests that most of the total constant dollar growth at the NSF—and at least some of the constant dollar value of the main education account—went to the main research account during the observed period.

**Figure 4. NSF Funding for RRA and EHR (2012 Constant)**

FY2003 to FY2011 actual, FY2012 estimate, in millions, rounded




**Source**: CRS calculations based on data provided by the NSF.

**Notes**: Dotted lines show relationship between actual and FY2012 estimated funding levels.

The distribution of funding for RRA and EHR, as a percentage of the total NSF budget, follows a pattern similar to the changes in the distribution by character class. As **Table 2** shows, the percentage of the NSF budget dedicated to RRA activities has generally increased and the percentage of the budget dedicated to EHR has generally decreased since FY2003. This is, as with the distribution by character class, consistent with the finding that most of the total increase in NSF funding for STEM activities during the observed period went to RRA.

**Table 2. Distribution of NSF Funding by Appropriations Account (% of Total)**

FY2003 to FY2011 actual, FY2012 estimate, and average

| Account | FY2003 | FY2004 | FY2005 | FY2006 | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012E | Average ('03-'11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RRA | 77.2% | 77.6% | 79.0% | 78.8% | 80.9% | 79.8% | 79.7% | 80.5% | 81.0% | 81.3% | 79.6% |
| EHR | 15.7% | 15.0% | 13.7% | 12.4% | 11.8% | 12.6% | 13.1% | 12.5% | 12.7% | 11.8% | 13.1% |
| MREFC | 3.3% | 3.3% | 3.0% | 4.1% | 2.8% | 2.7% | 2.5% | 2.4% | 1.7% | 2.4% | 2.8% |
| AOAM | 3.5% | 3.9% | 4.1% | 4.4% | 4.2% | 4.6% | 4.5% | 4.3% | 4.4% | 4.3% | 4.2% |
| NSB | 0.1% | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| OIG | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% |

**Source:** CRS calculations based on data provided by the NSF.

# Policy Issues and Observations

As the previous section on historical funding trends at NSF describes, Congress reduced funding for NSF's main education account in both FY2011 and FY2012. Those year-over-year reductions followed several years of varying funding for the main education account. In addition, changes in the distribution of the Foundation budget reduced funding for the main education account as a percentage of the total NSF budget. These changes generally appear to result from a combination of holding the main education account more-or-less constant while applying most of the Foundation's FY2003-FY2011 budget growth to the main research account.

It is not clear if—on the one hand—these funding changes reflect evolving congressional and Administration policy priorities and an intentional prioritization of research over educational activities at the NSF, or if—on the other hand—they reflect the cumulative impact of funding decisions made in response to specific conditions in specific fiscal years that happen to have had this effect. Further, congressional policymakers are challenged when trying to determine optimal funding levels for NSF accounts by the limited period of time for which comparable budgetary account data exist and the broader problem of directly linking federal investments in research and education with specific outcomes.

However, these historical funding trends may raise several policy questions for Congress to consider as it deliberates FY2013 funding for NSF—and for the overall federal STEM education effort—during a period of fiscal constraint. These questions include

- What is the policy rationale behind funding for STEM education at NSF?
- What are NSF's STEM education activities?
- What is NSF's role within the federal STEM education portfolio?
- What impact might changes in the NSF STEM education account have on research activities at NSF?
- What are the policy options?

## What Policy Rationale Drives Funding for STEM Education at NSF?

The primary policy rationale behind funding for STEM education programs at NSF relies on their perceived impact on the U.S. S&E workforce—and through it, on U.S. economic competitiveness and national security. A broad consensus of business, academic, and policy leaders holds that U.S. STEM education weaknesses have or will soon contribute to national S&E workforce shortages and that this labor supply problem has or will diminish U.S. global economic competitiveness and threaten national security. However, other analysts argue that perceived limitations in the U.S. S&E workforce are overstated and that U.S. competitiveness is not threatened by across-the-board S&E labor shortages and does not require a supply side response. A third view holds that perceptions of S&E workforce shortages are accurate if the increasing numbers of jobs that are technically non-STEM, but that require STEM competencies (e.g., analytical skills), are included in labor demand calculations.

In a March 2011 House appropriations hearing, advocates for STEM education programs at NSF argued that reducing funding for these activities would "have an adverse effect on U.S. competitiveness and on the ability of American students to compete in the global technological economy of the future."[12] This assertion is consistent with the widely held belief that

1. U.S. students are underperforming in mathematics and science relative to their international counterparts;
2. that this underperformance either is, or will soon, negatively impact the S&E labor supply; and
3. that these negative impacts will have further effects, such as U.S. workers losing out on good jobs; U.S. companies hiring foreign workers, moving operations overseas, or losing out on global economic opportunities; the U.S. economy suffering; and federal agencies unable to find the skilled workers needed for key defense, national security, and civilian activities.[13]

Analysts who hold this view often conclude, among other things, that the federal government should increase investments in STEM education across the so-called education "pipeline" (pre-kindergarten to post-graduate education). These investments, advocates assert, will improve U.S. student performance in STEM subjects and increase both the quantity and quality of U.S. students graduating with degrees in STEM fields. Examples of such policies include programs designed to improve teaching and learning in STEM fields and those that seek to attract and retain students in STEM degree programs through scholarships and financial aid.

[12] Testimony of STEM Education Coalition Executive Director James Brown, in U.S. Congress, House Committee on Appropriations, Subcommittee on Commerce, Justice, Science, and Related Agencies, *Member and Outside Witness Hearing*, hearings, 112th Cong., 1st sess., March 11, 2011, http://www.stemedcoalition.org/wp-content/uploads/2011/03/Testimony-STEM-Ed-Coalition-to-House-CJS-Subcommittee-Final.pdf.

[13] One influential example of this argument is laid out more fully in National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, Committee on Prospering in the Global Economy of the 21st Century: An Agenda for America Science and Technology, and Committee on Science, Engineering, and Public Policy, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, National Academies Press, 2007, http://www.nap.edu/catalog/11463.html.

Other observers counter that U.S. students are not underperforming in mathematics and science; that shortage claims are either overstated, misunderstood, or do not call for supply side interventions;[14] and that demand, not supply, may be the bigger policy challenge.[15] These analysts assert that the United States graduates more science and engineering students than there are science and engineering jobs[16] and that classic signs of shortages (e.g., rapidly increasing wages) are not broadly evident in the STEM labor supply. Such analysts typically acknowledge that there may be reasons to seek improved student STEM performance, but they argue that the current policy debate is based on misperceptions, obscures root causes of poor performance (e.g., poverty effects in education), and results in ineffective policy responses.[17] Analysts who hold this view have suggested demand-side policies (e.g., increased funding for R&D, tax credits for privately funded research, or more and better jobs for scientists), improved labor market signaling, or addressing the root problems of low-performing students (e.g., poverty) as possible policy alternatives.

A third view of the shortage question asserts that the disagreement about the adequacy of the supply of STEM workers "can be resolved by the fact that large numbers of people with STEM talent or degrees divert from STEM occupations either in school or later in their careers."[18] Analysts who hold this view contend that the economy has increasingly demanded STEM competencies—the knowledge, skills, and abilities typically associated with education in STEM fields—even in non-STEM occupations. This demand, such analysts assert, diverts the STEM educated from traditional STEM employment and into fields like management and finance. Those who hold this view recommend paying more attention to the role of personal interest in career choices, nurturing students with a personal interest in STEM "even if they do not look like traditional STEM workers,"[19] and integrating STEM competencies into a broader array of academic disciplines.

## What Are NSF's STEM Education Activities?

Funding for STEM education at NSF serves a variety of objectives. However, 66% of NSF's STEM education budget provides for programs designed either to support postsecondary students (primarily through scholarships and other forms of financial support) or for research on teaching and learning in STEM fields.[20] (See **Figure 5**.) Most of the postsecondary student funding goes to

---

[14] Richard Freeman, "The Market for Scientists and Engineers," *NBER Reporter*, no. 3 (Summer 2007), pp. 6-8, http://www.nber.org/reporter/2007number3/freeman.html.

[15] Ron Hira, "U.S. Policy and the STEM Workforce System," *American Behavioral Scientist*, v. 53, no. 7 (March 2010), pp. 949-961.

[16] Testimony of Institute for the Study of International Migration Director of Policy Studies B. Lindsay Lowell, in U.S. Congress, House Committee on the Judiciary, Subcommittee on Immigration Policy and Enforcement, *"STEM" the Tide: Should America Try to Prevent an Exodus of Foreign Graduates of U.S. Universities with Advanced Science Degrees?*, hearings, 112th Cong., 1st sess., Serial No. 112-64, October 5, 2011, http://judiciary.house.gov/hearings/hear_10052011_2.html.

[17] B. Lindsay Lowell and Harold Salzman, *Into the Eye of the Storm: Assessing the Evidence on Science and Engineering Education, Quality, and Workforce Demand*, Urban Institute, October 2007, http://www.urban.org/publications/411562.html.

[18] Anthony P. Carnevale, Nicole Smith, and Michelle Melton, *STEM: Science, Technology, Engineering, and Mathematics*, Georgetown University Center on Education and the Workforce, October 20, 2011, p.7, http://cew.georgetown.edu/STEM/.

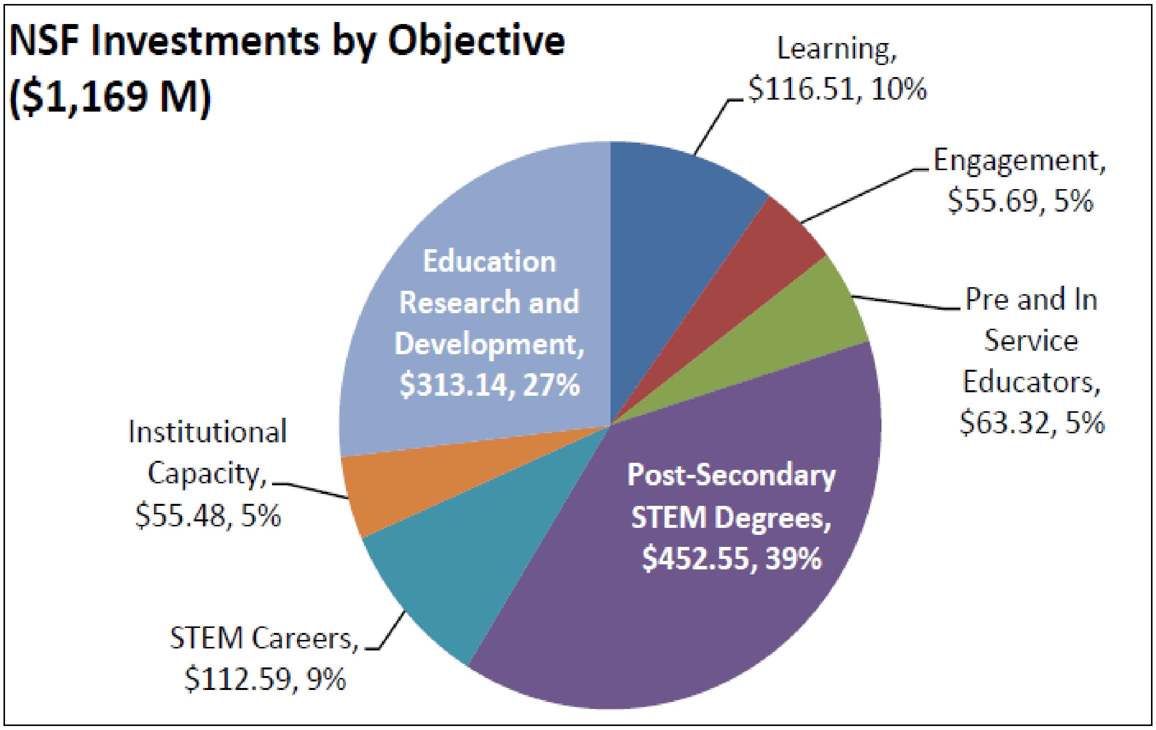
[19] Ibid., p. 75.

[20] Executive Office of the President, National Science and Technology Council, Committee on STEM Education, Fast-
(continued...)

the Graduate Research Fellowship (GRF) and Integrative Graduate Education and Research Traineeship (IGERT) programs, which provide stipends and support to STEM graduate students. Most of the funding for research in STEM education goes to the Discovery Research K-12 and Mathematics and Science Partnership programs, which seek to improve kindergarten-through-Grade 12 (K-12) STEM education. Smaller portions of NSF's STEM education budget provide for a number of other objectives.

**Figure 5. STEM Education Funding at NSF, by Objective**

FY2010 actual, millions of current dollars




**Source:** Executive Office of the President, National Science and Technology Council, Committee on STEM Education, Fast-Track Action Committee on Federal Investments in STEM Education, *The Federal Science, Technology, Engineering, and Mathematics (STEM) Education Portfolio*, December 2011, p. 68.

**Notes:** The NSTC calculation for STEM education funding at the NSF in FY2010 (actual) uses a different methodology than either the EHR or E&T estimates used in other parts of this report.

Several reports on the federal STEM education effort have noted a general dearth of STEM education program evaluations and have recommended that federal agencies increase their program evaluation rates. This challenge is not broadly applicable to the NSF, which has conducted evaluations of many of its STEM education programs. However, in a January 2012 Government Accountability Office (GAO) review of federal STEM education programs, GAO found that federal STEM education program evaluations—including NSF evaluations—could be improved. In particular, GAO recommended improved survey response rates, better alignment of

(...continued)

Track Action Committee on Federal Investments in STEM Education, *The Federal Science, Technology, Engineering, and Mathematics (STEM) Education Portfolio*, December 2011, p. 68, http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem__federal_stem_education_portfolio_report.pdf.

methods with other components of the evaluation, and robust use of criteria to measure outcomes.[21]

## What Is NSF's Role in the Federal STEM Education Portfolio?

The NSF plays a key role in the federal STEM education portfolio. As noted previously, the Foundation is responsible for one of the largest pieces of the federal STEM education budget pie and manages a large percentage of total federal STEM education programs. The NSF is also the only federal agency whose primary mission includes education across all fields of science and engineering. This key position means changes at the NSF may disproportionally affect the entire federal STEM education effort (funding and character). The specific debate about FY2013 funding for STEM education programs at the NSF is also taking place within a broader conversation about governance of the federal STEM education effort. This conversation has focused on the potential for duplication in the portfolio and on the perception that the federal effort lacks both coordination and an overarching strategy, among other things.

The NSTC estimates that total federal STEM education investments in FY2010 were $3.4 billion.[22] The NSF portion of that total was $1.2 billion (rounded). An increase of $175.0 million (approximately 15%) in the NSF STEM education budget in FY2010 would have increased the federal STEM education total by 5%. To the extent that NSF STEM education programs are integrated with similar programs at other agencies—as are the Mathematics and Science Partnership programs at NSF and ED—changes at NSF may impact other federal programs. The degree to which federal STEM education programs are integrated and coordinated across federal agencies is not well understood by analysts. Also, although NSF is a major contributor to the federal STEM education portfolio, some analysts may argue that national STEM education objectives could be met without NSF programs.

However, the widely held belief that the NSF *is* a primary federal agency for STEM education may increase demand for NSF's STEM education funding at a time when, as has been shown in previous sections, those accounts are decreasing. For example, in the House Appropriations Committee report on the Energy and Water Development Appropriations Bill, 2012 (H.Rept. 112-118), congressional appropriators directed the Department of Energy, Office of Science (SC) to "justify to the Committee why fellowships should be funded within the Office of Science when other agencies, in particular the National Science Foundation, are the primary federal entities for such purposes."[23] The Department of Energy did not ask for new funding for this fellowship program in FY2013. Other federal agencies might also reduce or eliminate STEM fellowship programs based on the expectation that the NSF serves this purpose. As such, it is possible to anticipate a budget scenario in which demand for NSF fellowships increases as other federal

[21] U.S. Government Accountability Office, Science, Technology, Engineering, and Mathematics Education: Strategic Planning Needed to Better Manage Overlapping Programs Across Multiple Agencies, GAO-12-108, January 2012, pp. 27-29, http://gao.gov/products/GAO-12-108.

[22] Executive Office of the President, National Science and Technology Council, Committee on STEM Education, Fast-Track Action Committee on Federal Investments in STEM Education, *The Federal Science, Technology, Engineering, and Mathematics (STEM) Education Portfolio*, December 2011, http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem__federal_stem_education_portfolio_report.pdf.

[23] U.S. Congress, House Committee on Appropriations, *Energy and Water Development Appropriations Bill, 2012*, report together with additional views to accompany H.R. 2354, 112th Cong., 1st Sess., H.Rept. 112-118, September 7, 2011 (Washington, DC: GPO, 2011), p. 114.

agencies reduce support for STEM education. Similarly, demand for NSF fellowships may not increase if potential fellows look to non-federal sources for research funding or pursue alternative careers.

In terms of the character of its contribution to the federal STEM education portfolio, NSF highlights its STEM education research and development (R&D) functions. The Foundation states that it focuses on identifying effective STEM education practices through research and small-scale testing, but that it is not well-positioned to bring these practices to scale.[24]

The dissemination of NSF's STEM education research—including research evaluating the effectiveness of NSF STEM education programs—to other federal agencies and education stakeholders is an ongoing policy challenge. Some policymakers have responded to this challenge by seeking improved collaboration between federal agencies at both the portfolio and program levels. For example, at the portfolio level, the federal STEM education strategy currently under development by the NSTC proposes sharing evidence-based approaches as a primary strategy toward accomplishing federal STEM education goals.[25] At the program level, the Administration's FY2013 budget request seeks funding for three STEM education collaborations between NSF and ED. Whether these collaborations, if they are funded, will prove successful depends on program managers' willingness to collaborate, on executive branch leadership support for collaboration, and on the institutional cultures of the respective agencies, among other things.

Other current strategies that seek to address the dissemination challenge include policies that direct NSF to independently distribute STEM education research to stakeholders (as opposed to dissemination via collaboration with other agencies). For example, the House Appropriations Committee report on Commerce, Justice, Science, and Related Agencies Bill, 2012 (H.Rept. 112-169) directed NSF to independently distribute research on best practices in STEM education to stakeholders. H.Rept. 112-169 also directed the NSF to develop methods to track and evaluate stakeholders' implementation of that research and to report to Congress on progress.[26] The results from that progress report may provide further insight into independent dissemination strategies for the Foundation.

NSF is also an important source of scholarships, fellowships, and financial support to STEM students as well as institutions of higher education. For example, since the establishment of the Graduate Research Fellowship (GRF) program in 1952—two years after NSF's own founding in 1950—NSF has supported researchers and students in STEM fields. This funding serves integrated research and education purposes. It seeks to support the national research effort through support of the STEM workforce, and it seeks to support the national STEM education effort by providing financial and educational incentives for students to go into STEM and STEM-related fields (such as K-12 science teaching). NSF estimates that it provides financial support to about 5% of the science and engineering graduate students in the United States.[27]

---

[24] Based on NSF briefing of CRS and GAO staff, January 21, 2011.

[25] For more information on the effort to establish a federal STEM education strategy, see the section of this report titled, "A Federal STEM Education Strategy."

[26] U.S. Congress, House Committee on Appropriations, *Commerce, Justice, Science, and Related Agencies Bill, 2012*, report together with minority views to accompany H.R. 2596, 112th Cong., 1st Sess., H.Rept. 112-169, July 20, 2011 (Washington, DC:GPO 2011), pp. 84-85.

[27] See National Science Foundation, *FY2013 Budget Request to Congress*, February 13, 2012, p. Summary Tables-5, http://www.nsf.gov/about/budget/fy2013/index.jsp.

In addition to NSF's relatively large role as a provider of STEM education R&D and STEM student support in the federal portfolio, the Foundation also operates smaller (measured by funding levels) programs that seek to advance other federal STEM education policy priorities. These include programs designed to increase the participation of historically under-represented groups in STEM fields.

## *The Federal STEM Education Effort: Selected Governance Concerns*

Governance concerns are key to the congressional debate about the federal STEM education effort. In particular, two governance concerns have specific implications for STEM education funding at NSF: the potential for duplication in the broader federal STEM education portfolio, and the perception of a lack of either coordination or strategy in federal STEM education investments.

### *Duplication and Consolidation*

The scope, scale, and apparent lack of coordination in the federal STEM education portfolio has some analysts concerned that federal agencies are duplicating effort. In response to these concerns, some policymakers have proposed consolidating or eliminating some or all of NSF's STEM education programs.[28]

Published assessments of duplication in the federal STEM education portfolio are somewhat contradictory. Preliminary findings from an April 2011 GAO report appeared to suggest the potential for duplication in federal teacher quality programs, including teacher quality programs at the NSF.[29] However, the December 2011 NSTC comprehensive inventory of federal STEM education programs specifically examined the duplication question within the federal STEM education portfolio and found "little overlap and no duplication."[30] A January 2012 GAO report on the federal STEM education effort concluded that 83% of federal STEM education programs overlapped "to some degree," but stated that this overlap would "not necessarily be duplicative."[31]

Federal program consolidation is a widely debated option that policymakers may employ to reduce duplication and potentially affect savings. Some policymakers see program consolidation as a means to increase program flexibility and improve program responsiveness, because federal program managers would have greater authority to shift priorities without having to modify federal law.[32] However, other policymakers may object to this change, because it can transfer

[28] For example, see Senator Tom Coburn, *The National Science Foundation: Under the Microscope*, April 2011, p. 54, http://coburn.senate.gov/public//index.cfm?a=Files.Serve&File_id=2dccf06d-65fe-4087-b58d-b43ff68987fa.

[29] The GAO found a total of 82 potentially duplicative teacher quality programs at 10 federal agencies. The auditing agency indicates that nine of these programs were at the NSF. See, U.S. Government Accountability Office, *Opportunities to Reduce Duplication in Federal Teacher Quality Programs* (GAO-11-510T), April 13, 2011, http://www.gao.gov/products/GAO-11-510.

[30] Executive Office of the President, National Science and Technology Council, Committee on STEM Education, Fast-Track Action Committee on Federal Investments in STEM Education, *The Federal Science, Technology, Engineering, and Mathematics (STEM) Education Portfolio*, December 2011, p. 37, http://www.whitehouse.gov/sites/default/files/microsites/ostp/costem__federal_stem_education_portfolio_report.pdf.

[31] U.S. Government Accountability Office, Science, Technology, Engineering, and Mathematics Education: Strategic Planning Needed to Better Manage Overlapping Programs Across Multiple Agencies, GAO-12-108, January 2012, pp. 20-21, http://gao.gov/products/GAO-12-108.

[32] This is, for example, part of the rationale for Administration-proposed program consolidations at the Department of (continued...)

program control from the legislative to the executive branch, potentially shifting the balance of power between the branches. Consolidation (particularly in the form of block grants) has also been proposed as a strategy to transfer control to the states and as a means to reduce program costs. Such a shift could increase the ability of states to respond to local conditions and needs, but might make it more difficult for federal policymakers to implement a national STEM education agenda,[33] or to leverage the unique assets that federal science agencies bring to the STEM education effort.[34] On the issue of cost and consolidation, the GAO has found that program consolidation can be more expensive in the short-term and may not result in long-term savings if program workloads are not reduced.[35] Consolidation opponents raise general concerns about the potential impact of merging programs, arguing that certain programs (such as STEM education programs) need specified funding streams to avoid being passed over in favor of competing educational priorities.

The impact of federal STEM education program consolidation efforts on STEM education at the NSF will depend on what programs are consolidated, how the consolidation is accomplished, how funding streams are affected, and the degree to which NSF programs are strictly duplicative of other federal STEM education efforts.[36] Congress could, for example, seek either a full or partial consolidation of STEM education programs at either the NSF or across the entire federal STEM education portfolio. Savings and program impacts would vary, depending on which of these strategies policymakers pursue.

### *A Federal STEM Education Strategy*

A second policy issue raised in the current federal STEM education governance debate relates to the perceived lack of coordination or an overarching strategy in the portfolio. Until recently, the federal STEM education effort was largely unknown and primarily undertaken in a distributed fashion that responded to the specific needs of agencies and STEM constituencies. Programs were typically not part of a defined, overarching federal STEM education strategy or well-coordinated across federal agencies. Although some analysts may view the distributed approach as particularly responsive to the unique workforce needs or STEM education assets of federal science agencies, other observers have suggested that an overarching cross-agency strategy may improve the efficiency of federal STEM education investments.[37]

---

(...continued)

Education. For more information about the Administration's planned changes at ED, see CRS Report R41355, *Administration's Proposal to Reauthorize the Elementary and Secondary Education Act: Comparison to Current Law*, by Rebecca R. Skinner et al.

[33] This would depend on how the grants to states were structured. Federal policymakers could still attempt to establish a national STEM education agenda by making receipt of consolidated program funds contingent on meeting certain defined national goals. However, some states may reject such efforts as overly prescriptive.

[34] For example, the National Aeronautics and Space Administration (NASA) has both unique workforce needs (e.g., astrobiologists) and unique assets that it can bring to the national STEM education effort (e.g., teaching from space).

[35] GAO states that "over 90% of STEM education programs that reported administrative costs estimated having administrative costs lower than 10% of their total program costs." U.S. Government Accountability Office, *Science, Technology, Engineering, and Mathematics Education: Strategic Planning Needed to Better Manage Overlapping Programs Across Multiple Agencies*, GAO-12-108, January 2012, p. 22, http://gao.gov/products/GAO-12-108.

[36] For example, programs that appear duplicative by some measures (e.g., target group), may have different intangible assets that could impact program implementation and outcomes.

[37] For example, the December 2011 NSTC inventory of federal STEM education programs suggested that there was room for improvement in their management and stated that "the primary issue [instead of duplication] is how to strategically focus the limited federal dollars available within the vast landscape of opportunity so they will have the (continued...)

Congress has addressed the need to develop a federal STEM education strategy. Section 101 of the America COMPETES Reauthorization Act of 2010 (P.L. 111-358) directed the NSTC to develop and implement a five-year federal STEM education strategy. Although the NSTC has not yet published this strategy, it issued a status report in February 2012.[38] That status report identifies two common federal STEM education agency goals—STEM workforce development and STEM literacy—as well as policy and administrative strategies designed to accomplish these goals. In particular, the status report identifies four priority policy areas for the federal effort: "effective K-12 teacher education, engagement, undergraduate STEM education, and serving groups traditionally underrepresented in STEM fields."[39] The status report notes that strong arguments can be made for other STEM education policy areas, but states that these four were chosen as the priority areas for the enterprise-wide coordinated effort because they represent the convergence of "national needs, Presidential priorities, and federal assets."[40] (Agencies may still maintain their own STEM education priorities as well.)

The adoption and implementation of an overarching federal STEM education strategy could have many implications for STEM education at the NSF, depending on the type of strategy policymakers adopt and the STEM education goals they pursue. The America COMPETES Reauthorization Act of 2010 gives the Executive Branch the authority to both develop and implement a federal STEM education strategy. However, implementation depends on appropriations and related congressional decisions. If the 112$^{th}$ Congress adopts the priority policy areas included in the NSTC status report in its FY2013 appropriations actions, NSF will likely continue its large role in the national STEM education strategy, because it has programs in all four areas. If legislators pursue the same goals (e.g., STEM workforce and STEM literacy), but undertake a different strategy—such as increasing funding for Advanced Placement course-taking or early childhood education at ED—then the NSF may play a different role. Alternatively, legislators may adopt different national STEM education goals or strategies.

## What Impact Might Changes in the NSF STEM Education Account Have on Research Activities at NSF?

Although this report focuses on NSF STEM education programs, many of those programs are co-funded (e.g., they receive funding from other Foundation accounts, principally RRA). As such, changes in the main NSF education account may impact the main research account.

(...continued)

most significant impacts possible in areas of national priority." (See, NSTC report, p. 37.) The GAO concluded similarly in its January 2012 report and recommended that the NSTC draft a federal STEM education strategy plan, and that NSTC should also develop policies to ensure agencies comply with the national plan. In particular, the GAO recommended that NSTC should develop (1) guidance for agencies on how to incorporate STEM education efforts into agency performance plans; (2) a framework for how agencies will be monitored to ensure they collect and report on strategic plan goals; and (3) guidance to help agencies determine the types of evaluations that may be feasible and appropriate for different types of STEM education programs. Additionally, GAO recommended that NSTC should work with agencies to identify programs that might be candidates for consolidation or elimination. (See, GAO-12-108, p. 31).

[38] See, Executive Office of the President, National Science and Technology Council, Committee on STEM education, Federal Coordination in STEM Education Task Force, *Coordinating Federal Science, Technology, Engineering, and Mathematics (STEM) Education Investments: Progress Report*, February 2012, http://www.whitehouse.gov/sites/default/files/microsites/ostp/nstc_federal_stem_education_coordination_report.pdf.

[39] Ibid., p. 13.

[40] Ibid., p. 17.

For example, compared to FY2011, the FY2012 estimate for RRA includes a $81.0 million increase. Of this amount, $60.0 million (74.1%) went to education and training. The FY2013 request seeks another $40.0 million for education and training, or 13.6% over the FY2012 estimated level.[41] The cumulative impact of these changes, if Congress adopts the President's FY2013 budget request, would be a 1.4% increase (from 3.7% to 5.1%) in the education and training portion of the RRA account and a 1.4% decrease (from 92.6% to 91.1%) in the R&D portion of the account. It is not clear that this change in the research account would significantly impact NSF's research capacity. However, the growth in the E&T portion of the research account comes at a time when Congress has been reducing funds for EHR.

At the program level, this change in RRA's contribution to E&T activities is particularly noticeable in the Graduate Research Fellowship (GRF) program. Beginning in FY2009, the RRA contribution to the GRF grew from under 10% of the total GRF budget to about 50.0% in the FY2013 NSF budget request. (Most post-FY2009 growth in this account has come from RRA.) The NSF FY2013 budget request also includes the new Expeditions in Education ($E^2$) program, which would use RRA funding to develop STEM education programs that "build upon"[42] core cyberlearning and undergraduate education programs from EHR.[43]

One interpretation of the above-described changes in RRA is that they represent a deeper integration of the Foundation's complementary research and education mission. The research experience is sometimes perceived as serving educational purposes,[44] just as support for education may ultimately benefit the research enterprise. However, an alternative explanation might be that budgetary reductions to the main education account are putting pressure on the main research account. For FY2013, Congress may wish to consider whether and to what extent the RRA account should serve education and training and whether the main education account is sufficient for congressional priorities in these areas. Additionally, Congress may wish to seek further clarification from NSF on how it determines which of its education and training activities receives funding from the RRA account.

# Options for Congress

Fiscal constraints on discretionary spending in the FY2013 budget are prominent issues for policymakers. Therefore, legislators may focus more intently on NSF's STEM education funding. Among the several options available to Congress are the following.

- **Maintain NSF budget as it is.** If Congress seeks to preserve NSF's budgetary autonomy, it could maintain the NSF budget as it is, making no significant increases or reductions. This would provide the Foundation its historical fiscal

[41] See **Appendix A** and National Science Foundation, *FY2013 Budget Request to Congress*, February 13, 2012, p. QDT-2, http://www.nsf.gov/about/budget/fy2013/index.jsp.

[42] National Science Foundation, *FY2013 Budget Request to Congress*, February 13, 2012, p. NSF-wide Investments-17, http://www.nsf.gov/about/budget/fy2013/index.jsp.

[43] These examples highlight the growing contribution of RRA to E&T activities, but are not intended as generally representative of all NSF STEM education programs.

[44] For example, some STEM education advocates argue that early undergraduate research opportunities are critical learning experiences and important to the STEM educational process.

discretion, while Congress could continue to guide its activities through the oversight process.

- **Increase funding for STEM education at NSF.** If Congress seeks to increase NSF's STEM education capacity and its role in the federal portfolio, it could provide additional funding for EHR or for the E&T portion of the RRA account.
  - *Increase funding for EHR*—Congress could do this by either shifting funding from other appropriations accounts to EHR or by providing additional funding directly to the main education account. A shift in funding from other accounts to EHR would not necessarily result in a real increase to NSF's STEM education programs (particularly if the reductions were to RRA, which could presumably offset such reductions by limiting its contributions to co-funded programs). Further, reductions to other accounts may limit NSF's ability to meet Congress' non-STEM education priorities.
  - *Increase the RRA contribution to E&T*—Another way to increase overall funding for education at the NSF would be to increase the RRA contribution to E&T activities through increased contributions to co-funded activities. Congress could do this with or without overall increases to the NSF and RRA; however, if R&D funding does not also increase at the rate of inflation, purchasing power may be lost. Increasing RRA contributions to E&T activities may deepen the integration of these complementary NSF missions or may put pressure on research activities.
- **Decrease funding for STEM education at NSF.** If Congress seeks to capture savings from the NSF budget, it could reduce funding for NSF STEM education programs. To this end, Congress has at least two options. It could prioritize certain programs—for example, by either portfolio role or performance—and reduce others. Alternatively, it could reduce topline support for EHR and limit the percentage of RRA that may be used for E&T.
  - *Prioritization*—In general, prioritization of certain programs might result in savings, depending on the choices policymakers make about reductions and support for the programs it preserves. However, congressional prioritization of NSF's STEM education programs may challenge the Foundation's historical autonomy, which many analysts see as essential to its scientific mission. Congress has at least two options for prioritizing NSF's STEM education programs: portfolio role and performance.
    - *By Portfolio Role*—Instead of treating NSF's education activities as a single function, Congress could separate NSF's STEM education R&D programs from its student and institutional aid programs. Congress could then establish differential funding rates for NSF's STEM education R&D and aid programs. For example, some analysts suggest that research funding is most efficient when provided in predictable incremental increases (as opposed to wide variations, which impose adjustment costs). However, demand for student and institutional aid tends to be affected by factors that vary—such as population size, general economic conditions, and state education budgets, among others.
    - *By Performance*—Congress could direct NSF to develop a framework for evaluating its STEM education programs. That framework could

incorporate factors that reflect the importance of the program to NSF's mission, to the federal STEM education portfolio, to the constituencies served, to the field (e.g., intellectual merit), and to other congressional criteria. Policymakers at NSF and Congress could use this information to prioritize funding for NSF's STEM education programs. A performance approach to reductions could increase the effectiveness of NSF's STEM education programs. However, one of the challenges of the performance approach is that the criteria by which decisions are made may not reflect the full value of the programs and as a result, effective programs may be unintentionally terminated.

  - *Decrease topline funding for EHR and limit the percentage of RRA that may be used for E&T.* Given the important role played by federal funding for fundamental research—most of NSF-funded research is basic research—Congress could prioritize NSF's research activities over its education activities and continue assigning most of the Foundation's funding to the research account. To the extent that NSF's STEM education programs are unique to the federal effort, this may affect the portfolio.

- **Use mechanisms other than the NSF to achieve federal STEM education goals.** Congress could meet federal STEM education goals in any number of ways, depending on what those goals are and the policy strategies policymakers pursue. For example, Congress could increase the number of students who are interested in and prepared to study STEM subjects in college by increasing funding for Advanced Placement or other gifted student programs at ED. Other analysts may seek to increase general federal student aid (e.g., Pell program), which also serves STEM students (along with all others) but does not create incentives for students to pursue degrees in certain fields. Some policymakers may prefer to leave such matters to state and local governments to decide.
- **Decrease funding for STEM education across the portfolio.** If Congress seeks to prioritize other national concerns (e.g., national debt, defense, health care), it may choose to reduce funding for STEM education across the federal enterprise. Federal agencies may respond to reduced funding levels by limiting STEM education activities. Congress may wish to consider providing guidance to federal agencies in such instances, to ensure that legislative priorities are maintained.

As Congress weighs these various options in the context of the FY2013 appropriations process, it may be useful to consider the short, medium, and long-term impact of congressional funding choices on the entire federal STEM education portfolio, on the respective research and education missions of the NSF, and on the general policy purposes (e.g., advancement of the national STEM labor supply) these investments seek to serve. Congress may also wish to consider these investments in the context of a national STEM education strategy.

# Appendix A. Appropriations Data

**Table A-1. NSF Appropriations by Account (Current)**

FY2003-FY2011 actual and FY2012 estimate, in millions, rounded

| Account | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012E |
|---|---|---|---|---|---|---|---|---|---|---|
| R&RA | $4,143.6 | $4,387.6 | $4,328.2 | $4,449.3 | $4,758.4 | $4,853.2 | $5,152.4 | $5,615.3 | $5,608.4 | $5,689.0 |
| E&HR | $845.7 | $849.9 | $750.2 | $700.3 | $695.7 | $766.3 | $845.5 | $872.8 | $861.0 | $829.0 |
| MREFC | $179.0 | $184.0 | $165.1 | $233.8 | $166.2 | $166.9 | $160.8 | $165.9 | $125.4 | $197.1 |
| AOAM | $189.4 | $218.9 | $223.5 | $247.1 | $248.5 | $282.0 | $294.1 | $299.9 | $299.3 | $299.4 |
| NSB | $2.9 | $2.2 | $3.7 | $3.9 | $3.7 | $3.8 | $4.0 | $4.4 | $4.5 | $4.4 |
| OIG | $8.7 | $9.5 | $10.2 | $11.5 | $11.9 | $11.8 | $12.0 | $14.0 | $14.0 | $14.2 |
| Total | $5,369.3 | $5,652.0 | $5,480.8 | $5,645.8 | $5,884.4 | $6,084.0 | $6,468.8 | $6,972.2 | $6,912.6 | $7,033.1 |

**Source:** CRS calculations based on data provided by the NSF.

**Table A-2. NSF Appropriations by Account (2012 Constant)**

FY2003-FY2011 actual and FY2012 estimate, in millions, rounded

| Account | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012E |
|---|---|---|---|---|---|---|---|---|---|---|
| R&RA | $5,080.6 | $5,247.0 | $5,012.9 | $4,983.7 | $5,176.8 | $5,160.2 | $5,400.5 | $5,831.8 | $5,711.9 | $5,689.0 |
| E&HR | $1,036.9 | $1,016.3 | $868.9 | $784.4 | $756.8 | $814.7 | $886.2 | $906.4 | $876.9 | $829.0 |
| MREFC | $219.5 | $220.0 | $191.3 | $261.9 | $180.8 | $177.4 | $168.5 | $172.3 | $127.7 | $197.1 |
| AOAM | $232.3 | $261.8 | $258.8 | $276.7 | $270.3 | $299.9 | $308.2 | $311.4 | $304.8 | $299.4 |
| NSB | $3.5 | $2.7 | $4.2 | $4.4 | $4.0 | $4.1 | $4.2 | $4.5 | $4.6 | $4.4 |
| OIG | $10.7 | $11.3 | $11.8 | $12.8 | $13.0 | $12.6 | $12.6 | $14.5 | $14.3 | $14.2 |
| Total | $6,583.5 | $6,759.1 | $6,347.8 | $6,323.9 | $6,401.7 | $6,468.9 | $6,780.2 | $7,241.0 | $7,040.2 | $7,033.1 |

**Source:** CRS calculations based on data provided by the NSF.

# Appendix B. Character Class Data

**Table B-1. NSF Funding by Character Class (Current)**

FY2003-FY2011 actual and FY2012 estimate, in millions, rounded

| Activity | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012E |
|---|---|---|---|---|---|---|---|---|---|---|
| R&D | $3,943.8 | $4,166.0 | $4,098.3 | $4,239.5 | $4,406.9 | $4,506.4 | $4,728.6 | $5,488.2 | $5,536.6 | $5,614.3 |
| NIA | $524.3 | $544.7 | $558.7 | $623.6 | $675.0 | $721.5 | $842.9 | $583.6 | $575.5 | $580.5 |
| E&T | $901.2 | $941.3 | $823.8 | $782.7 | $802.5 | $856.2 | $897.2 | $900.4 | $800.4 | $838.3 |
| Total | $5,369.3 | $5,652.0 | $5,480.8 | $5,645.8 | $5,884.4 | $6,084.1 | $6,468.8 | $6,972.2 | $6,912.5 | $7,033.1 |

**Source:** CRS calculations based on data provided by the NSF.

**Table B-2. NSF Funding by Character Class (2012 Constant)**

FY2003-FY2011 actual and FY2012 estimate, in millions, rounded

| Activity | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012E |
|---|---|---|---|---|---|---|---|---|---|---|
| R&D | $4,835.7 | $4,982.0 | $4,746.7 | $4,748.7 | $4,794.3 | $4,791.4 | $4,956.3 | $5,699.8 | $5,638.8 | $5,614.3 |
| NIA | $642.8 | $651.4 | $647.0 | $698.5 | $734.3 | $767.2 | $883.5 | $606.1 | $586.1 | $580.5 |
| E&T | $1,105.0 | $1,125.6 | $954.1 | $876.7 | $873.1 | $910.3 | $940.4 | $935.1 | $815.1 | $838.3 |
| Total | $6,583.5 | $6,759.1 | $6,347.8 | $6,323.9 | $6,401.7 | $6,468.9 | $6,780.2 | $7,241.0 | $7,040.1 | $7,033.1 |

**Source:** CRS calculations based on data provided by the NSF.

## Author Contact Information

Heather B. Gonzalez
Specialist in Science and Technology Policy
hgonzalez@crs.loc.gov, 7-1895