Scientific Management Review Board

Working Group on the NIH Grant Review, Award, and Management Process

Scott Koenig, M.D., Ph.D.
Member, GRAMP Working Group

October 14, 2014

Charge to SMRB

- NIH requests that the SMRB recommend ways to further optimize the process of reviewing, awarding, and managing grants in a way that maximizes the time researchers can devote to research while still maintaining proper oversight.
- In addressing this charge, the SMRB should consider:
  1. How NIH could streamline the grant-making process and shorten the time from application to allocation of funds
  2. How administrative requirements on applicants and their institutions, scientific reviewers, Council members, and NIH staff could be reduced while maintaining a high-quality review and management process

SMRB Working Group

Non-Federal Members

- Michael A. Marletta, Ph.D.
- Nancy C. Andrews, M.D., Ph.D.
- Scott Koenig, M.D., Ph.D.
- Gilbert S. Omenn, M.D., Ph.D.
- Larry J. Shapiro, M.D.

Federal Members

- Linda S. Birnbaum, Ph.D.
- Josephine P. Briggs, M.D.
- Stephen I. Katz, M.D., Ph.D.
- Griffin P. Rodgers, M.D.
- Martha J. Somerman, D.D.S., Ph.D.

GRAMP Working Group

3

Two Types of Possible Change

Adjust the existing system

Make major/radical changes to the system

GRAMP Working Group

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SMRB Briefings to Date

- May 7, 2014
  - Richard K. Nakamura, Ph.D.
    - *Director, Center for Scientific Review, National Institutes of Health*
  - Sally J. Rockey, Ph.D.
    - *Deputy Director for Extramural Research, National Institutes of Health*
- July 8, 2014
  - Richard Nakamura, Ph.D.
    - *Director, Center for Scientific Review, National Institutes of Health*
  - Donald Schneider, Ph.D.
    - *Senior Advisor, Center for Scientific Review, National Institutes of Health*
  - Robin A. Barr, D.Phil.
    - *Director of the Division of Extramural Activities, National Institute on Aging, National Institutes of Health*
  - Alicia Dombroski, Ph.D.
    - *Director, Division of Extramural Activities, National Institute of Dental and Craniofacial Research, National Institutes of Health*
  - Lisa Goffman, Ph.D.
    - *Professor of Speech, Language, & Hearing Sciences, Purdue University*

SMRB Briefings to Date *(cont.)*

- July 8, 2014 *(cont.)*
  - Ann A. Hagan, Ph.D.
    - *Associate Director for Extramural Activities, National Institute of General Medical Sciences, National Institutes of Health*
  - James M. Larner, Ph.D.
    - *Professor and Chair of the Department of Radiation Oncology, University of Virginia School of Medicine*
  - Christy L. Ludlow, Ph.D.
    - *Professor of Communication Sciences and Disorders, James Madison University*
  - Sally J. Rockey, Ph.D.
    - *Deputy Director for Extramural Research, National Institutes of Health*
  - Richard D. Hichwa, Ph.D.
    - *Professor in Radiology and Senior Associate Vice President for Research, University of Iowa*
  - Gary L. Harris, Ph.D.
    - *Professor of Electrical and Computer Engineering, Associate Provost for Research, and Dean of the Graduate School, Howard University*

SMRB Briefings to Date *(cont.)*

- August 11, 2014
  - Sally J. Rockey, Ph.D.
    - *Deputy Director for Extramural Research, National Institutes of Health*
- September 12, 2014
  - Michael A. Marletta, Ph.D.
    - *Member, HHMI Scientific Review Board*
- September 26, 2014
  - Linda Blevins, Ph.D.
    - *Senior Technical Advisor, Office of Science, Department of Energy*
  - Michael Santos, Ph.D.
    - *Deputy Director, Strategy, Planning & Management, Discovery & Translational Sciences and HIV, Gates Foundation*
- October 3, 2014
  - Joanne Tornow, Ph.D.
    - *Deputy Assistant Director in the Social, Behavioral and Economic Sciences Directorate, National Science Foundation*

Today: Presentations

Panel I: Granting Process at U.K. Funding Organizations

- Alyson Fox, Ph.D.
  - *Head of Grants Management, Wellcome Trust (U.K.)*
- Declan Mulkeen, Ph.D.
  - *Chief Science Officer, Medical Research Council (U.K.)*

Panel II: Granting Process at Other U.S Federal Research Funding Agencies

- Sonny Ramaswamy, Ph.D.
  - *Director, National Institute of Food and Agriculture, U.S. Department of Agriculture*
- Joanne S. Tornow, Ph.D.
  - *Deputy Assistant Director for Social, Behavioral, and Economic Sciences, National Science Foundation*

Today: Topics for Discussion

- Describe the grant review, award, and management process of other scientific organizations;
- Identify apparent bottlenecks in the grant review, award, and management process; and
- Describe any efforts to streamline the grant review, award, and management process.

Evaluation of the ARRA Summer Supplements program

Luci Roberts, Ph.D.

Director of Planning and Evaluation

Office of Extramural Research

October 12, 2014

National Institutes of Health
Turning Discovery Into Health

Agenda

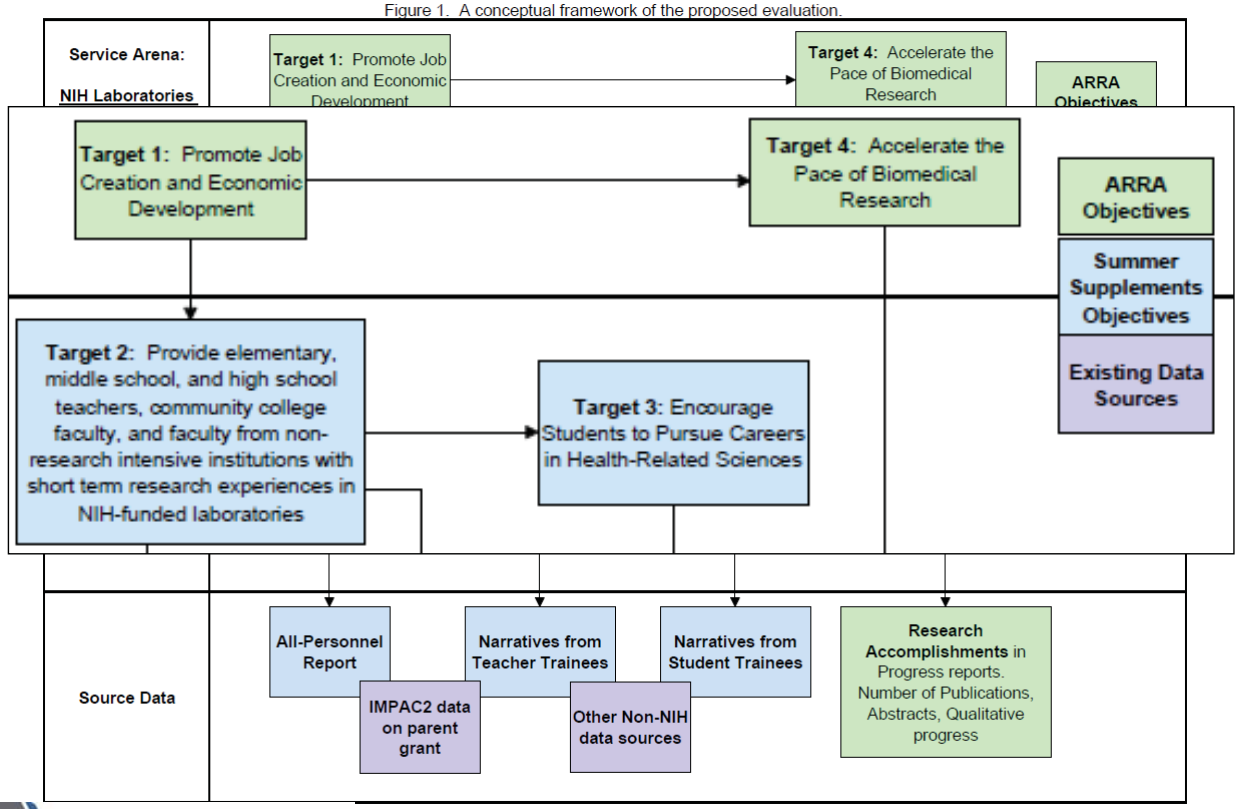
- Program and Participants
- Coding methodology
- Program Outputs
- Lessons Learned

ARRA Summer Research Experiences

- Provide support from ARRA to NIH grantees to host high school students, undergraduate students, and educators for summer research experiences on ongoing NIH research studies
- 1,352 supplement awards
- All RPG and Center activities were eligible
  - Also K awards; SBIR/STTR

Conceptual Framework

Figure 1. A conceptual framework of the proposed evaluation.



Outcome Measures

- Measure 1: Number of Participants Supported
- Measure 2: Teacher reported application of knowledge to classroom
- Measure 3: Student reported plans to pursue careers in Health Sciences
- Measure 4: Investigator reports of accelerated pace of research

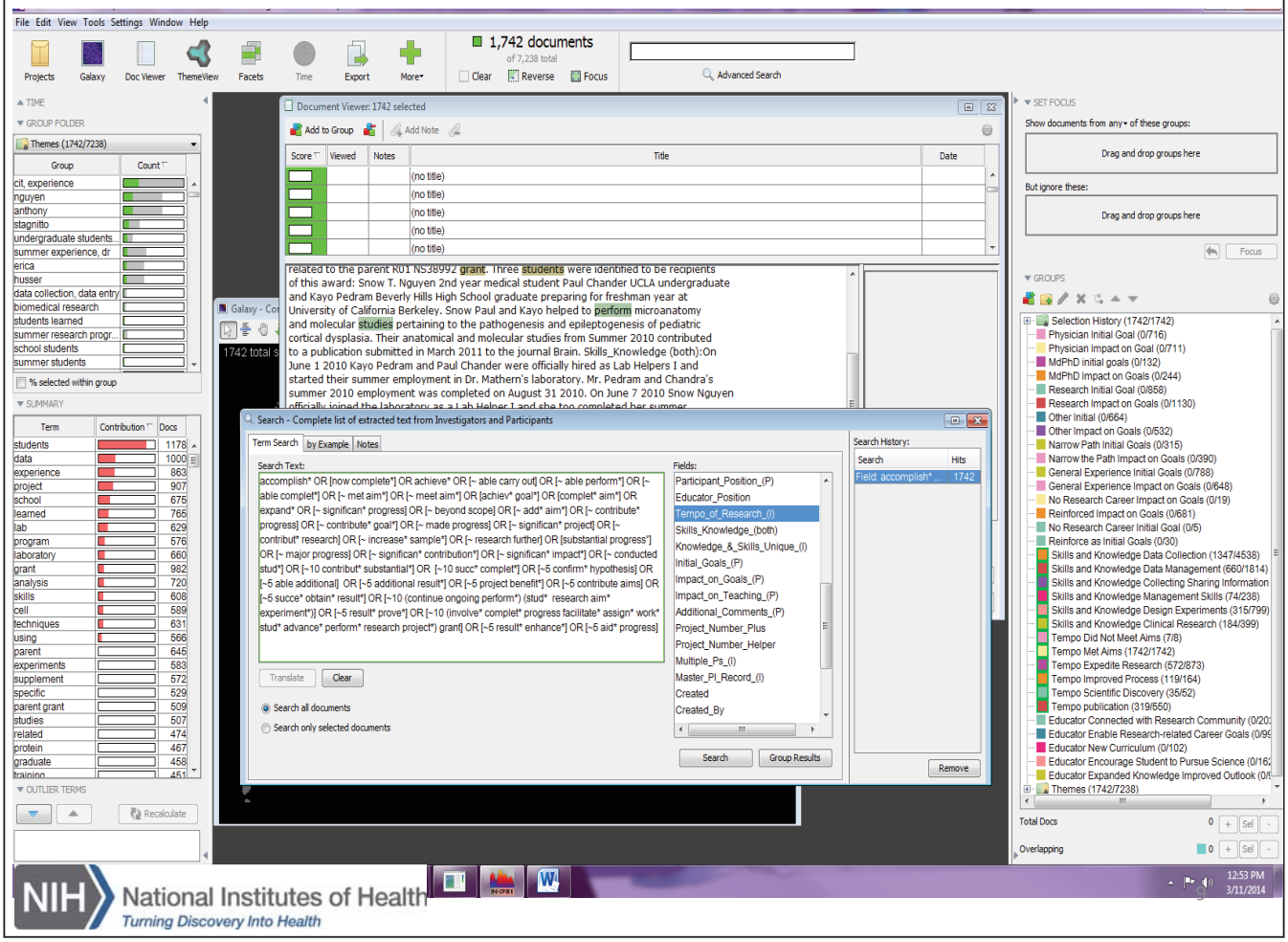
Compliance with Reporting Requirement

- Statements collected from investigators/participants on 1,104 of the Summer Research Experiences supplements, a response rate of 82%
- 1,246 unique statements collected from investigators (some submitted separate reports for each intern or multiple summers)
- 2,663 participants submitted statements about their research experience (average 2.65 participants per award)

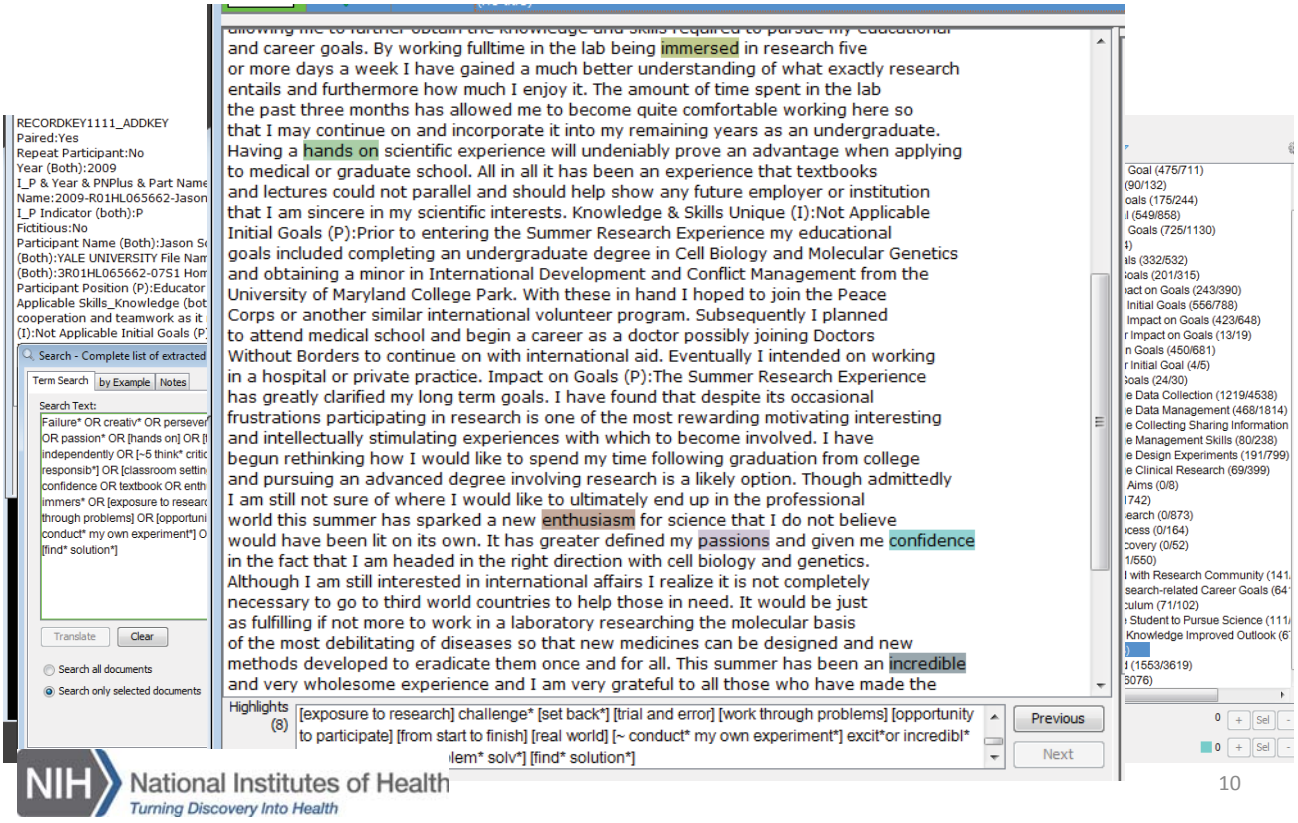
Types of Participants

- 2,026 undergraduates or recent post-baccalaureates
- *328 high school students*
- *281 teachers*
  - mostly high school and community college science teachers
  - *105 middle and high school teachers are broken out for today's presentation*
- Extrapolating to the total of 1352 awards that were made, there were ~3600 participants supported in the summers of 2009-2011

Code Group	Category Descriptions
Tempo of Research	The participants' contributions… • helped us pursue the project Specific Aim(s) • accelerated the progress of the research • improved the quality of the research process • resulted in a new scientific discovery • resulted in a pending publication and/or conference abstract • did not accelerate the tempo of the research
Skills and Knowledge	• Original data collection • Data management and analysis • Communication: Collecting, creating and sharing information • Project management, planning, and oversight • Research project design
Short-term and Long-term Employment Goals	• Establish connections to the research community • Enable research related career goals • Develop a new curriculum or revise teaching program at home school • Encourage students to pursue science • Expand and improve science knowledge/skills in science



Immersed in the Process of Discovery



Quality of Outcomes

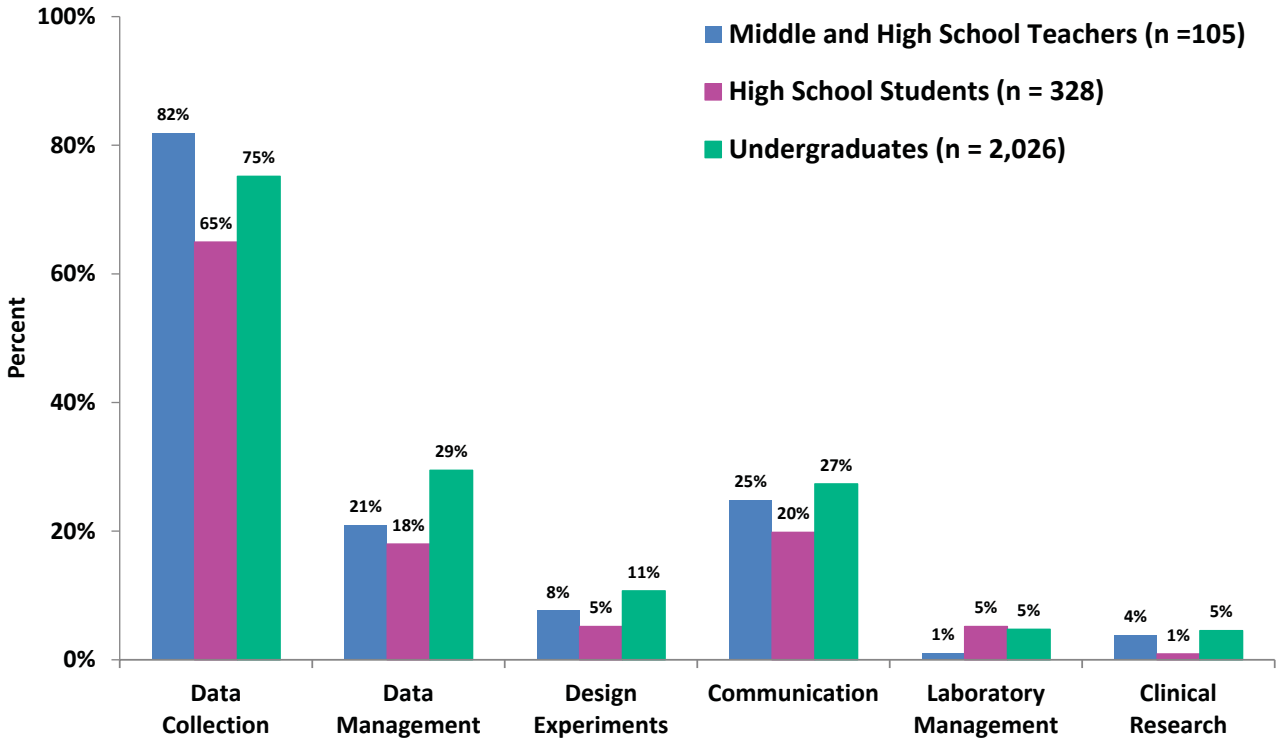
- ✓ Investigator reported productivity
- ✓ Number of activities participants were engaged in
- ✓ Publications
- ✓ Retention in the summer supplements program
- ✓ Retention in biomedical research
  - For students, not for educators
- ✓ Translation of new knowledge into curricula or teaching materials for students

Results: Tempo

Only 801 of the 1,246 statements from investigators addressed the question of whether the Summer Research participants affected the tempo of the research project.

Code Group and Code Names	No. (%) Statements
Tempo of Research: Investigator statements	n = 801
Helped pursue the project's Specific Aim(s)	593 (74%)
Accelerated the progress of the research	329 (41%)
Improved the quality of the research process	47 (6%)
Resulted in a new scientific discovery	16 (2%)
Resulted in a pending publication and/or conference abstract	190 (24%)
Did not accelerate the tempo of the research	5 (0.006%)

Results: Skills and Knowledge



NIH National Institutes of Health
Turning Discovery Into Health

1 versus 2 Summers

Participant Type	Total Participants (n)	Repeat Participants (n)	Repeat Participants %
High School	328	26	8%
Undergraduate	2,026	259	13%
Middle/High School Teachers	105	24	23%

Table 1. Participant Distribution

Note: The sample size for repeat high school participants was deemed too small to conduct analysis specifically on that group; however, when considering repeat participants as one group, they remained a part of the analysis.

NIH National Institutes of Health
Turning Discovery Into Health

Duration of internships

Duration of internship	Number of Participants*		Proportion of total participants %	
	High School Students (mean: 7.8 weeks)	Middle/High School Teachers (mean: 8.1 weeks)	High School Students	Middle /High School Teachers
Less than 5 weeks	31	7	11%	7%
5 – 8 weeks	159	56	58%	57%
9 - 12 weeks	75	32	27%	33%
13-16 weeks	8	1	3%	1%
17 weeks or more	1	2	<1%	2%

* The duration of the Summer Research Experience was not reported for some participants; for this reason the total number of students who participated exceeds the total of the students who participated across all duration columns.

Skills and Knowledge (cont'd)

Category	Avg # Skills Categories Duration (weeks)			
	less than 5	5 - 8	9 - 12	13 or more
High School (N = 274)	0.71	1.1	**1.4**	1.0
Undergraduate (N = 1,707)	1.3	1.4	**1.6**	**1.7**

High School Students whose host Investigators reported they were co-authors on a publication, abstract or poster spent 7.1 weeks in the lab on average. They engaged in 0.94 Skills categories, on average.

Immersed in Discovery…

Category	Number of Responses Duration (weeks)			
	less than 5	5 - 8	9 - 12	13 or more
High School (N = 274)	8 (26%)	58 (36%)	30 (40%)	3 (30%)
Undergraduate (N = 1,707)	22 (56%)	124 (42%)	487 (45%)	151 (50%)

"…all that I learned from working here that I would not have learned until high level college classes. For example I learned about some of the cell signaling pathways that can be affected by leukemia. Finally this was a great experience of working in a professional atmosphere. The communication and teamwork skills needed to succeed here will be important in any career."

"My summer research experience in RAP was very helpful to me because not only did I get a hands on learning experience in a lab but I also received a lot of good advice from my mentor on college."

Middle/High School Teachers

Category	Total Participants (n = 105)	Repeat Participant Yes / No		Duration (weeks)		
		(n = 24; 23%)	(n = 81)	5 – 8	9 – 12	13 or more
Connected with Research Community	26 (25%)	6 (23%)	20	17	4	0
Develop or Improve Curriculum	18 (17%)	2 (11%)	16	12	4	0
Enable Research Career Goals	33 (31%)	6 (18%)	27	15	14	0
Encourage Students to Pursue Science	26 (25%)	5 (19%)	21	17	8	1
Expanded Knowledge and Improved Outlook	65 (62%)	11 (17%)	54	38	20	2

Conclusions

- Participants and investigators reported favorably on the program
- Longer Summer Research Experiences were associated with richer variety of activities
- Favorable sentiments from participants were not predictive of higher quality experiences
- Publications were not associated with longer experiences, repeat participation or a higher number of activities.
- Teachers who wanted to pursue research career were more likely to publish, and devoted more time to the experience

Evaluation Team

- Luci Roberts – DPE/OER
- Cary Scheiderer – DPE/OER
- Rashada Alexander – DPE/OER
- Jennifer Pohlhaus – Ripple Effect
- Erica Husser – Ripple Effect
- Michael Stagnitto – Ripple Effect
- Kerry Gorelick – Ripple Effect
- Ray Mott - ORIS

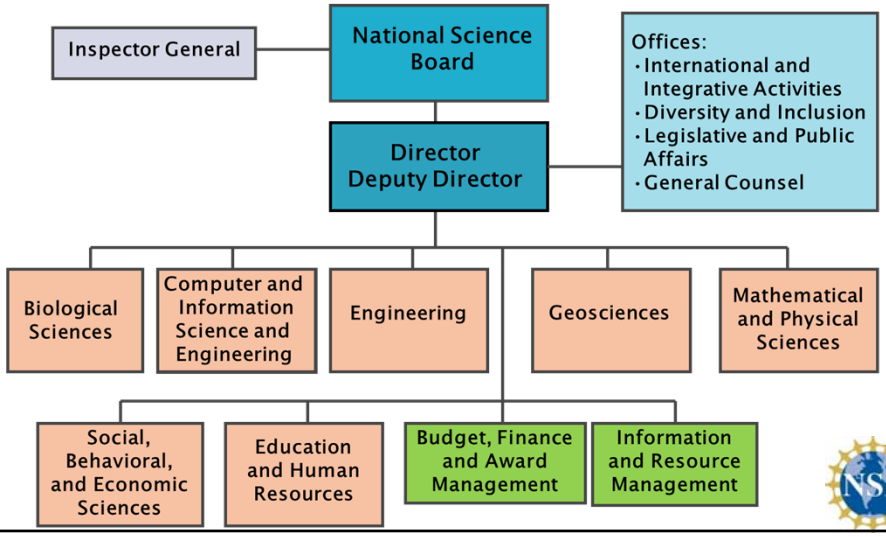
The Grants Process at the National Science Foundation

For the NIH Scientific Management Review Board

October 14, 2014

Joanne Tornow
Deputy Assistant Director

NSF Mission: To promote the progress of science; to advance the National health, prosperity, and welfare; to secure the National defense, and for other purposes.

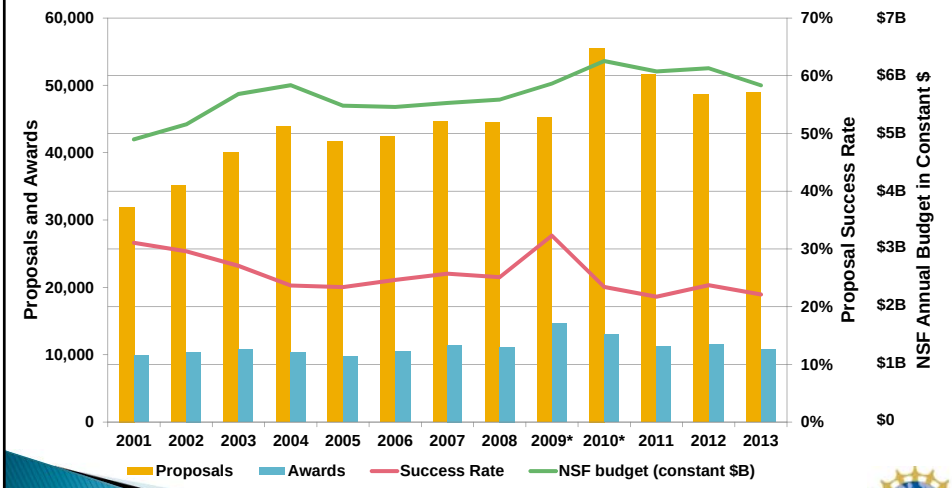


NSF by the Numbers (FY 2013)

- $6.9 billion annual budget (after sequester)
- Provides 22% of federal support for basic S&E research
- 48,999 proposals
- 10,829 new awards
- 22% funding rate
- 36,475 reviewers

NSF's Merit Review Process FY 2013
http://nsf.gov/pubs/2014/nsb1432/nsb1432.pdf

NSF Proposals, Awards and Funding Rates



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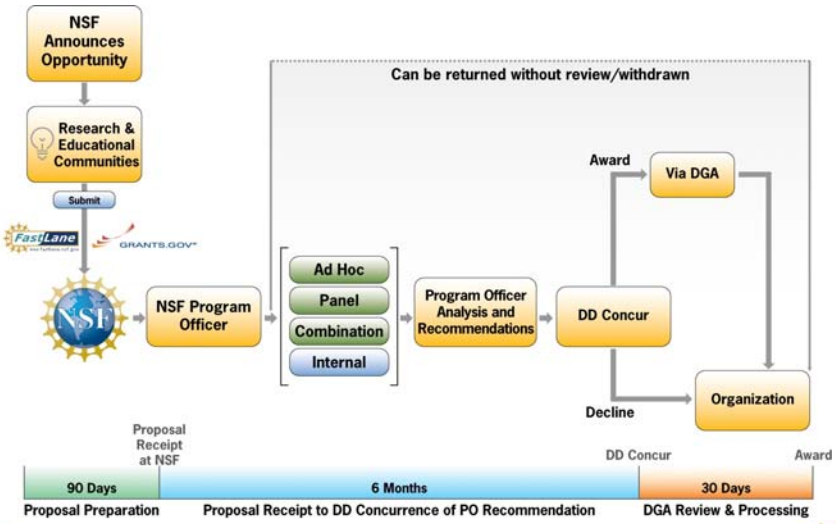
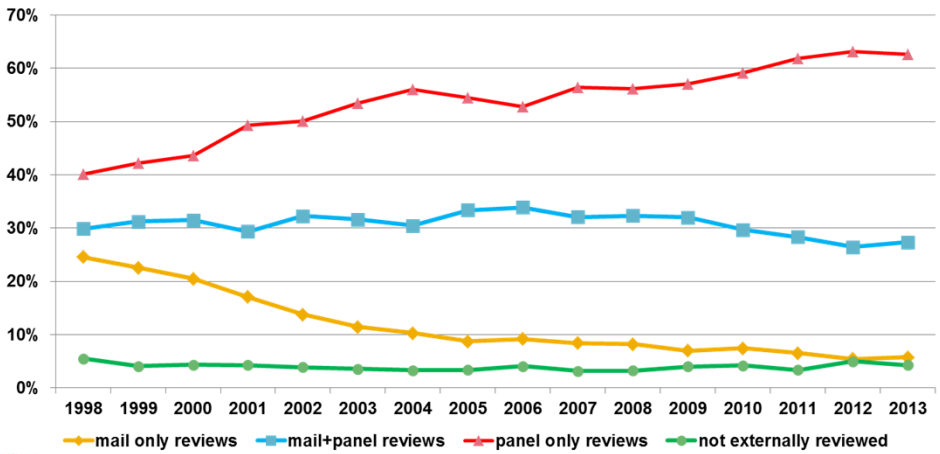
NSF Proposal & Award Process Timeline



Review Methods



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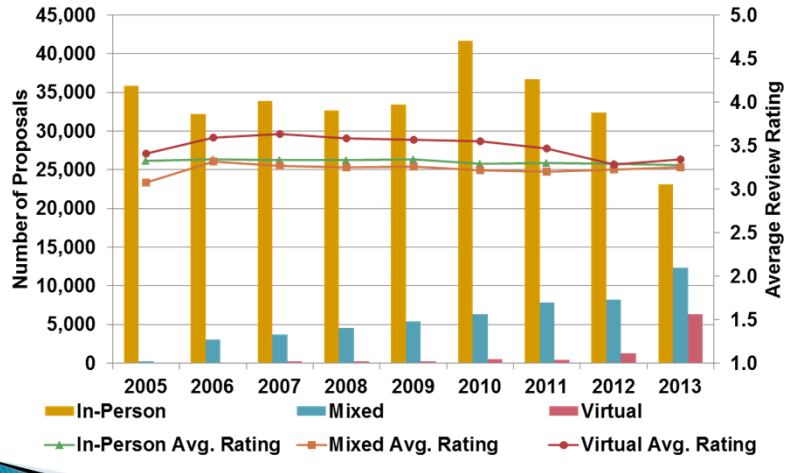
Merit Review Pilots

Pilot	Nature of pilot
Virtual Panels	Expanded use of review panels in which all panelists participate electronically from distributed locations
Asynchronous Reviewer Discussions	Access-controlled moderated message board, open to reviewers over a specified period, to enable the sharing of comments and discussion of a set of proposals.
Mechanism Design	Game theory techniques are used to allow investigators who submit proposals to take part in the review process.
Preliminary Proposals for Core Programs	Core programs move from semi-annual deadlines for full proposals to an annual deadline for preliminary proposals.
One-Plus	Investigators with promising but unfunded proposals may revise and resubmit their ideas for possible funding in the second half of the annual funding cycle by invitation only
Elimination of Program Deadline	A core program that has traditionally had two proposal deadlines per year switched to accepting proposals at any time to see if proposal pressure would be affected.
Umbrella-Amendment Solicitation	Flexible solicitation mechanism for community infrastructure accommodates both long-term goals and changing community requirements.

Usage of and Proposal Rating by Panel Review Type



Percentage of Proposals Processed within 6 Months

FY04	FY05	FY06	FY07	FY08	FY09*	FY10	FY11	FY12	FY13
77%	76%	78%	77%	78%	61%	75%	78%	78%	76%

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Potential Bottlenecks (1)

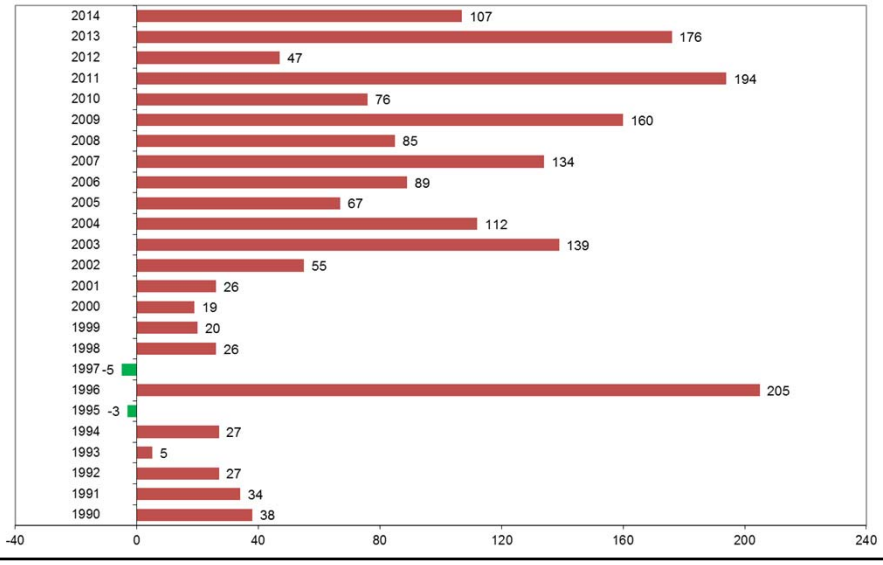
- Identifying reviewers
- Additional review steps for larger or specific types of proposals:
  - Site visits
  - Review by Director's Review Board
  - Review by the National Science Board

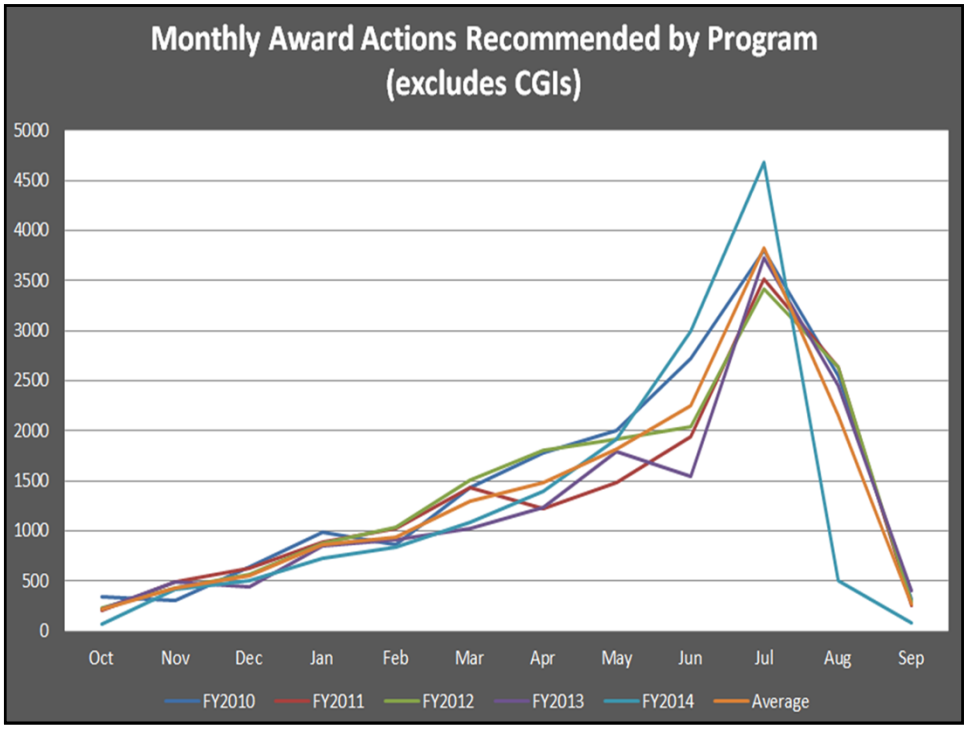
Potential Bottlenecks (2)

- Ensuring appropriate documentation
  - Animal Care and Use
  - Human Subjects Protections
  - Environmental Protections
  - New institutional awardees
- Volume of work
- Uncertainty of funds

Appropriations Drift: 1990 to 2014

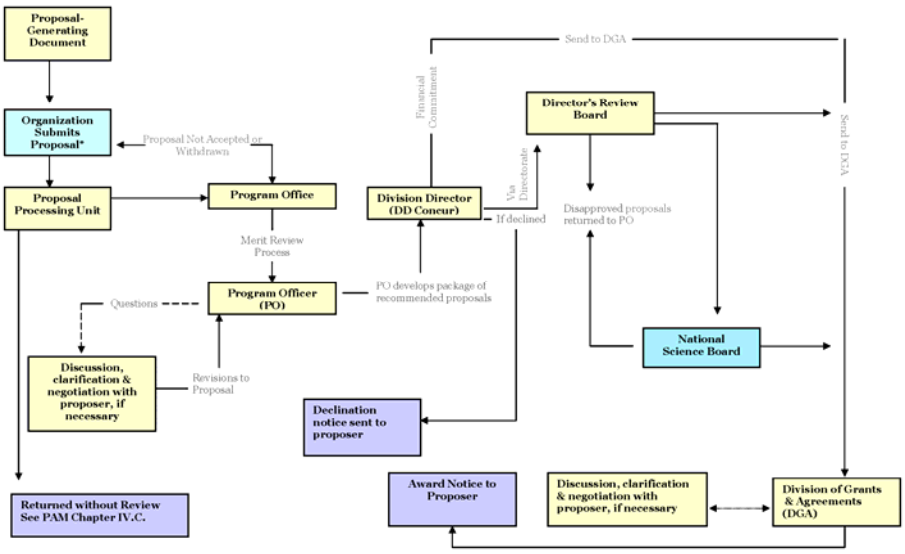
NSF Appropriations Dates vs Start of FY




Monthly Award Actions Recommended by Program
(excludes CGIs)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
FY2010
FY2011
FY2012
FY2013
FY2014
Average


NSF
Where discoveries begin
NSF

Exhibit I-1
Flowchart of the Proposal & Award Process
(*Letters of Intent and Preliminary Proposals are processed as described in Chapter III)



Evaluation of NIH's Science Education Partnership Award (SEPA) Program

Scientific Management Review Board
Pre-College Engagement in Biomedical Science
October 14, 2014

Tony Beck, PhD
Director, Office of Science Education/SEPA
Office of Research Infrastructure Programs (ORIP)
Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI)

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
Supported by the National Institutes of Health
Established 1991

Genesis:
- Inquiry-based STEM educational resources to increase the numbers of urban, rural and minority students considering research and medical careers

Partnerships:
- Scientists and clinicians partnering with educators, community organizations and science centers

Goals:
- Increased diversity in the workforce
- Increased public health literacy

Status FY 2014:
- SEPA R25 Awards = 57
- Budget = $18.5M

Evolution of SEPA *Project* Evaluation Rigor

Evolution of SEPA Project Evaluation Rigor

- Pre-2004
  - Evaluation encouraged but not scored
  - Project evaluation by PI
- 2004 (RFA-RR-04-004)
  - 10% of requested budget for evaluation
  - External evaluator required
- 2006 – 2008 (PAR-06-549)
  - Encourage Randomized Controlled Trial (RCT) or Case-Comparison
  - Key Personnel must have evaluation expertise

Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI) NIH National Institutes of Health U.S. Department of Health and Human Services

Evolution of SEPA Project Evaluation Rigor

- 2010 -2012 (PAR-10-206)
  - Logic model encouraged
  - External and internal evaluation team required
- 2014 – 2016 (PAR-14-228)
  - May 2014 release
  - November 2014 review
  - January 2015 Council of Councils Review

Department of Health and Human Services

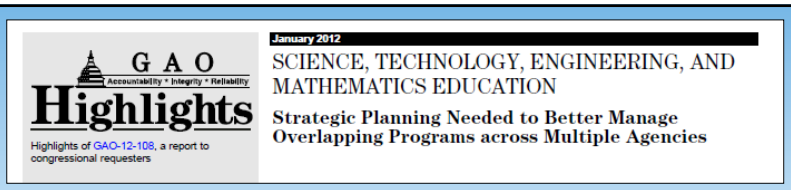
Part 1. Overview Information

Participating Organization(s)	National Institutes of Health (NIH)
Components of Participating Organizations	Division of Program Coordination, Planning and Strategic Initiatives Office of Research Infrastructure Programs (ORIP)
Funding Opportunity Title	**NIH Science Education Partnership Award (SEPA) (R25)**
Activity Code	R25 Education Projects
Announcement Type	This is a reissue of PAR-10-206
Related Notices	None
Funding Opportunity Announcement (FOA) Number	**PAR-14-228**

Evaluation Plan

- SEPA classroom-based P-12 projects *must utilize either a Randomized Controlled Trial (RCT) or a Well-Matched Comparison study evaluation* design to evaluate project effectiveness.
- The proposed evaluation plan *must include a Logic Model*.
- It is *recommended* that SEPA projects have an *Advisory Committee for independent feedback* on content development and project management

SEPA *Program* Evaluation


GAO
Accountability * Integrity * Reliability
Highlights
Highlights of GAO-12-108, a report to congressional requesters

January 2012

SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS EDUCATION

Strategic Planning Needed to Better Manage Overlapping Programs across Multiple Agencies

- Agencies' *limited use of performance measures and evaluations may hamper their ability to assess the effectiveness* of their individual programs as well as the overall STEM education effort.
- A majority of *programs did not conduct comprehensive evaluations* since 2005 to assess effectiveness.

GAO-12-108 , January 2012

September 2010 SEPA Program Evaluation *Feasibility Report*

Overview of the Evaluation and Questions to Be Addressed

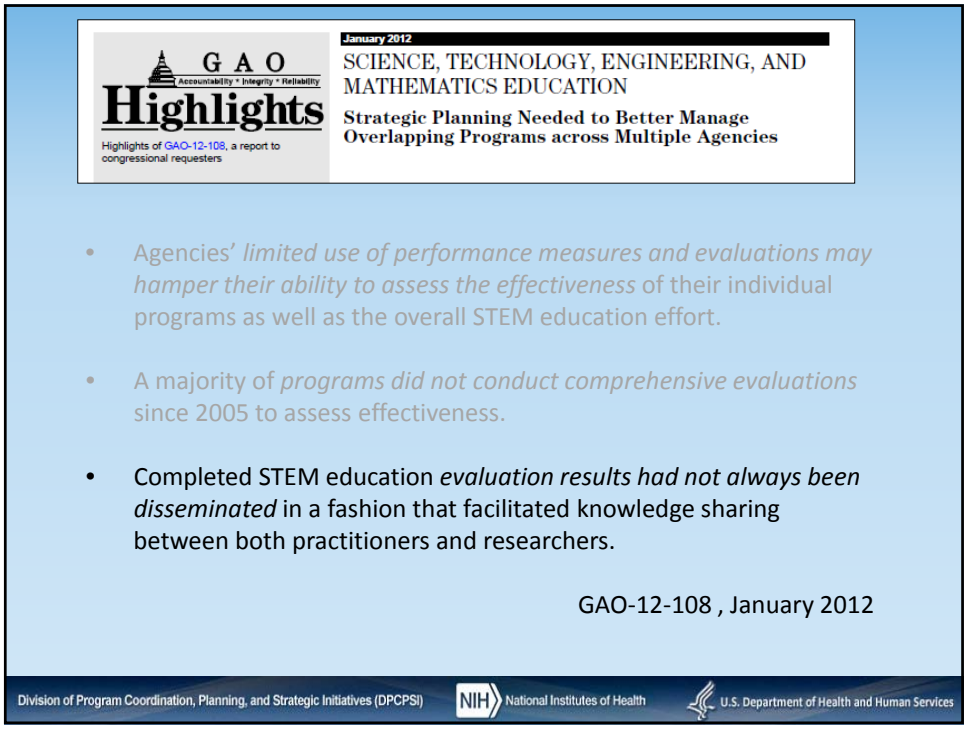
1. The evaluation should be designed to provide information for both *program improvement and assessment* of program impacts.
2. SEPA should be *examined at multiple levels*: the program as a whole, the program as it relates to its various potential target populations, and the program's subcomponents.
3. The evaluation should examine the program within the *context of the overall work of the NCRR, NIH, and other federal funding* for science, technology, engineering, and mathematics (STEM) educational programs.
4. The evaluation should *draw on a variety of data sources*, both primary and secondary.
5. The evaluation should be designed to keep the burden on respondents as low as possible

September 2014 - SEPA *Program Process Evaluation*

Evaluation of the Science Education Partnership Award (SEPA) Program

Statement of Work:

- This evaluation will be a Process Evaluation that will *focus on the SEPA portfolio, the development of partnerships, and the rigor of project evaluations.*
- The questions identified for examination during this process evaluation were selected because of their importance in documenting how the SEPA program:
  - Functions at both the program and awardee levels
  - Contributes to the NIH goals of diversity in the workforce and public health literacy
  - Interacts with other Federal P-12 STEM programs.


GAO
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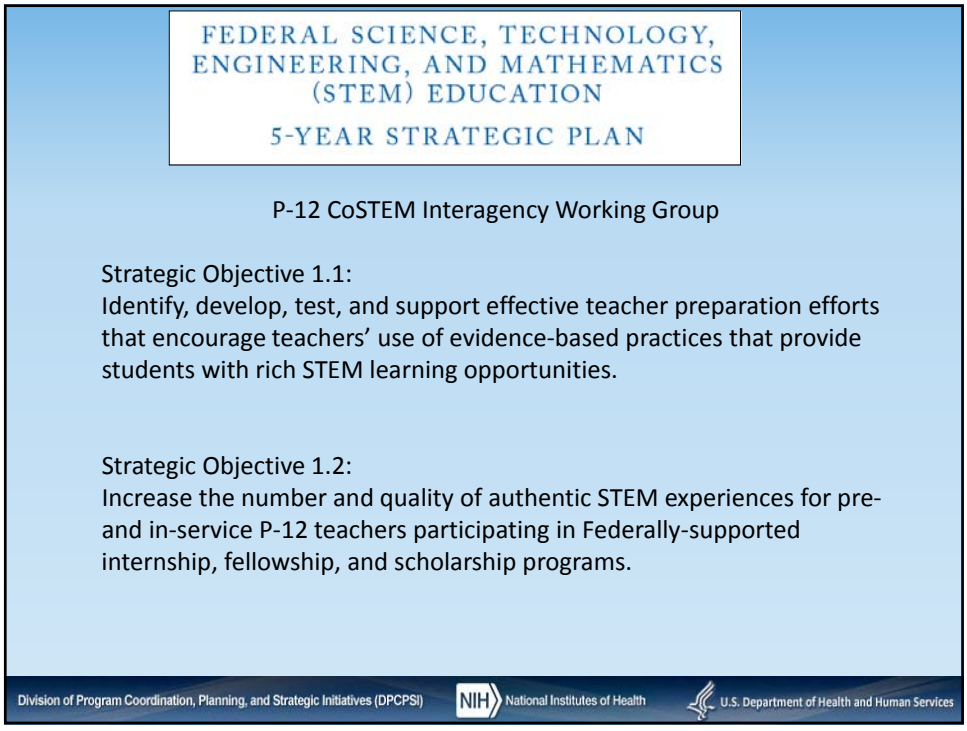
SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS EDUCATION
Strategic Planning Needed to Better Manage Overlapping Programs across Multiple Agencies
• Agencies' limited use of performance measures and evaluations may hamper their ability to assess the effectiveness of their individual programs as well as the overall STEM education effort.
• A majority of programs did not conduct comprehensive evaluations since 2005 to assess effectiveness.
• Completed STEM education evaluation results had not always been disseminated in a fashion that facilitated knowledge sharing between both practitioners and researchers.
GAO-12-108 , January 2012
Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI)
NIH National Institutes of Health
U.S. Department of Health and Human Services


FEDERAL SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM) EDUCATION
5-YEAR STRATEGIC PLAN
P-12 CoSTEM Interagency Working Group
Strategic Objective 1.1:
Identify, develop, test, and support effective teacher preparation efforts that encourage teachers' use of evidence-based practices that provide students with rich STEM learning opportunities.
Strategic Objective 1.2:
Increase the number and quality of authentic STEM experiences for pre- and in-service P-12 teachers participating in Federally-supported internship, fellowship, and scholarship programs.
Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI)
NIH National Institutes of Health
U.S. Department of Health and Human Services

Update on SEPA Presentation to SMRB
March 2014
Vanderbilt/Nashville model

Nature of *effective pre-college interventions* that produce a robust biomedical workforce pipeline

School for Science and Math (SSMV) Vanderbilt

- 9-12th grade research-based laboratory program
  - Open to all Nashville students
  - Traditional high school courses
  - 1 day/week for 4-years at Vanderbilt
- Training
  - Vanderbilt faculty, post-doctoral and graduate student mentors
  - Science and math curriculum
  - Critical thinking skills and problem solving
  - Authentic laboratory research experience
- Evaluation
  - RCT student selection from all Nashville Middle Schools
  - Quantitative: student scores
  - Qualitative: pre/post, mentor surveys
  - Longitudinal student tracking

Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI) NIH National Institutes of Health U.S. Department of Health and Human Services

Outcomes – SSMV at Vanderbilt

- SSMV student college matriculation rate (98%)
- Students attending top 50 colleges and universities
  - SSMV (60%)
  - MNPS academic magnet schools (20%)
- Longitudinal studies (early data)
  - Continuing in STEM disciplines
    - SSMV (79%)
    - MNPS academic magnet schools (53%)
    - Nationally (10%)

Eeds, A., Vanags, C., Creamer, J., Loveless, M., Dixon, A., Sperling, H., et al. (2014). The School for Science and Math at Vanderbilt: An innovative research-based program for high school students. *CBE—Life Sciences Education,* 13, 297–310.

Science Education Partnership Award (SEPA)

West Virginia Health Sciences and Technology Academy (HSTA)
West Virginia University , Morgantown, WV
Students Design Public Health Clinical Trials, R25 RR023274)
Teaching to Learn: WV-HSTA Students Take CBPR to Their Community (R25 OD010495)

NIH Scientific Management Review Board

Working Group on Pre-college Engagement in Biomedical Science

FINDINGS & PRELIMINARY RECOMMENDATIONS

CLYDE W. YANCY, M.D. October 14, 2014

ROSTER

Non-Federal Members

- Clyde W. Yancy, M.D. (Chair)
- Nancy C. Andrews, M.D., Ph.D.
- Norman R. Augustine
- Lee E. Babiss, Ph.D.
- Gilbert S. Omenn, M.D., Ph.D.

Federal Members

- Josephine P. Briggs, M.D.
- Gary H. Gibbons, M.D.
- Alan E. Guttmacher, M.D.
- Stephen I. Katz, M.D., Ph.D.
- Roderic I. Pettigrew, Ph.D., M.D.

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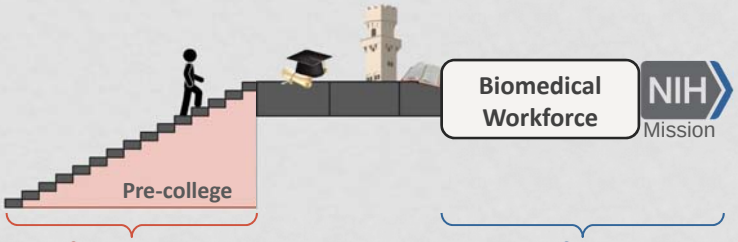
CHARGE

To recommend ways to optimize NIH's pre-college programs and initiatives that both align with the NIH mission and ensure a continued pipeline of biomedical science students and professionals



***Focus* of recommendations: NIH's pre-college activities**

***Ultimate goal* of recommendations: strengthen workforce, further NIH mission**

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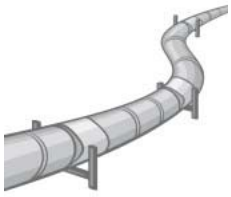
PIPELINE OR FUNNEL?

To recommend ways to optimize NIH's pre-college programs and initiatives that both align with the NIH mission and ensure a continued pipeline of biomedical science students and professionals



or

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ELEMENTS OF THE CHARGE

In addressing this charge, the SMRB should:

1. Examine the **evidence base** for successful approaches for pre-college biomedical science programs aimed at strengthening the biomedical workforce pipeline;
2. Identify the attributes, activities, and components of **effective pre-college biomedical science programs**, including the role and relative importance of teacher training programs;
3. Identify those points in the pre-college **biomedical workforce pipeline** where NIH's efforts could be applied most effectively, given finite resources; and
4. Define ways for NIH to **improve the evidence base** for effective pre-college biomedical science programs.

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GENERAL FINDINGS

- **Education disparities harm millions of students, especially minority and poor students**
  - Uneven distribution of well-trained science teachers and resources.
  - Lower academic and career expectations for under-represented minority students
- **Ad hoc curriculum and standards impede preparedness for college**
  - Discrepancies in rigor of science standards and quality of curriculum
  - Efforts to change science standards and curriculum are ongoing and are often controversial
- **These issues will need to be addressed nationally by political and community leaders, policy makers, and other decision makers.**

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FINDINGS RELATED TO NIH'S STEM PROGRAMS

1. **Limited opportunities for under-represented minority and low SES students**
2. **Outmoded workforce categories in the biomedical science enterprise**
3. **Uncoordinated governance and oversight of NIH's pre-college activities**
4. **Limited program evaluation**
5. **Untapped potential of NIH's research community**
6. **Need for partnering with other entities committed to STEM outreach for pre-college students**

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FINDING 1: Limited opportunities for under-represented minority and low SES students

- Quality and quantity of individuals entering the STEM workforce may be sufficient, but the overall makeup is decidedly lacking in diversity, especially in positions of leadership.
- STEM attitudes are positive at a young age across gender and racial/ethnic groups, but access and performance gaps begin to appear in elementary school.
- Women are just as likely as men to persist in STEM major once chosen; however, they enter into STEM majors at different rates.
- Strong need to engage and retain under-represented and low socioeconomic status (SES) students and improve their access to educational and career opportunities.

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FINDING 1: Limited opportunities for under-represented minority and low SES students

PRELIMINARY RECOMMENDATIONS and OPPORTUNITIES

- Better target NIH-funded education outreach to students from under-represented groups and their teachers.
- Promulgate best practices of exemplar programs with a track record of directing under-represented minorities students toward careers in biomedical science.
- Utilize NIH enrichment programs (e.g., summer internship programs) as opportunities to enhance diversity.

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FINDINGS

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FINDING 2: Outmoded workforce categories in the biomedical science enterprise

- Conceptualization of the workforce is too narrow.
- New job categories are emerging.
- There is a need to cultivate cross-disciplinary science and opportunities for young people to bring new capabilities.

Biomedical Workforce

Principal investigator | Clinician scientist | Postdoctoral researcher

vs.

Tech transfer officer | Science teacher | Clinical trial coordinator | Veterinarian

Journal editor | Pharmaceutical manufacturer | Clinical nurse | Staff scientist

Statistician | **Biomedical Workforce*** | Clinician

Principal investigator | Clinician scientist | Postdoctoral researcher

Science policy analyst | Computational biologist | Grant manager | Regulatory official

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FINDING 2: Outmoded workforce categories in the biomedical science enterprise

PRELIMINARY RECOMMENDATIONS and OPPORTUNITIES

- Emphasize the wide range of current and future career options available to students.
- Promote the cross-disciplinary nature of innovative biomedical science.
- NIH's STEM education programs should be informed by the work of the NIH Division of Biomedical Research Workforce Programs in order to:
  - understand the composition of the current biomedical workforce
  - project future workforce needs, and
  - identify emerging skills that should be fostered in K-12 education settings.

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FINDING 3: Uncoordinated governance and oversight of NIH's pre-college activities

- Governance is a key attribute of success.
- NIH supports a number of STEM programs targeted at K-12 students and teachers, (e.g., SEPA, summer research programs), but these efforts are largely ad-hoc and uncoordinated.

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FINDING 3: Uncoordinated governance and oversight of NIH's pre-college activities

INVENTORY OF NIH'S PRE-COLLEGE ACTIVITIES

- NIH staff reported a total of 246 K-12 STEM activities
  - 35 internship programs
  - 19 curriculum supplements
  - 66 teacher development activities
- 41 percent of the activities include students from underrepresented minority groups

Note: Criteria for identifying pre-college activities may have varied by IC and office.

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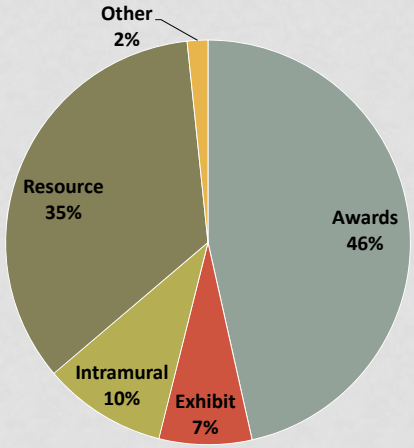
FINDING 3: Uncoordinated governance and oversight of NIH's pre-college activities

INVENTORY: Types of activities



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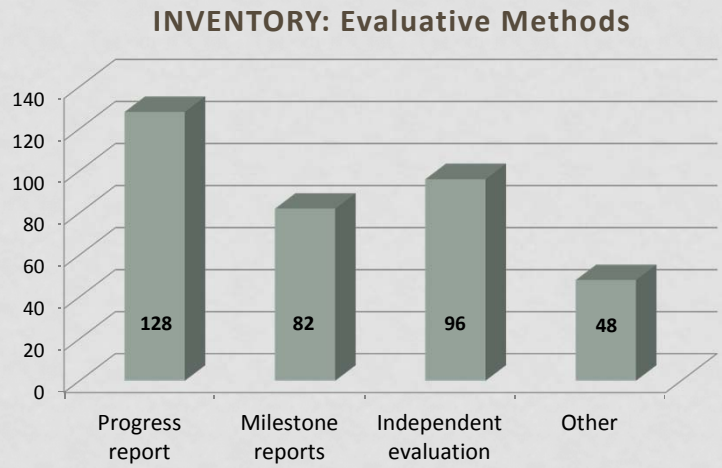
FINDING 3: Uncoordinated governance and oversight of NIH's pre-college activities



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FINDING 3: Uncoordinated governance and oversight of NIH's pre-college activities

PRELIMINARY RECOMMENDATIONS and OPPORTUNITIES

- Assign an office and/or leader to provide governance and coordination. Governance functions should include:
  - Report annually on NIH-supported STEM programs to the NIH Director, SMRB, and the ACD.
  - Produce and update annually a complete inventory of active NIH pre-college STEM programs.
  - Develop metrics needed to assess the effectiveness of already extant NIH STEM programs.
  - Provide more resources for those engaged in teaching or mentoring pre-college students.
  - Strongly encourage all NIH-supported STEM programs to maximize outreach to under-represented populations.
  - Identify best practices in pre-college engagement.

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FINDING 4: Limited program evaluation

- NIH's pre-college engagement programs are not routinely or consistently evaluated for their impact on students and teachers, effectiveness in advancing NIH's goals, or scalability.
- There is little empirical evidence on specific programs or educational approaches that are effective, either for improving science teaching or student learning outcomes.
- Without an evidence base for what works, it is impossible to precisely define the attributes of effective STEM programs;

HOWEVER…

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FINDING 4: Limited program evaluation

- … NIH's programs should aim to:
  - improve teacher preparedness and retention,
  - equip students with cross-disciplinary skills,
  - engage students' interests in biomedical science careers, and/or
  - give students, particularly under-represented populations, greater access to biomedical science learning opportunities.

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FINDING 4: Limited program evaluation

PRELIMINARY RECOMMENDATIONS and OPPORTUNITIES

- Work with other federal agencies to build the evidence base for STEM education
- Establish systematic and comparable evaluation practices for NIH's pre-college programs
- Identify appropriate metrics and outcome measures
- Work with other agencies to improve the collection of longitudinal, student-level data, especially as they relate to K-12 student's exposure to biomedical and human health learning experiences and eventual career trajectories

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FINDING 5: Untapped potential of NIH's research community

- NIH can increase the impact and reach of its STEM education efforts by leveraging existing investments in university researchers, trainees, and infrastructure.

PRELIMINARY RECOMMENDATIONS and OPPORTUNITIES

- Encourage and incentivize grantee institutions, researchers, and trainees to engage pre-college students in biomedical research.

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FINDING 6: Need for partnering with others

- Many other agencies and institutions are engaged in STEM education outreach and influence audiences beyond the reach of NIH.
- NIH makes a unique contribution to biomedical education and outreach.
- By using the leverage of NIH, the varied entities in this space could improve the coordination of their collective efforts with the goal of complementing each other's roles, thus achieving greater impact than working in isolation.

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FINDING 6: Need for partnering with others

- CoSTEM (Committee on Science, Technology, Engineering, and Math Education) is made up of 14 federal entities:
  - Department of Agriculture
  - Department of Commerce
  - Department of Defense
  - Department of Education
  - Department of Energy
  - Department of Health and Human Services
  - Department of Homeland Security
  - Department of the Interior
  - Department of Transportation
  - Environmental Protection Agency
  - Executive Office of the President
  - National Aeronautics and Space Administration
  - National Science Foundation
  - Smithsonian Institution

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FINDING 6: Need for partnering with others

- CoSTEM subcommittees are addressing five national goals:
  - Improve STEM instruction
  - Increase and sustain youth and public engagement in STEM
  - Enhance STEM Experience of Undergraduate Students
  - Better serve groups historically under-represented in STEM fields
  - Design graduate education for tomorrow's STEM workforce

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FINDING 6: Need for partnering with others

PRELIMINARY RECOMMENDATIONS

- Build relationships with industry and non-profits:
  - Develop a Pre-College Biomedical Science Council with organizations that support pre-college programs and biomedical science outreach.
- Leverage federal interagency efforts and assets:
  - Work closely with the National Science and Technology Council's Committee on STEM Education (Co-STEM).
  - Leverage NIH's resources to support government-wide efforts to improve STEM education and strengthen the evidence base.
  - Partner with ED and NSF to build and implement evaluation standards for NIH's STEM programs.
  - Partner with NSF to improve data collection at the undergraduate and pre-college level that will be useful for biomedical workforce analysis.

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NEXT STEPS

- **Fall–Winter Working Group activities**
  - Explore opportunities to work with CoSTEM organizations
  - Refine recommendations and findings
  - Draft report
- **December 15 SMRB meeting**
  - Vote on PEBS findings and recommendations

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Scheme processing timelines

Grants Management
October 2014

wellcome trust

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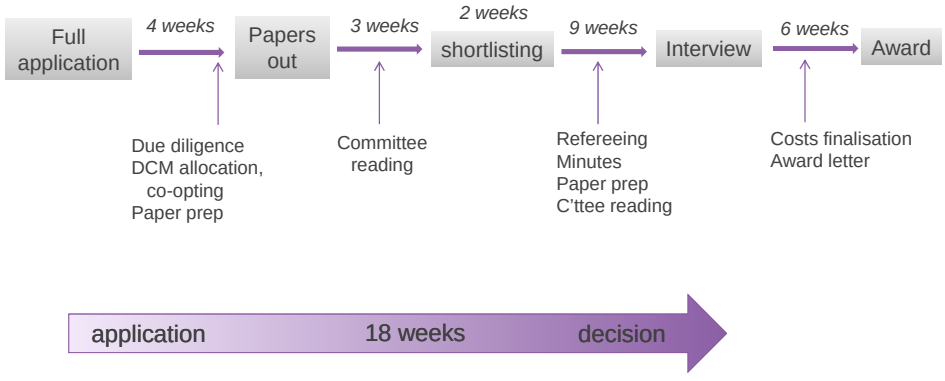
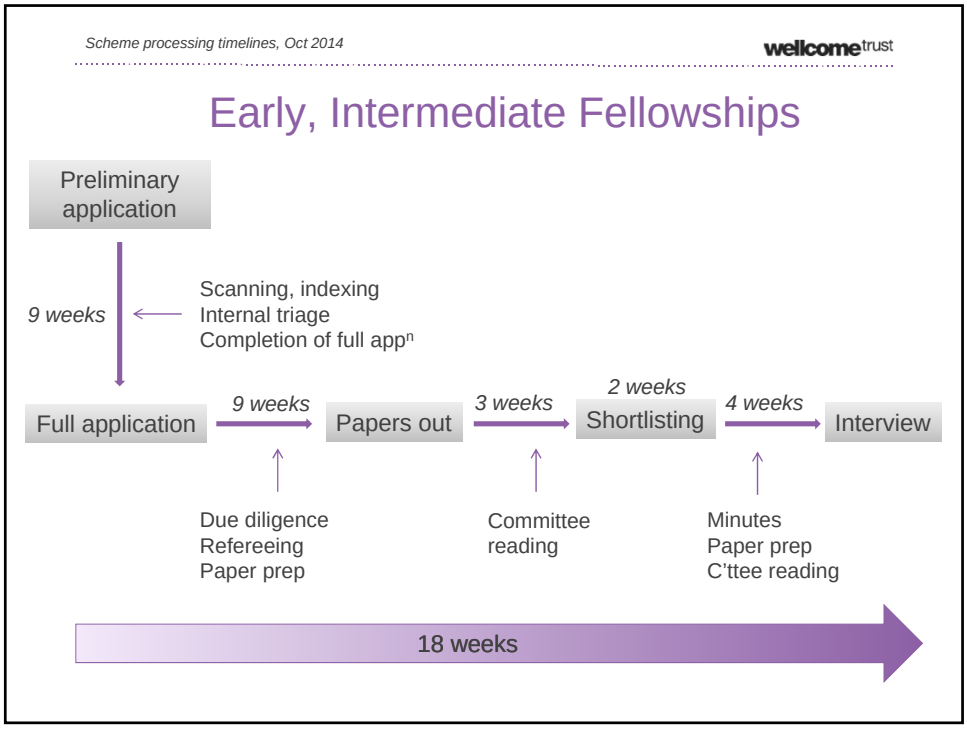
Investigator Awards, Senior Fellowships




Scheme processing timelines, Oct 2014
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Early, Intermediate Fellowships
Preliminary application
9 weeks
Scanning, indexing
Internal triage
Completion of full appn
Full application
9 weeks
Papers out
3 weeks
2 weeks
Shortlisting
4 weeks
Interview
Due diligence
Refereeing
Paper prep
Committee reading
Minutes
Paper prep
C'ttee reading
18 weeks