Directorate for Education and Human Resources (EHR)

Elizabeth VanderPutten.
Deputy Division Director
Division of Research on Learning in Formal and Informal Settings
Directorate for Education and Human Resources
National Science Foundation
Why does the National Science Foundation invest in STEM education?

“We shall have rapid or slow advance on any scientific frontier depending on the number of highly qualified and trained scientists exploring it.”

Vannevar Bush

*Science: The Endless Frontier*
The National Science Foundation

- National Science Board
- Office of the Director
  France A. Córdova
- Biological Sciences
- Computer and Information Science and Engineering
- Engineering
- Geosciences
- Mathematical and Physical Sciences
- Social, Behavioral, and Economic Sciences
- Education and Human Resources
EHR’s organizational structure

Office of the Assistant Director (OAD)

- Division of Research on Formal and Informal Settings (DRL)
- Division of Graduate Education (DGE)
- Division of Undergraduate Education (DUE)
- Division of Human Resource Development (HRD)
EHR Mission:

• Develop a diverse workforce ready to advance the frontiers of science and engineering for society

• Grow and sustain a STEM-literate public
STEM Workforce and STEM-Literate Public

- Early Childhood Education
- Elementary School
- Middle School
- High School
- Undergraduate Education
- Graduate School
- Postdoctoral Experiences
- Community College
- STEM Workforce

DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES
STEM Workforce and STEM-Literate Public

- Virtual Worlds
- Augmented Reality
- Making
- Games
- Museums
- Online Learning
- Citizen Science
- Social Media
- Science Centers
- After-school Programs
EHR is committed to an inclusive STEM enterprise for science and society.

- **$953 million** FY 2017 request
- **4,243 proposals**
- **831 awards funded**
- **650 EHR-funded Institutions**
- **147,000 EHR-supported researchers**
- **42 former GRF fellows received Nobel Prize**
- Funds all S&E disciplines
- Funds research in STEM education

*Other than the FY 2017 request, numbers shown are based on FY 2015 activities.*
Committee on Science, Technology, Engineering, and Mathematics Education (CoSTEM)
Federal Science, Technology, Engineering, and Mathematics (STEM) Education 5-Year Strategic Plan

Priority Areas

• P-12 STEM education
• Undergraduate education
• Graduate education
• Broadening participation
• Public engagement
• Coordination and evaluation
## Federal STEM Education 5-Year Strategic Plan

<table>
<thead>
<tr>
<th>Priority Areas</th>
<th>Strategic Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Increase and Sustain Youth and Public Engagement in STEM</strong></td>
<td>Support a 50% increase in the number of youth who have authentic STEM experiences each year</td>
</tr>
<tr>
<td><strong>Enhance STEM Experience of Undergraduate Students</strong></td>
<td>Graduate 1 million additional students with degrees in STEM fields over a decade</td>
</tr>
<tr>
<td><strong>Better Serve Groups Historically Underrepresented in STEM Fields</strong></td>
<td>Provide basic research expertise, professional development, and specialized skills development to graduate-trained STEM professionals</td>
</tr>
<tr>
<td><strong>Design Graduate Education for Tomorrow’s STEM Workforce</strong></td>
<td>Increase number of underrepresented minorities graduating in STEM and improve women’s participation where they are significantly underrepresented</td>
</tr>
<tr>
<td><strong>Improve STEM Teacher Training: P-12 STEM Education</strong></td>
<td>Support a 50% increase in the number of youth who have authentic STEM experiences each year</td>
</tr>
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<table>
<thead>
<tr>
<th>Coordination Objectives</th>
<th>Governance &amp; Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build new models for leveraging assets and expertise</td>
<td>Build and use evidence-based approaches</td>
</tr>
</tbody>
</table>

| **P-12 STEM Education** | 100,000 new K-12 STEM teachers by 2020 and support existing STEM teacher workforce |
| **Undergraduate Education** | Graduate 1 million additional students with degrees in STEM fields over a decade |
| **Graduate Education** | Provide basic research expertise, professional development, and specialized skills development to graduate-trained STEM professionals |
| **Broadening Participation** | Increase number of underrepresented minorities graduating in STEM and improve women’s participation where they are significantly underrepresented |
| **Youth & Public Engagement** | Support a 50% increase in the number of youth who have authentic STEM experiences each year |
EHR’s Focal Areas

- Learning & Learning Environments
- Broadening Participation & Institutional Capacity
- Workforce Development
EHR Core Research (ECR) across all themes: EHR invests in foundational research for the strategic improvement of STEM education.
## Program Focus in the EHR Directorate

<table>
<thead>
<tr>
<th>EHR Division</th>
<th>Learning and Learning Environments</th>
<th>Broadening Participation in STEM</th>
<th>STEM Professional Workforce</th>
</tr>
</thead>
</table>
| Research on Learning (DRL) | ECR - *Learning*  
DR-PK12  
AISL     | ECR includes:  
• Research on Gender in Science and Engineering (GSE)  
• Research in Disabilities Education (RDE)  
| • STEM+C Partnerships for the 21st Century  
ITEST - Innovative Technology Experiences for Students and Teachers  
• CSforAll  
• ITEST |
| Graduate Education (DGE)   | Project and Program Evaluation (PPE)  
Building Community & Capacity in Data (BCC) | ECR - *STEM Professional Workforce*  
CyberCorps: Scholarship for Service (SFS)  
Graduate Research Fellowship (GRF)  
National Research Traineeship (NRT) | |
| Human Resource Development (HRD) | ADVANCE  
AGEP  
HBCU-UP  
TCUP | ECR - *Broadening Participation and Capacity Building*  
LSAMP | Excellence Awards in Science and Engineering  
- PAEMST & PAESMEM  
CREST |
| Undergraduate Education (DUE) | ECR-*Learning Environment*  
Improving Undergraduate STEM Education (IUSE) | | Advanced Technological Education (ATE)  
Robert Noyce Teacher Scholarship Program  
S-STEM Scholarship Program |
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</table>
| Research on Learning in Formal and Informal Settings (DRL) | Core Research & Development (ECR)  
DR-K12- (Discovery Research K-12 )  
AISL- Advancing Informal STEM Learning  
Big Data                                                                 | ECR* includes:  
• Research on Gender in Science and Engineering (GSE)  
• Research in Disabilities Education (RDE)  
• AISL and ITEST are BP emphasis programs                                                        | STEM+C Partnerships for the 21st Century  
ITEST - Innovative Technology Experiences for Students and Teachers  
CSforAll                                                                                       |
## Program Focus in DUE

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<tbody>
<tr>
<td><strong>Undergraduate Education (DUE)</strong></td>
<td>Core Research &amp; Development (ECR)</td>
<td>Advanced Technological Education (ATE)</td>
<td>Robert Noyce Teacher Scholarship Program (NOYCE)</td>
</tr>
<tr>
<td>IUSE- Improving Undergraduate STEM Education</td>
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<tr>
<td>S-STEM = Scholarship in STEM Program</td>
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<tr>
<td>EHR Division</td>
<td>Learning and Learning Environments</td>
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<tr>
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</tr>
<tr>
<td>Graduate Education (DGE)</td>
<td>Project and Program Evaluation (PPE)/Promoting Research and Innovation in Methodologies for Evaluation (PRIME)</td>
<td>• EHR Core Research: Workforce Development (ECR)*&lt;br&gt;• SFS- CyberCorps: Scholarship for Service&lt;br&gt;• GRF - Graduate Research Fellowship&lt;br&gt;• NRT- National Research Traineeship&lt;br&gt;• INSPIRE-Integrated NSF Support Promoting Interdisciplinary Research and Education&lt;br&gt;• NSF Innovation Corps (I-Corps)</td>
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Research and Evaluation

• All EHR awards are expected to contribute to knowledge about STEM learning and learning environments, workforce development or broadening participation.

• Research
  – Is integral to the project
  – Contributes to generalizable knowledge
  – Depending on the research questions, can be qualitative, quantitative or mixed

• Evaluation
  – All projects must have a way to assess process or outcomes
  – Depending on the solicitation, evaluation needs to be independent but can be done by an external firm, an advisory board or through peer review
Common Guidelines

- Foundational Research and Early-Stage or Exploratory Research
- Design and Development Research
- Efficacy Research
- Effectiveness Research
- Scale-up Research

# Program Focus in HRD

<table>
<thead>
<tr>
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<th>Broadening Participation in STEM</th>
<th>STEM Professional Workforce</th>
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</thead>
<tbody>
<tr>
<td>Human Resource Development (HRD)</td>
<td>• ADVANCE-Increasing the Participation and Advancement of Women in S &amp; E careers&lt;br&gt;• AGEP-Alliances for Graduate Education and the Professoriate&lt;br&gt;• HBCU-UP-Historically Black Colleges and Universities Undergraduate Program&lt;br&gt;• TCUP- Tribal Colleges and Universities Programs</td>
<td>*Core Research &amp; Development (ECR)&lt;br&gt;LSAMP- Louis Stokes Alliances for Minority Participation</td>
<td>• PAEMST- Presidential Awards for Excellence in Mathematics and Science Teaching&lt;br&gt;• PAESMEM- Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring&lt;br&gt;• CREST- Centers of Research Excellence in Science and Technology</td>
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</table>
Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science

- Comprehensive initiative to enhance U.S. leadership in science and engineering by seeking and developing STEM talent from all sectors and groups in our society

- Long-term goal

  Support innovative models, networks, partnerships, and research that enable the U.S. science and engineering workforce to thrive by ensuring that all groups are represented in percentages comparable to their representation in the U.S. population

FY 2016: NSF 16-544, 16-081, $15.5M
FY 2017 Budget Request $16M
Using Collective Impact*- style approaches to scaling social innovation

NSF INCLUDES National Network

<table>
<thead>
<tr>
<th>FY16</th>
<th>FY17</th>
<th>FY18 and beyond</th>
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<tbody>
<tr>
<td><strong>Design and Development</strong></td>
<td><strong>Alliances</strong></td>
<td><strong>Backbone</strong></td>
</tr>
<tr>
<td>Launch Pilots</td>
<td>may be funded in FY 17</td>
<td>Organizations</td>
</tr>
<tr>
<td>2 year awards @ $300K</td>
<td>5 year awards @ $12.5M</td>
<td>may be funded in 17</td>
</tr>
<tr>
<td>(30-40 awards)</td>
<td>(3-5 awards)</td>
<td>Other Activities</td>
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<tr>
<td></td>
<td>5 year award(s) @ $3.5M</td>
<td>funded in 17</td>
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<tr>
<td></td>
<td></td>
<td>Link to BP Portfolio</td>
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<tr>
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<td></td>
<td>Evaluation &amp; Assessment</td>
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<td></td>
<td>Evaluation &amp; Assessment</td>
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<tr>
<td></td>
<td></td>
<td>Conferences and Workshops</td>
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<td></td>
<td></td>
<td>5 year awards @ $3.5M</td>
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<tr>
<td></td>
<td></td>
<td>5 year awards @ $3.5M</td>
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<tr>
<td></td>
<td>PI Meeting Evaluation &amp; Assessment</td>
<td>5 year awards @ $3.5M</td>
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<td>5 year awards @ $3.5M</td>
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<td>Link to BP Portfolio Evaluation &amp; Assessment</td>
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<tr>
<td></td>
<td>Link to BP Portfolio Evaluation &amp; Assessment</td>
<td>5 year awards @ $3.5M</td>
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Key elements INCLUDES is looking for

- Novel systems approaches and collective impact-style strategies
- New research, models, networks, and partnerships to scale social innovations
- Leverage the current Broadening Participation Portfolio
- Collaborative alliances spanning education levels, public and private sectors,…

Design & Development
Launch Pilots in FY16, FY17
NSF INCLUDES Alliances

• Up to five NSF INCLUDES Alliances will be funded beginning in FY 2017 or FY 2018
• Alliances will involve the most promising launch pilot activities
• Design and Development Launch Pilots may be reconfigured by adding new partners, collaborators or networks = new Alliance team
• Alliances may focus on emerging fields in science and engineering or established fields - key is to advance BP
• Each Alliance to be funded for 5 years at $2.5M per year
Research, Development, and Model-Building for STEM Learning:

A Core Knowledge
- Foundational Research
- Early Stage and Exploratory Research

B Design and Development Projects

C Impact: Studies
- Efficacy Studies
- Effectiveness Studies
- Scale-up Studies

Common Guidelines for Education Research & Development
Prospective Principal Investigators

- Engage with NSF
- Answer fundamental questions
- Seek Collaborations
- Strengthen Interdisciplinary Partnerships
- Communicate – early and often!
Engage with NSF

- Submit Proposals
- Serve as Reviewers & Panelists
- Be Active as Workshop Participants and Organizers
- Consider Being a Rotator
  [Link to NSF website](http://www.nsf.gov/about/career_opps/rotators/index.jsp)

For information on a particular EHR division and program, go to the EHR website and choose a division.
  [Link to EHR website](http://www.nsf.gov/dir/index.jsp?org=EHR)

Contact NSF Program Directors for questions and suggestions
### Answer fundamental questions

<table>
<thead>
<tr>
<th>Goals</th>
<th>Rationale</th>
<th>Evaluation</th>
<th>Dissemination</th>
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<tbody>
<tr>
<td>What are you trying to accomplish?</td>
<td>Why do you believe that you have a good idea?</td>
<td>Why is your approach promising?</td>
<td>How will others find out about your work?</td>
</tr>
<tr>
<td>What will be the outcomes?</td>
<td>Why is the problem important?</td>
<td>How does it tie into previous literature/efforts?</td>
<td>How will you interest them?</td>
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<td>How will you excite them?</td>
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Stay connected

- Proposal and Award Policies and Procedures Guide (PAPPG): [http://](http://)
- Guide to Programs: [www.nsf.gov/funding/browse_all_funding.jsp](http://www.nsf.gov/funding/browse_all_funding.jsp)
- Award Information: [www.nsf.gov/awardsearch](http://www.nsf.gov/awardsearch)
- FastLane: [www.fastlane.nsf.gov](http://www.fastlane.nsf.gov)
- Funding Opportunities: [www.nsf.gov/funding](http://www.nsf.gov/funding)
Thank You!

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