



## **Directorate for Education and Human Resources (EHR)**

**Elizabeth VanderPutten.**

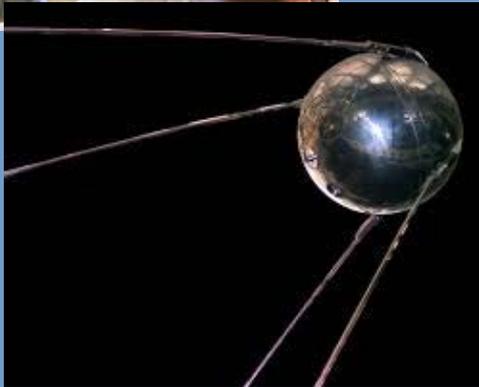
Deputy Division Director

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

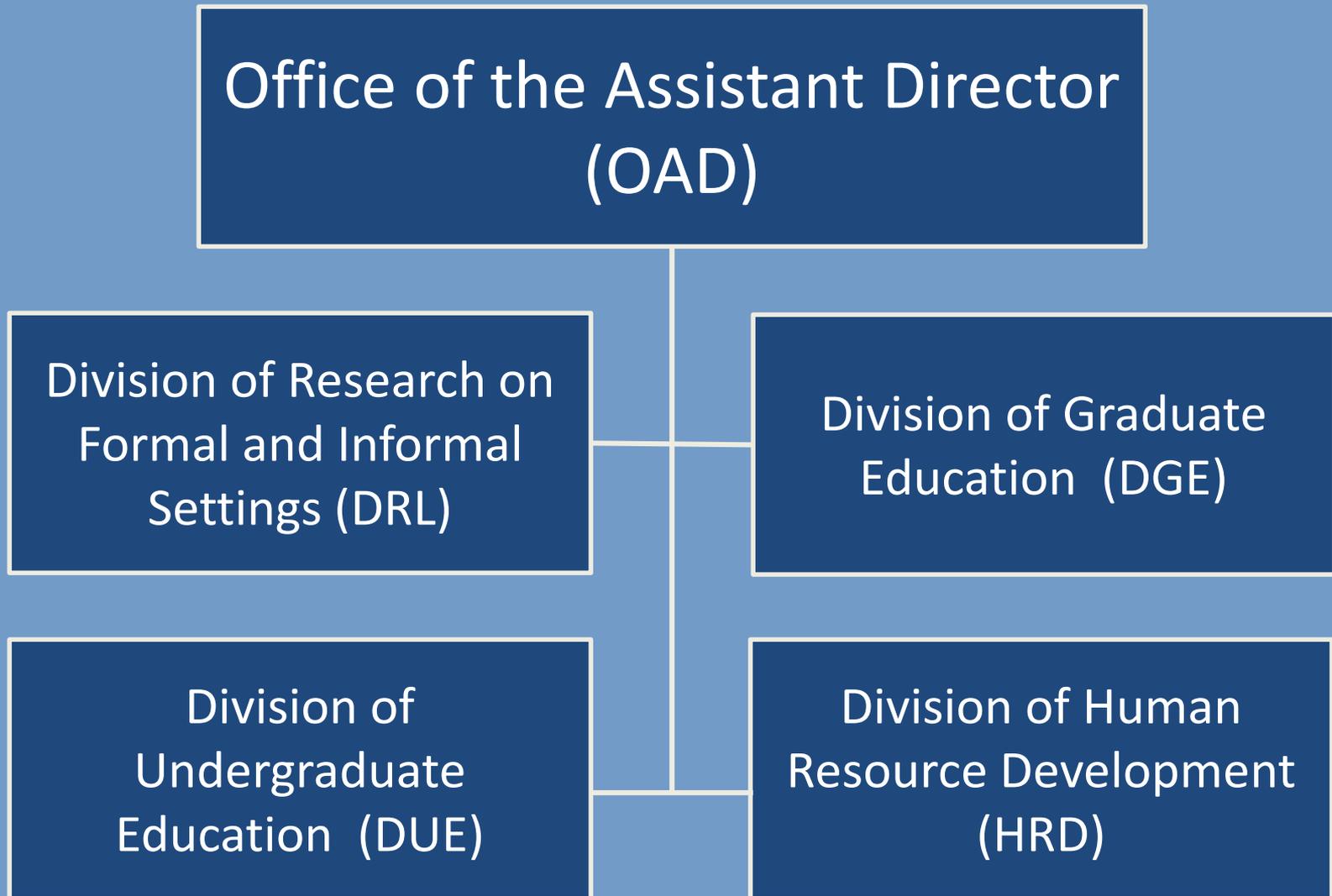


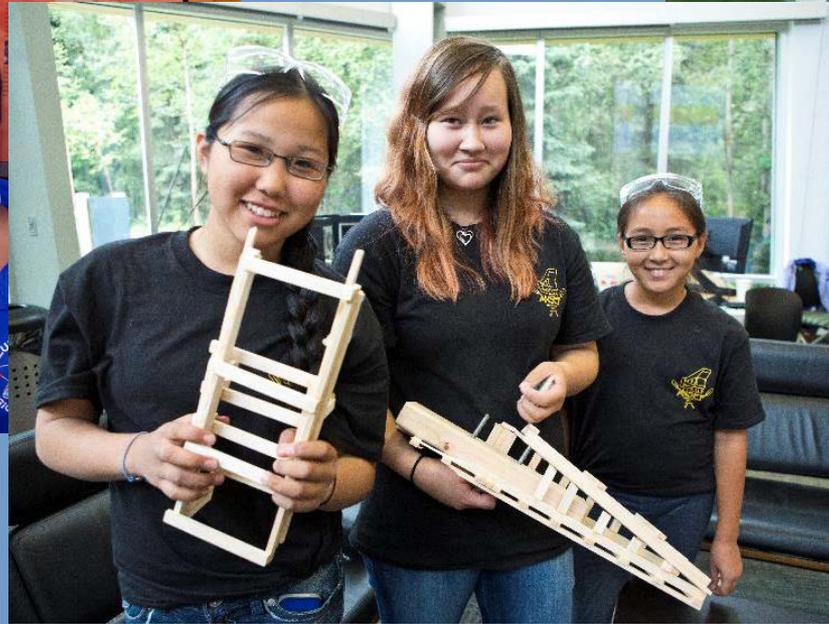
Social, Behavioral, and  
Economic Sciences



Education and Human  
Resources

# EHR's organizational structure



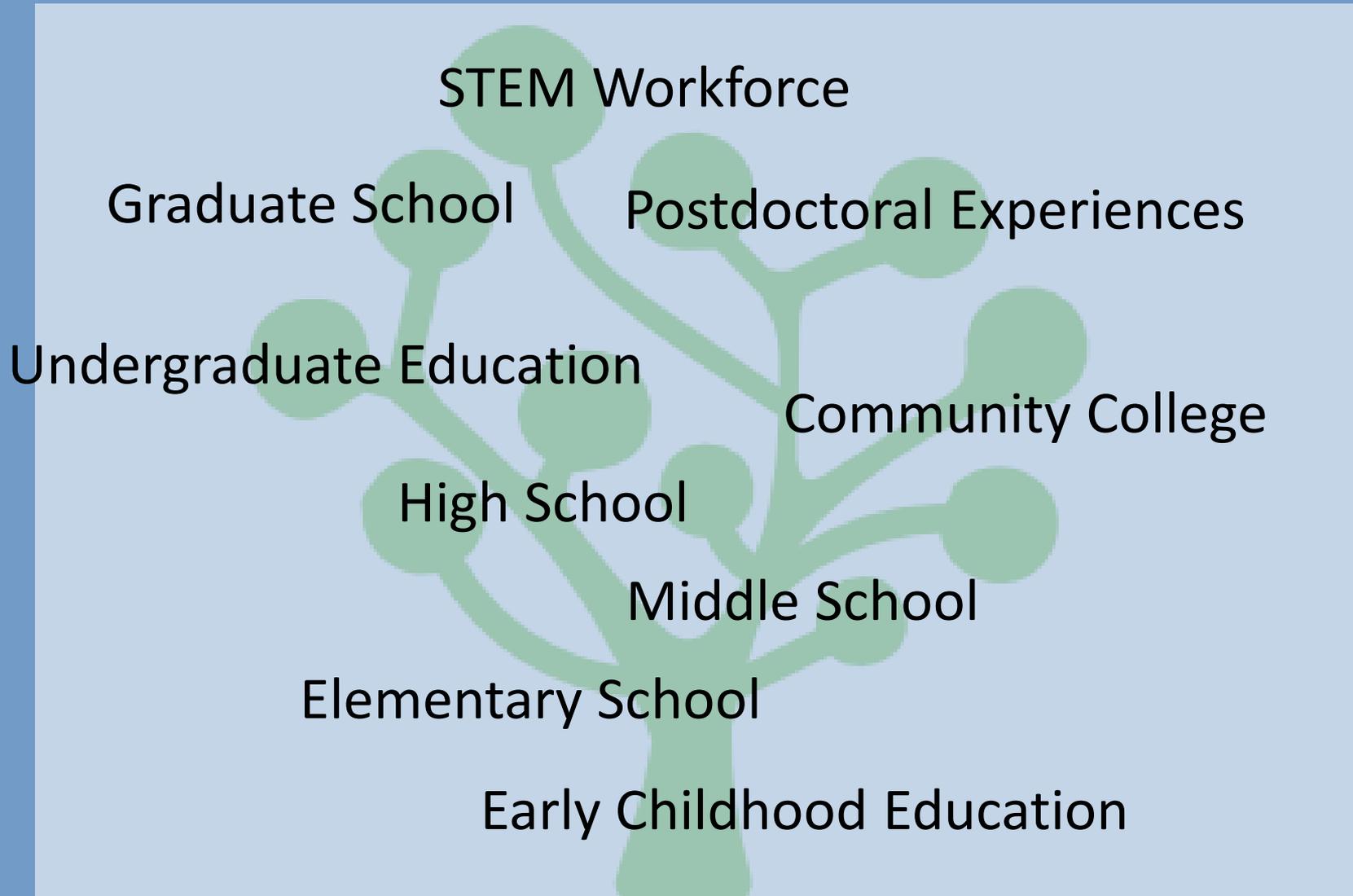


## EHR Mission:

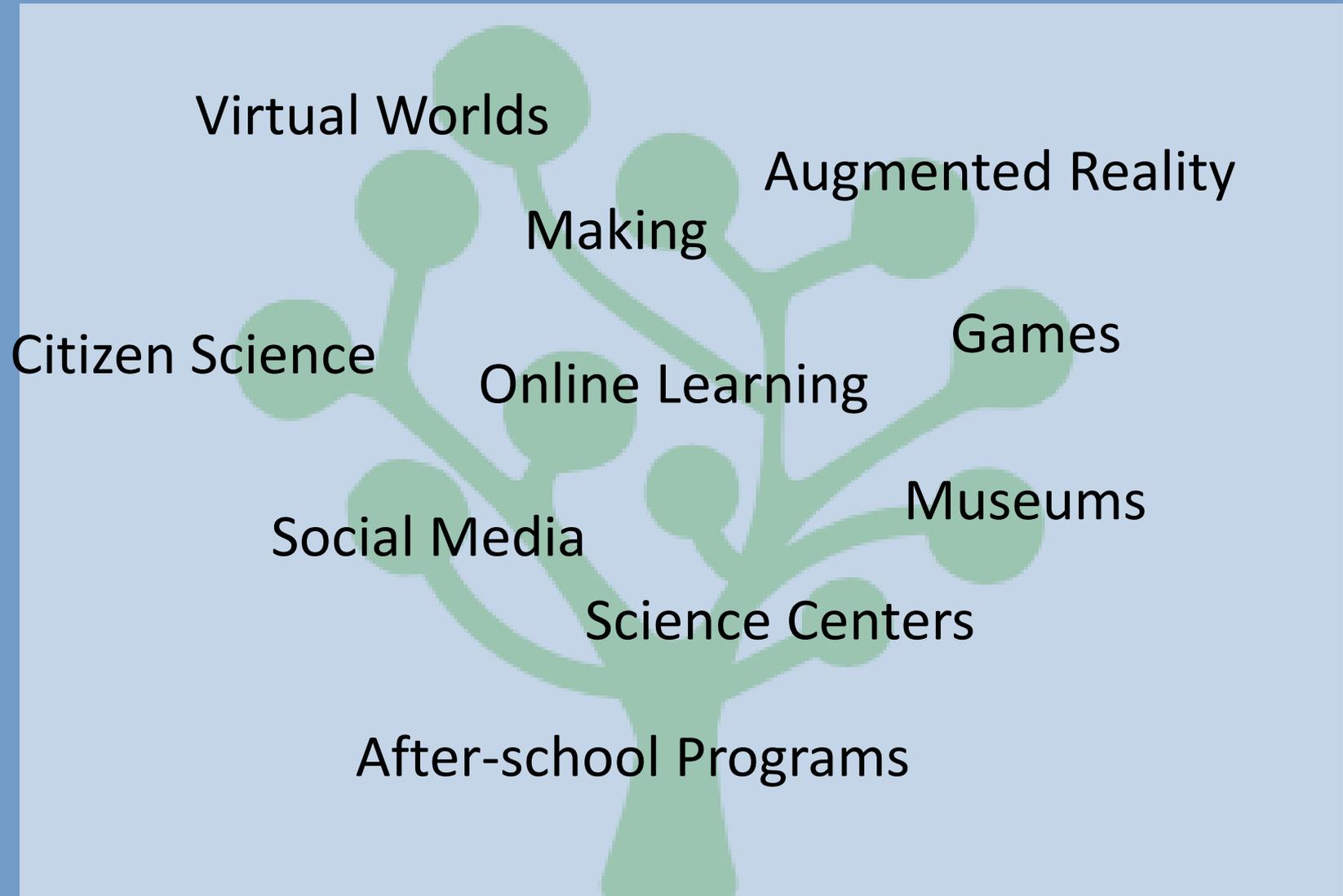
- Develop a diverse workforce ready to advance the frontiers of science and engineering for society
- Grow and sustain a STEM-literate public



# STEM Workforce and STEM-Literate Public



# STEM Workforce and STEM-Literate Public

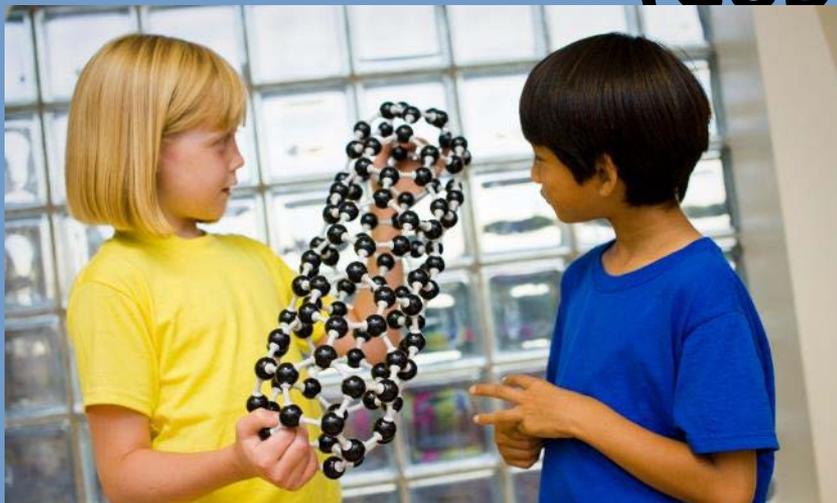


# EHR is committed to an inclusive STEM enterprise for science and society.

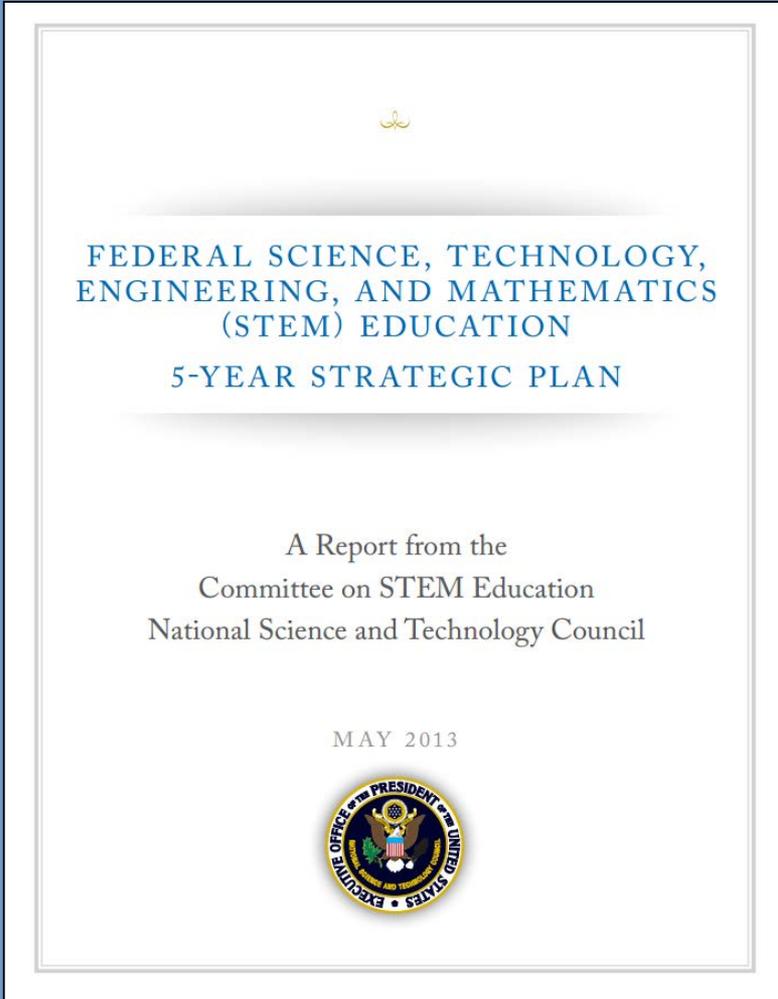


*Other than the FY 2017 request, numbers shown are based on FY 2015 activities.*

# 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

## **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**

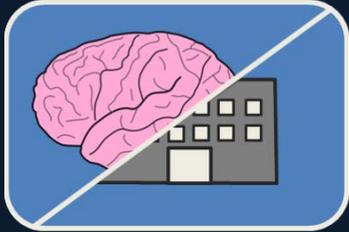
## **Youth & Public Engagement**

**Support a 50% increase in the number of youth who have authentic STEM experiences each year**

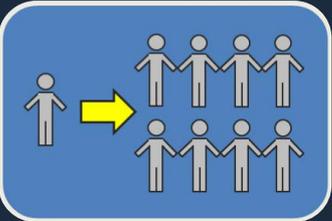
## **Governance & Coordination**

**Build new models for leveraging assets and expertise  
Build and use evidence-based approaches**

# 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

EHR Division	Learning and Learning Environments	Broadening Participation in STEM	STEM Professional Workforce
Research on Learning (DRL)	ECR - <i>Learning</i> DR-PK12 AISL	ECR includes: <ul style="list-style-type: none"> <li>• Research on Gender in Science and Engineering (GSE)</li> <li>• Research in Disabilities Education (RDE)</li> </ul>	<ul style="list-style-type: none"> <li>• STEM+C Partnerships for the 21<sup>st</sup> Century ITEST - Innovative Technology Experiences for Students and Teachers</li> <li>• CSforAll</li> <li>• ITEST</li> </ul>
Graduate Education (DGE)	Project and Program Evaluation (PPE) Building Community & Capacity in Data (BCC)	ECR- <i>STEM Professional Workforce</i> CyberCorps: Scholarship for Service (SFS) Graduate Research Fellowship (GRF) National Research Traineeship (NRT)	
Human Resource Development (HRD)	ADVANCE AGEP HBCU-UP TCUP	ECR- <i>Broadening Participation and Capacity Building</i> LSAMP	Excellence Awards in Science and Engineering - PAEMST & PAESMEM CREST
Undergraduate Education (DUE)	ECR- <i>Learning Environment</i> Improving Undergraduate STEM Education (IUSE)		Advanced Technological Education (ATE) Robert Noyce Teacher Scholarship Program S-STEM Scholarship Program

# Program Focus in DRL

EHR Division	Learning and Learning Environments	Broadening Participation in STEM	STEM Professional Workforce
<p>Research on Learning in Formal and Informal Settings (DRL)</p>	<p>Core Research &amp; Development (ECR)</p> <p>DR-K12- (Discovery Research K-12 )</p> <p>AISL- Advancing Informal STEM Learning</p> <p>Big Data</p>	<p>ECR* includes:</p> <ul style="list-style-type: none"> <li>• Research on Gender in Science and Engineering (GSE)</li> <li>• Research in Disabilities Education (RDE)</li> <li>• AISL and ITEST are BP emphasis programs</li> </ul>	<p>STEM+C Partnerships for the 21<sup>st</sup> Century</p> <p>ITEST - Innovative Technology Experiences for Students and Teachers</p> <p>CSforAll</p>

# Program Focus in DUE

<b>EHR Division</b>	<b>Learning and Learning Environments</b>	<b>Broadening Participation in STEM</b>	<b>STEM Professional Workforce</b>
<b>Undergraduate Education (DUE)</b>	<b>Core Research &amp; Development (ECR)</b>  <b>IUSE- Improving Undergraduate STEM Education</b>	<b>Advanced Technological Education (ATE)</b>  <b>Robert Noyce Teacher Scholarship Program (NOYCE)</b>  <b>S-STEM = Scholarship in STEM Program</b>	

# Program Focus in DGE

<b>EHR Division</b>	<b>Learning and Learning Environments</b>	<b>Broadening Participation in STEM</b>	<b>STEM Professional Workforce</b>
<b>Graduate Education (DGE)</b>	<b>Project and Program Evaluation (PPE)/Promoting Research and Innovation in Methodologies for Evaluation (PRIME)</b>	<ul style="list-style-type: none"><li>• <b>EHR Core Research: Workforce Development (ECR)*</b></li><li>• <b>SFS- CyberCorps: Scholarship for Service</b></li><li>• <b>GRF - Graduate Research Fellowship</b></li><li>• <b>NRT- National Research Traineeship</b></li><li>• <b>INSPIRE-Integrated NSF Support Promoting Interdisciplinary Research and Education</b></li><li>• <b>NSF Innovation Corps (I-Corps)</b></li></ul>	

# 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

<https://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf>

# Program Focus in HRD

EHR Division	Learning and Learning Environments	Broadening Participation in STEM	STEM Professional Workforce
<b>Human Resource Development (HRD)</b>	<ul style="list-style-type: none"> <li>• <b>ADVANCE-Increasing the Participation and Advancement of Women in S &amp; E careers</b></li> <li>• <b>AGEP-Alliances for Graduate Education and the Professoriate</b></li> <li>• <b>HBCU-UP-Historically Black Colleges and Universities Undergraduate Program</b></li> <li>• <b>TCUP- Tribal Colleges and Universities Programs</b></li> </ul>	<p><b>*Core Research &amp; Development (ECR)</b></p> <p><b>LSAMP- Louis Stokes Alliances for Minority Participation</b></p>	<ul style="list-style-type: none"> <li>• <b>PAEMST- Presidential Awards for Excellence in Mathematics and Science Teaching</b></li> <li>• <b>PAESMEM- Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring)</b></li> <li>• <b>CREST- Centers of Research Excellence in Science and Technology</b></li> </ul>

# NSF INCLUDES (16-544, 16-408; new one on the way)

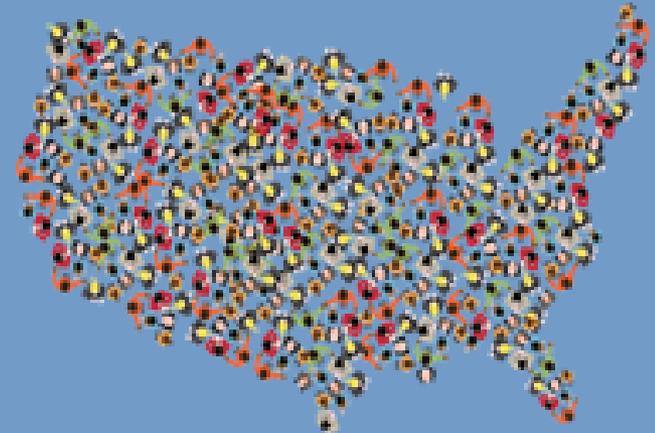
Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science

- 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



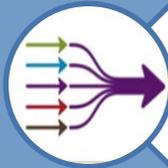
\* Kania, M. Kramer, Stanford Social Innovation Review, 2011

# NSF INCLUDES National Network

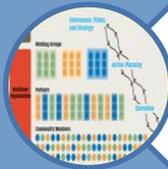
	FY16	FY17	FY18 and beyond
<b>Design and Development Launch Pilots</b>	2 year awards @ \$300K (30-40 awards)	2 year awards @ \$300K	2 year awards @ \$300K
<b>Alliances</b> may be funded in FY 17		5 year awards @ \$12.5M (3-5 awards)	5 year awards @ \$12.5M
<b>Backbone Organizations</b> may be funded in 17	Conferences and Workshops	5 year award(s) @ \$3.5M	5 year awards @ \$3.5M
<b>Other Activities</b>	PI Meeting Evaluation & Assessment	Link to BP Portfolio Evaluation & Assessment	Link to BP Portfolio Evaluation & Assessment

# Key elements INCLUDES is looking for

Design & Development  
Launch Pilots in FY16, FY17



**Novel systems approaches and collective impact-style strategies**



**New research, models, networks, and partnerships to scale social innovations**



**Leverage the current Broadening Participation Portfolio**

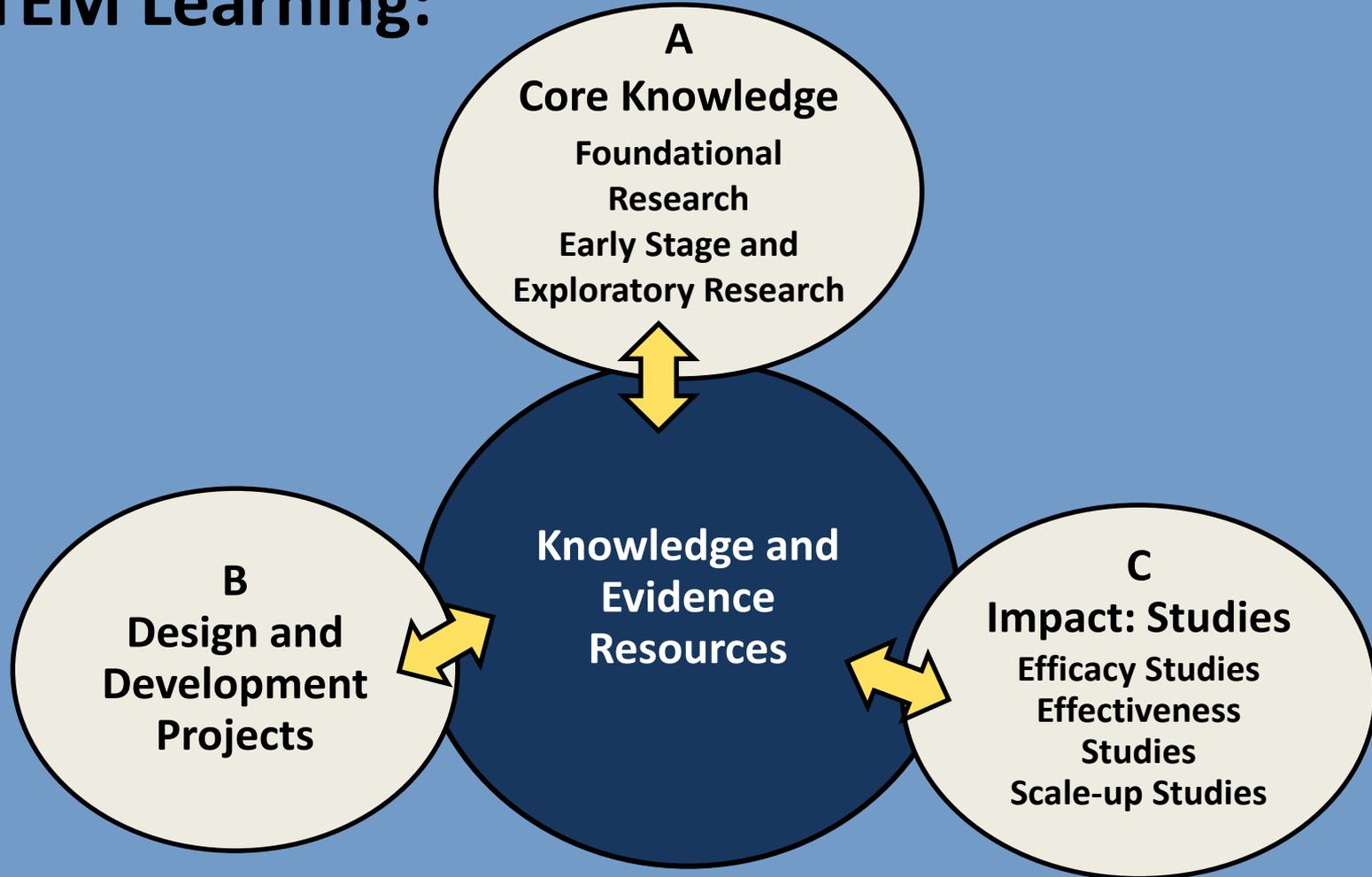


**Collaborative alliances spanning education levels, public and private sectors,...**

# 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:



Common Guidelines for Education Research & Development

<http://ies.ed.gov/pdf/CommonGuidelines.pdf>



# 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
- [http://www.nsf.gov/about/career\\_opps/rotators/index.jsp](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.

<http://www.nsf.gov/dir/index.jsp?org=EHR>

**Contact NSF Program Directors for questions and suggestions**



# Answer fundamental questions

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What are you trying to accomplish?  
What will be the outcomes?

} *Goals*

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Why do you believe that you have a good idea?  
Why is the problem important?  
How does it tie into previous literature/efforts?  
Why is your approach promising?

} *Rationale*

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How will you manage the project to ensure success?  
How will you know if you succeed?

} *Evaluation*

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How will others find out about your work?  
How will you interest them?  
How will you excite them?

} *Dissemination*



# Stay connected

- NSF: [www.nsf.gov](http://www.nsf.gov)
- Proposal and Award Policies and Procedures Guide (PAPPG): <http://www.nsf.gov/pappg>
- 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)
- Broader Impacts: [www.nsf.gov/pubs/gpg/broaderimpacts.pdf](http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf)
- Data Management Plan: [www.nsf.gov/bfa/dias/policy/dmp.jsp](http://www.nsf.gov/bfa/dias/policy/dmp.jsp)
- Funding Opportunities: [www.nsf.gov/funding](http://www.nsf.gov/funding)





# Thank You!

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