An Overview of the NSF S-STEM Program (16-540)

- Scholarships + Ecosystem of Academic/Student Supports = STEM Degrees

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Presentation Outline

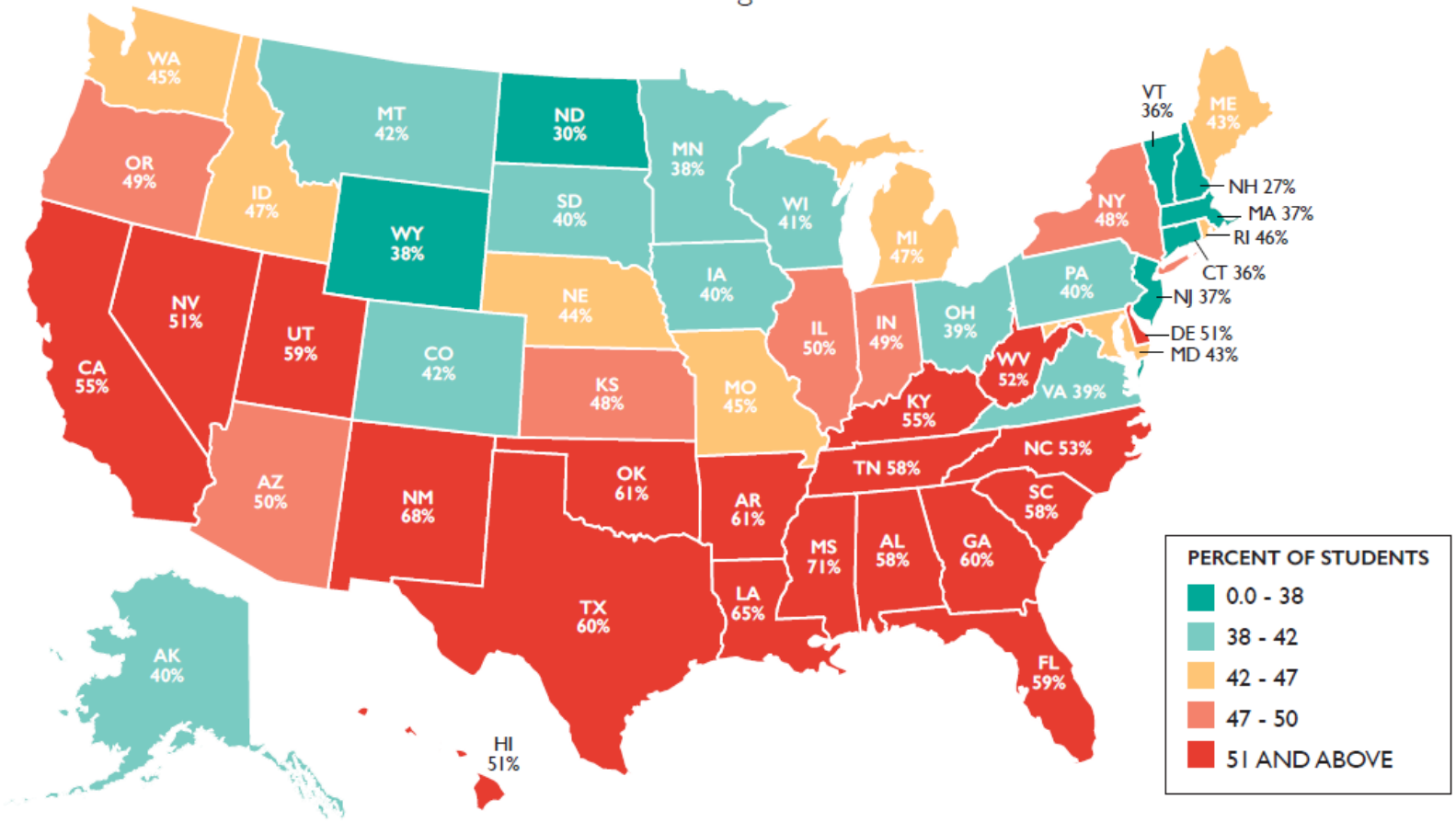
- Overview of the S-STEM Program
- Examples from the Portfolio
  - Specifically in Physics & Astronomy
  - One recent award Tucker/1565073
- Recommendations

S-STEM Program: Core Purpose

- To improve the STEM workforce by increasing
  - # of students who graduate with STEM degrees
  - # of students entering the STEM workforce
- Institutions Provide Scholarships
  - Academically Talented (or Promising) Students
  - Low-income students with demonstrated financial need
    - FAFSA (undergraduates)
    - GAANN (graduate students)
- Funded by H-1B visa fees

PERCENT OF LOW INCOME STUDENTS IN U.S. PUBLIC SCHOOLS 2013

National Average: 51%



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Data Source: U.S. Department of Education, National Center for Education Statistics, Common Core of Data

The New S-STEM Program: Changes

- Funding
  - At least 60% of the funds must be used for scholarships
  - Up to 40% of funds may be used for other things – support structures, research, recruitment, etc.
- Why the change?
  - Scholarships are not enough
  - Many more support structures are now possible
  - A more systematic determination of what support structures are effective will benefit the STEM education community.

S-STEM Program

Two Program Tracks

Institutional Capacity Building (Strand 1)

Up to $650K
Up to 5 yrs

Deadlines (All Proposals): May 16, 2016

For institutions with limited experience in implementing effective curricular and co-curricular activities

Design and Development (Strand 2)

Two Types

Single Institution (Type 1)

Up to $1M
Up to 5 yrs

Multi-institutional Consortia (Type 2)

Up to $5M
Up to 5 yrs

Seeks to leverage S-STEM funds with institutional efforts and infrastructure to increase and understand impacts

Project Team

- At least 3 (one a PI and two Co-PIs)
  - STEM Faculty Member (most often the PI)
  - Administrator
  - Educational Researcher
  - Two other Co-PIs are allowed
- One External Evaluator (must NOT be a Co-PI or senior personnel)

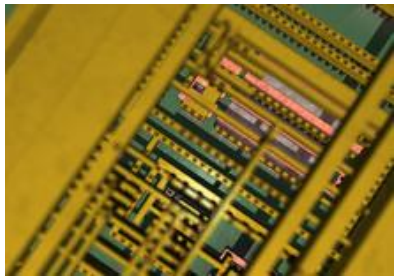
Cohorts and Faculty Mentors Required

- All S-STEM projects must include plans to provide faculty mentors for S-STEM Scholars
- All S-STEM projects must include plans to develop a cohort experience for the scholarship recipients.
  - Experience shows that the most successful S-STEM scholarship projects involve faculty mentors and a group of students who form a cohort.
  - A cohort is a group of student who in some way naturally associate.
  - The project plan should include activities to establish a cohort of students who receive scholarships.

Research and Internships – Optional!

- Projects may offer research opportunities and internships for scholarship recipients.
- These activities can enhance the student experience!
- Research participation and internships MUST be optional components of the S-STEM project.
  - S-STEM scholarships may not be, nor appear to be, payment for services.
  - Research and internship opportunities are valuable components of S-STEM projects, as long as they are clearly optional for the student.

Portfolio Example



Project – "Scholarships and Nanofabrication Experience: Successful Transitions from Community College to Graduate School", NSF #1259968 (SUNY - Binghamton University), a pathway from 16 Community Colleges into the high-demand Nanotechnology area.

Portfolio Example

Project - "Academic and Professional Development for Engineering and Computer Science Students: From Upper-Division to Research, Graduate School, Academia, and the Skilled STEM Workforce", NSF #1060226 (Arizona State University), students with S-STEM scholarships at ASU have graduated at over a 95% rate and 50% of them have gone directly on to graduate school.

DCL supplemental funding to establish pathways with local HS CCs.

Portfolio Example: Stevens S-STEM Scholarships

- The Project (awarded in 2015):
  - Provide 53 Scholarships for MS in Software Engineering to Liberal Arts Undergraduates
- Context:
  - The U.S. needs more Homegrown Software Engineers: NSF Priority
  - Liberal Arts Graduates have higher unemployment (or underemployment) than engineering and CS
  - Different Pathways for entry into Software Engineering Careers, Significant Evidence that non-CS/Engineering UG have had extremely successful careers in computing
- So far:
  - Marketing: More difficult than expected

Tucker/1565073 (UC-Irvine)

- 60 scholarships to students at the University of California, Irvine (UCI) who are majoring in physics.
- UCI is a leader in serving low-income, first-generation, and underrepresented students.
- Recently the number of incoming physics majors has doubled -- yet the rate of retention has remained low.
- Project will provide scholarships, strengthen the departmental student community, increase academic support through faculty advising and access to tutoring in gateway courses, and encourage research and industry opportunities.
- Research questions center upon persistence, attitudes towards science, and changes in students' physics identity.

Diversity

Issue: Some proposals will describe specifically focusing on awarding scholarships to students from an under-represented group.

Background:

- The requirements for a student to receive an S-STEM scholarship are academic talent and low-income demonstrated financial need. There are no other criteria! This program's underlying motivation is workforce improvement!
- How can proposals promote diversity?
  - Through recruiting applicants
    - But all applicants who meet the requirements should have an **equal chance** at getting a scholarship
  - Through support mechanisms
    - Best if driven by educational research describing how particular mechanisms are ideal for improving particular problems.

Supported Majors

- Issue: A number of disciplines are listed in the solicitation as STEM disciplines (and associated technology fields) that are clearly supported. And there are disciplines that clearly shouldn't be classified as STEM disciplines and are NOT supported. There are many disciplines in between that are challenging to classify!
- Background: From the solicitation – must be a degree candidate in:
  - Biological sciences (except medicine and other clinical fields);
  - Physical sciences, including physics, chemistry, astronomy, and materials science;
  - Mathematical sciences;
  - Computer and information sciences;
  - Geosciences;
  - Engineering; or
  - Technology areas associated with the preceding fields (for example, biotechnology, chemical technology, engineering technology, information technology, etc.);

Supported Majors (cont.)

What I tell reviewers: Please evaluate in your reviews how well the proposed discipline fits among the STEM disciplines. Consider …

- the amount of math and science courses that are part of the required coursework for the major
- the number of jobs that are available in the workforce (both locally and nationally) for their graduates

Potential PIs who have contacted us have been advised to make the case in these two areas (if their program doesn't obviously fit under the list in the solicitation).

Knowledge Generation

Issue: Some proposals may appear to be "totally focused" on simply giving out scholarships.

Background: A major goal of the new solicitation is that all proposals should be "knowledge generating". They should be gathering information on their unique thrust. Learning about how the …

- Particular workforce needs identified
- Instructional focus of their academic programs and
- Support structures targeting "points of failure" identified in an institutional scan

work together and how they are being evaluated and the "lessons learned" disseminated to the broader S-STEM community. We want to learn how to best award scholarships to have the maximum impact!

What I tell reviewers: Please evaluate a proposal's "knowledge generation" in your reviews! It is of major importance!

Is Research Really Needed for S-STEM?

- All projects must be knowledge-generating
  - The projects that rise to the top typically have full-blown research projects in them.
    - with clearly stated research questions
  - It is best if the research is well-coordinated with your support structures.
- Challenges to S-STEM Research
  - Small N
  - It isn't always possible to have a control group

Possible S-STEM Research Areas

- Advising
  - in person, using Technology
- Co-curricular Activities
  - internships in industry
  - projects w/faculty (undergrad research)
- Cognitive Factors
  - problem solving, critical thinking
- Cohort Structure
  - building relationships
  - forming peer groups
- Communication Skills
  - public speaking, report writing
- Connection with Professionals, Industry
  - Colloquia
- Faculty Mentoring
- Non-Cognitive Factors – grit, self-efficacy
- Recruitment
  - attitudes toward STEM
- Retention – pathways, bridging structures
- Professional Skills
  - interviewing, resumes, etc.
- Student Curricular Supports
  - peer support networks
  - tutor rooms
- Student Skills
  - using technology (effectively)
  - avoiding multitasking, managing time
  - notetaking, study habits

Final Words of Wisdom

- Read solicitation – there is no substitute.
  - Get informed of updates
  - NSF site – Funding/Due Dates/

  https://service.govdelivery.com/accounts/USNSF/subscriber/new?topic_id=USNSF_29

  Should the solicitation get "tweaked" – NSF promises to give you 90 days before proposals are due.
- Make sure you
  - Have a research component
  - Prioritize "low-income" students
- Emphasize "intellectual cohesiveness"
  - Your project components should "fit" together!
  - Your project decisions should be "justified"
- Whenever in doubt – return to the overarching goal – getting STEM graduates out into the workforce!

Thank you

NSF S-STEM Team

Front Row L to R: John Krupczak, Nicole Bennett, Joyce Evans, Lidia Yoshida, Kevin Lee
Second Row: Dawn Rickey, John Haddock, Karen Crosby, Connie Della-Piana, Yvette Weatherton,
Not Pictured: Brent Driscoll, Kate Denniston, Alyssa Jones, Nabriya Horton, Liz Teles, Paul Tymann