NSTA Pre-Conference Workshop: Enhancing Science Instruction to Meet the Needs of English Language Learners in Grades 6-12

The English Language Learner Portfolio at the National Science Foundation

Julio E. López-Ferrao
Program Director, EHR/DRL
National Science Foundation

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NSF: Two Relevant Performance Goals

- **Prepare and engage a diverse STEM workforce motivated to participate at the frontiers . . . including students from underrepresented groups and institutions.**

- **Enhance research infrastructure and promote data access to support researchers' and educators' capabilities and enable transformation at the frontiers . . . by partnering with other agencies…to make complementary investments…and ensuring that diverse students…have access to infrastructure.**

Source: NSF Strategic Plan for Fiscal Years 2011—2016

NSF Promotes and Supports High-Quality, Rigorous Research Focused on ELLs' STEM Education

Current Programs that Support ELL STEM Education

- Discovery Research K-12 (DRK12)
- Innovative Technology Experiences for Students and Teachers (ITEST)
- Faculty Early Career Development (CAREER)

The Changing Landscape

- New standards for K-12 science and mathematics education
- Understanding Language Initiative at Stanford University
- New knowledge from research on learning
  - *Taking science to schoo*l (NRC, 2007)
  - *How students learn* (NRC, 2005)
- New state/federal regulations
  - *Allocating federal funds for state programs* (NRC, 2011)
- Understanding STEM
  - *Successful K-12 STEM education* (NRC, 2011)
  - *Monitoring progress toward successful K-12 STEM education: A nation advancing?* (NRC, 2013)
  - Potential value of integrated STEM education (in preparation, NRC, 2013)

Challenges and Opportunities for the Future of STEM Education

- In both mathematics and science new standards pose opportunities and challenges for curriculum developers, policy makers, school administrators, teachers, teacher educators, and those who represent out-of-school learning environments.

- New information from the cognitive and learning sciences is enabling younger students to engage with complex concepts.

- New technologies can now be implemented in classrooms and is beginning to yield important information about students' learning.

Source: **FORUM: K-12 Education across EHR and NSF - May 24, 2012** initiated by Assistant Director Joan Ferrini-Mundy, initiated the first in a series of agency-wide forums on important issues for both EHR and all other directorates in the broad realm of STEM education.

Current Research Issues

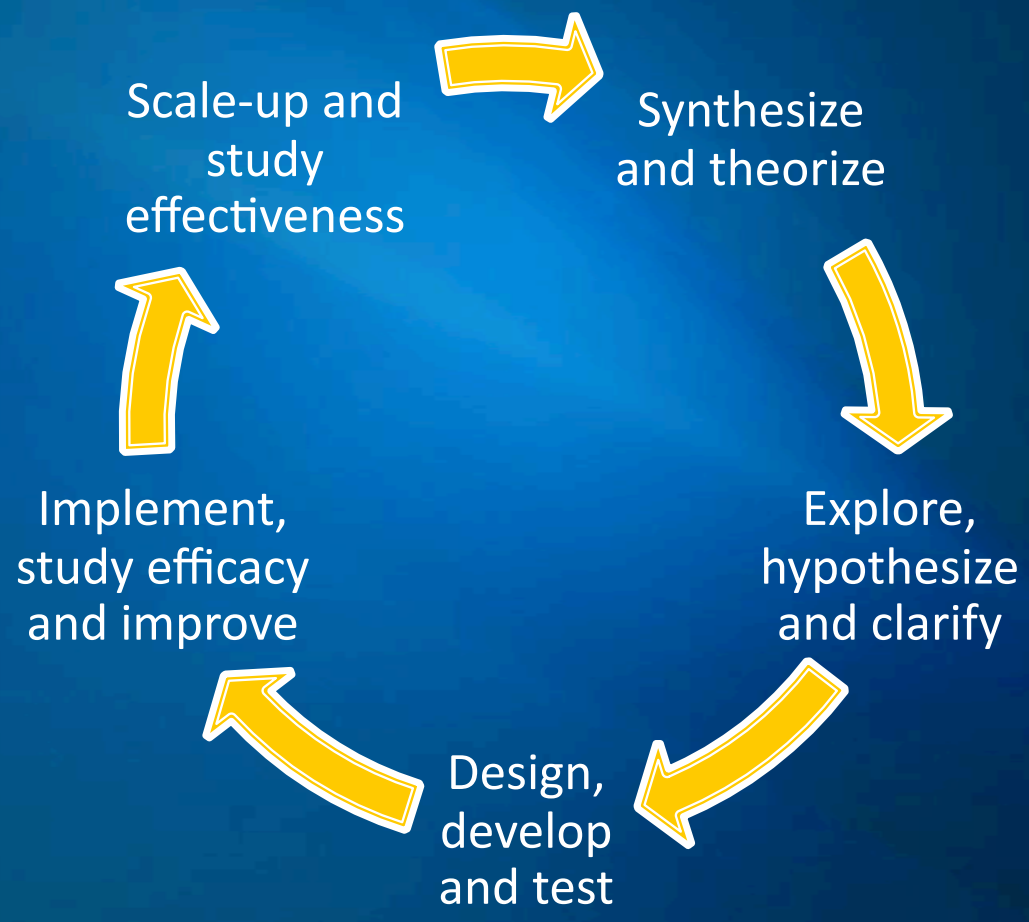
- The blending of language and content learning.
- There is growing evidence about what good instructional strategies look like.
- There in an increasing move toward teaching STEM as an integrated set of concepts.
- There is decreased time for science at the elementary level and this is a concern because interest in science develops in the elementary years.
- There is much discussion about changing the nature of schooling itself (e.g., blending formal and informal learning).
- All of the above imply new roles for teachers , administrators, and policy makers.

The DR K-12 Portfolio on ELLs

2013 EHR's Emerging Portfolio on ELLs

>42 active awards (~10% of the Discovery Research K-12 portfolio) focused on science and mathematics learning, instruction, assessment, technology, and policy with an average of 2.5 (of 5) years of implementation

Cycle of Research and Development

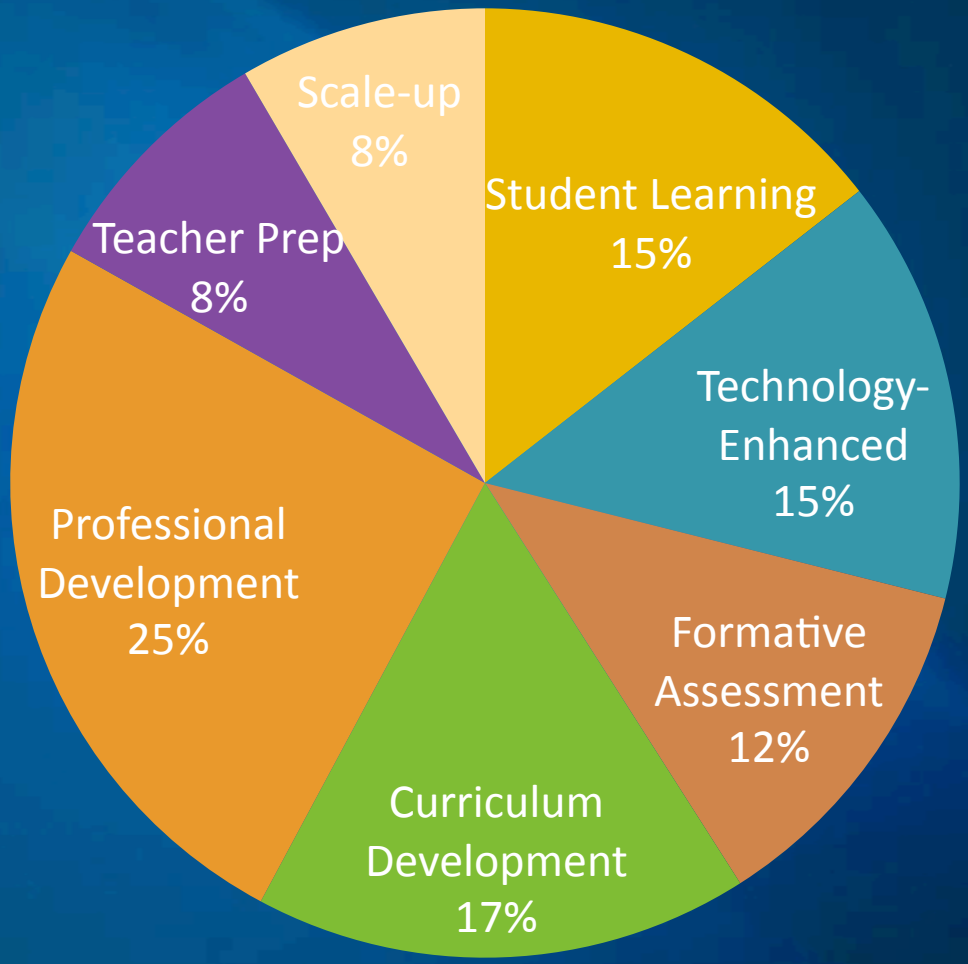


2013 Descriptive Portfolio Analysis

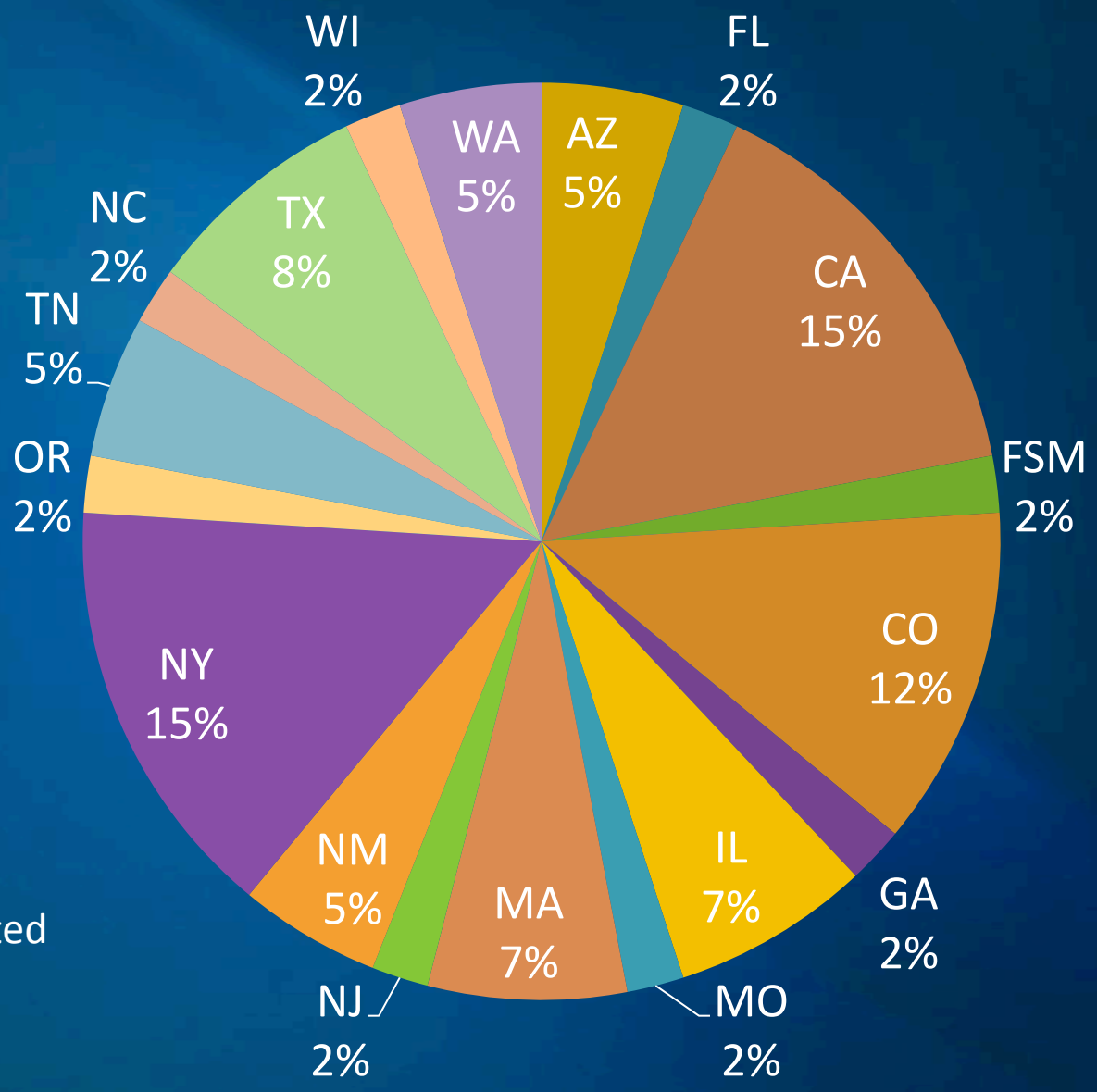
- The fields of ELL science and mathematics education are <u>just emerging</u> as researchers from different backgrounds cross domains (i.e., science, math, language acquisition, cognition).
- More than half of the projects focus on middle school grades.
- Most projects target Spanish-speaking students.
- Most projects employ mixed-methods approaches.
- Almost all projects focus on improving students' science or math achievement as the key outcome.
- Most projects gather data from at least two school districts.

Source: Community for Advancing Discovery Research in Education (2011)

Major Research Topics



Geographic Distribution



FSM – Federated States of Micronesia

FLORIDA

Promoting Science Among English Language Learners

What is this effort about?

- It is a curricular and professional development intervention aimed at improving science achievement of all students, particularly ELLs, in the context of high-stakes testing and accountability in science (FCAT Science)
- The intervention consists of:
  - Scientific inquiry and understanding
  - State science standards and assessment
  - Science instruction with ELLs

Texas

Project Middle School Science for ELLs

TEXAS A&M UNIVERSITY

What is the project about?

- Purpose: Investigate the effectiveness of a 2-year experimental longitudinal study of an enhanced instructional science model on the science academic language development and science achievement in English of Grade 5 and Grade 6 students

- Context and Participants: Economically disadvantaged Spanish-speaking ELLs and non-ELLs in an urban school district in Southeast Texas

- Design: 4 intermediate schools (2 experimental, 2 control)

New Mexico

Scaling Up Mathematics Achievement

What is this project about?

- In order to increase mathematics achievement for Hispanic and ELLs, they must be provided with a language-rich, inquiry–based, rigorous problem-solving curriculum.
- Students need to be able to make sense of mathematical concepts and procedures in order to apply them in the challenges of the 21st century global economy.

Action Steps for the Immediate Future

- A synthesis of research to date on diversity, with particular emphasis on ELLs' science and mathematics learning is needed.
- Research-informed teaching and learning models that work for whom and under what conditions should be broadly disseminated.
- Education systems need to align their policies to reflect research findings responsive to their ELLs' needs, including the benefits of bilingualism.
- Interagency collaboration should be promoted.

Source: Community for Advancing Discovery Research in Education (2011)

Final Comments

The National Science Foundation welcomes proposals addressing the needs of students from underrepresented groups, including English language learners.

The National Science Foundation is willing to continue partnerships and establish new efforts with other agencies and organizations to make complimentary investments in this critical area.

Thank you!

Julio E. López-Ferrao
jlopezfe@nsf.gov