Understanding Language
Language, Literacy, and Learning in the Content Areas

NEXT GENERATION SCIENCE STANDARDS
For States, By States

P-SELL

Promoting Science Among English Language Learners (P-SELL) Scale-Up

(NSF 1209309)

2015 Forum NEXT GENERATION STEM Learning for All

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Development of Language-Focused Three-Dimensional Science Instructional Materials to Support English Language Learners in Fifth Grade

NEW YORK UNIVERSITY

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Student Diversity

- **Poverty:** “Majority of U.S. public school students are in poverty” (51%), *New York Times,* January 16, 2015
- **Race and ethnicity:** “U.S. school enrollment hits majority-minority milestone” (this fall), *Education Week,* February, 1, 2015
- **Disabilities:** 12% of students received special education services in 2011
- **English language:**
  - 21% of students speak a language other than English at home in 2011
  - 9% of students participate in ELL programs in 2011

Teaching STEM for diversity is teaching STEM for all.

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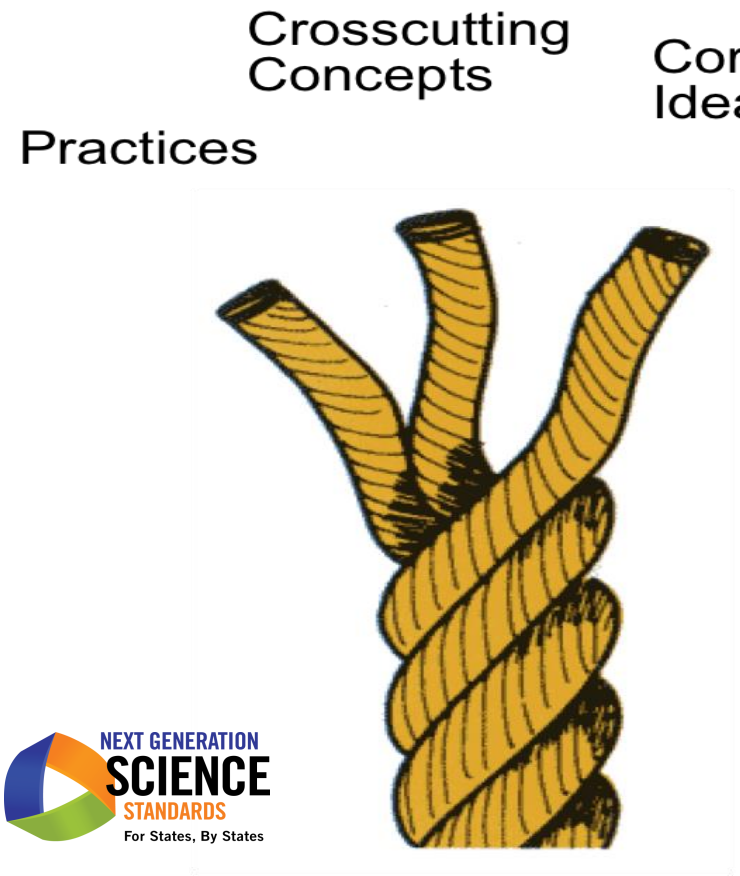
Framework and NGSS for Diversity and Equity

3-Dimensional Learning

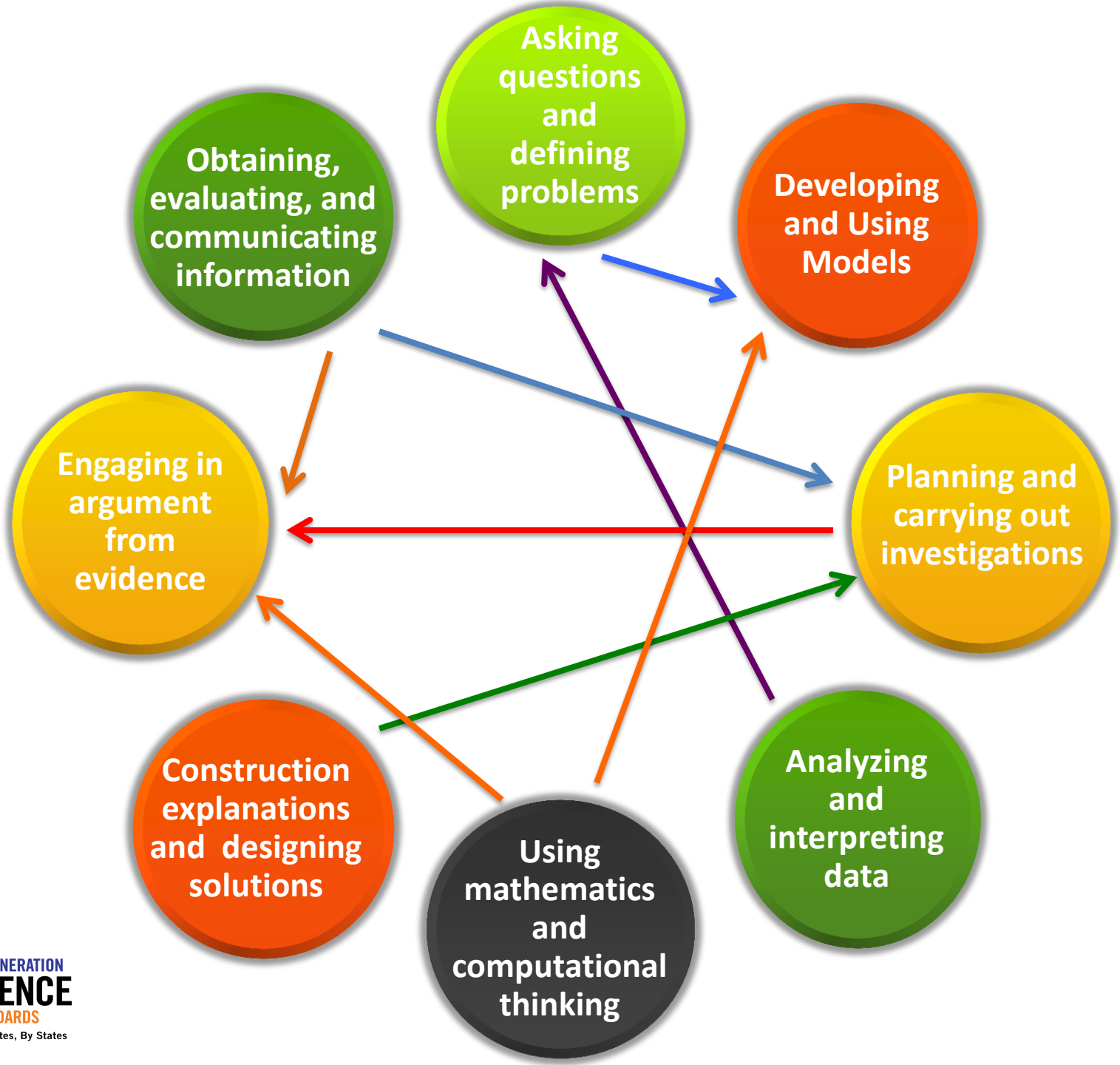


- To explain phenomena (science) and design solutions to problems (engineering)
- To occur in local contexts (e.g., homes and communities) that capitalize on students' everyday language and experience

Framework and NGSS for English Language Learners (ELLs)

Understanding Language

- Raise the bar for content (academically rigorous)
- Raise the bar for language (language intensive)
- Call for a high level of classroom discourse for all students, including ELLs



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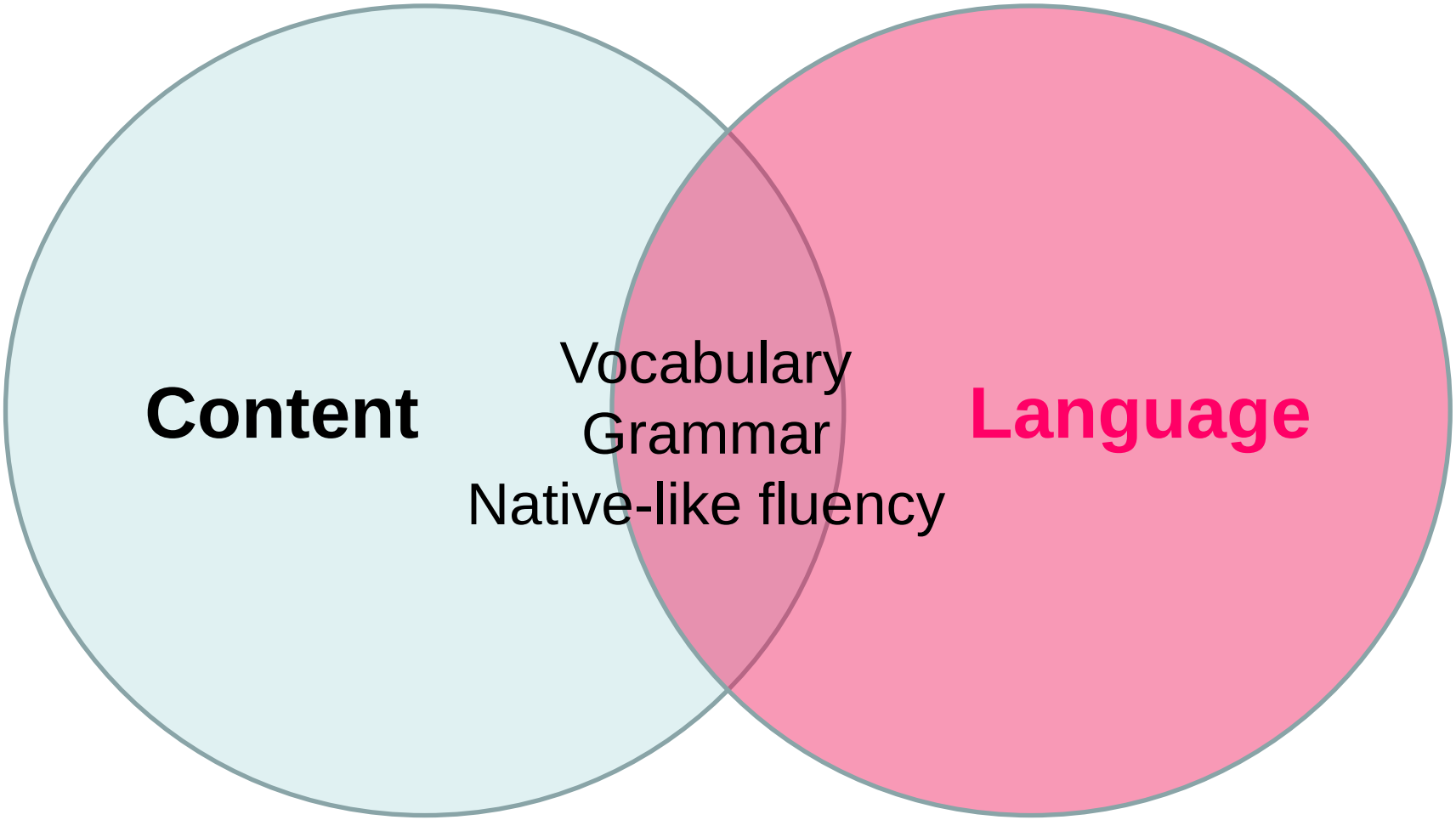
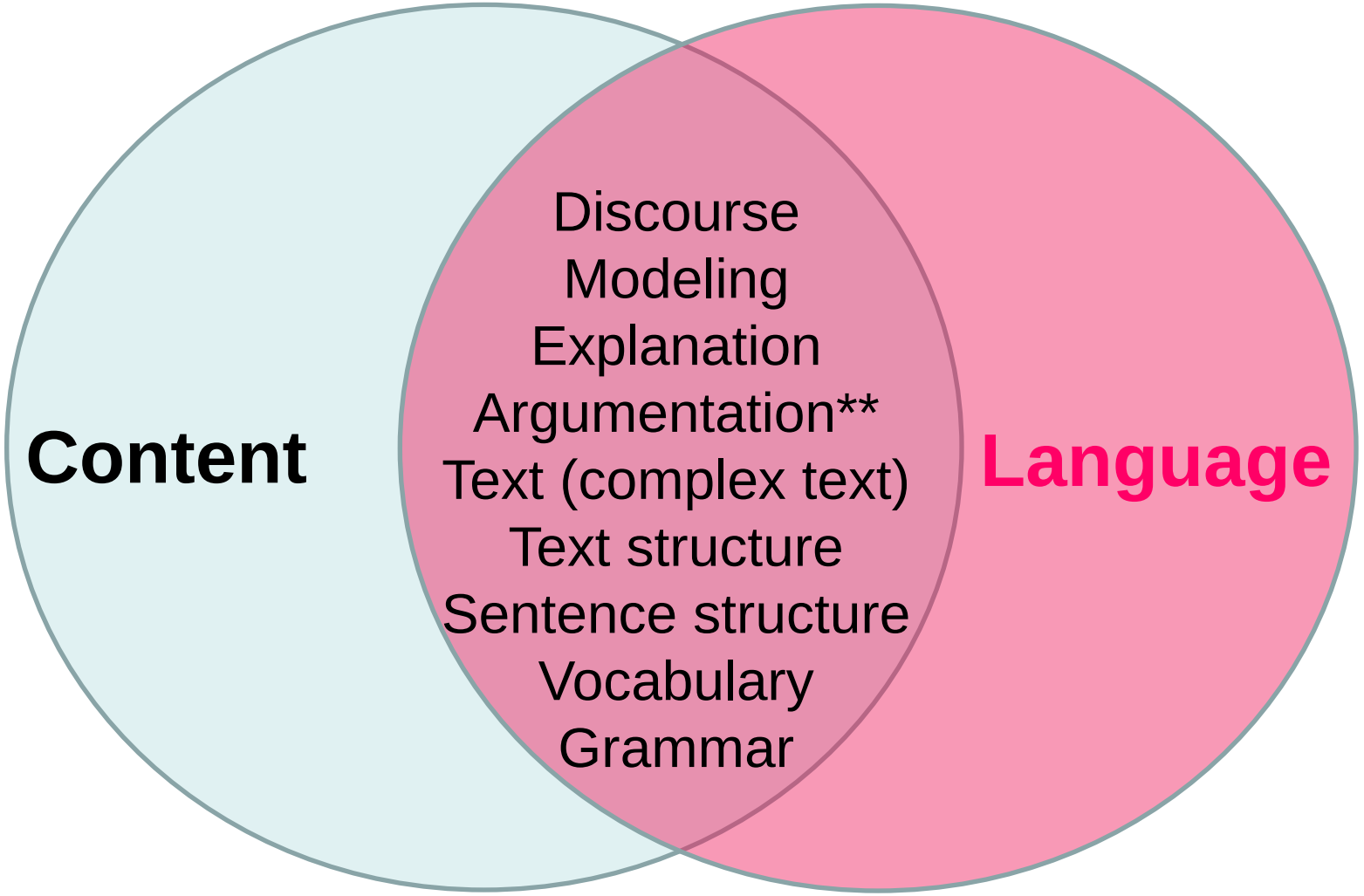
ELLs: Old Paradigm



Source: Linquanti & Hakuta, 2012; ell.stanford.edu

ELLs: New Paradigm



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Conceptual Framework:
Language Use in the Science Classroom

NGSS Practice 7: Engage in argument from evidence	
Analytical Science Tasks	• Distinguish between a claim and supporting evidence or explanation • Analyze whether evidence supports or contradicts a claim • Analyze how well a model and evidence are aligned • Construct an argument
Receptive Language Functions	• Comprehend arguments made by others orally • Comprehend arguments made by others in writing
Productive Language Functions	Communicates (orally and in writing) ideas, concepts, and information related to the formation, defense, and critique of arguments • Structure and order written or verbal arguments for a position • Select and present key evidence to support or refute claims • Question or critique arguments of others

Design Principles for Instructional Materials

Science

- Select a phenomenon or problem in a **community-based context**, specifically students' home and community experience to build on prior knowledge and generate language including home language
- Engage in **three-dimensional learning**
- Build **coherence** (i.e., learning progressions) over time

Language

- Promote language use
- Support for ELLs at different levels of English proficiency

Assessment

- Assess 3-D science learning
- Assess language use

Unit 1: What Happens to Our Garbage?

5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen

5-PS1-2: Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved

5-PS1-3: Make observations and measurements to identify materials based on their properties

5-PS1-4: Conduct an investigation to determine whether the mixing of two or more substances results in new substances

5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost

Research and Development Plan

Research Sites

- One school district in California
- One school district in New Jersey

Development

Year 1 (2015-2016): Development of instructional materials with students and teachers, with limited field testing

Year 2 (2016-2017): Continued development and field testing of instructional materials

Year 3 (2017-2018): Field testing of instructional materials

Year 4 (2017-2018): Pilot study to investigate the impact of the intervention on teachers and students

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