SAN DIEGO STATE UNIVERSITY

Noyce Mathematics and Science Master Teaching Fellowship Project: Project Learn

Reception
Welcome!

March 10, 2014

SDSU Noyce Mathematics and Science Master Teaching Fellowship Project: Project Learn

Mathematics Educators	Science Educators
Randolph Philipp	**Donna Ross**
Lisa Lamb	Meredith Houle Vaughn
Susan Nickerson	Kathy Williams

Candace Cabral, Casey Hawthorne, Teresa Dunleavy

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SAN DIEGO STATE

College of Education

Science Teachers

QUALCOMM FOUNDATION

Private

La Mesa-Spring Valley School District

Every Child Learning Every Day

Middle School Teachers

SAN DIEGO UNIFIED SCHOOL DISTRICT

Grossmont Union

High School Teachers

Lakeside Union SCHOOL DISTRICT

Lakeside, California

NSF

SWEETWATER UNION HIGH SCHOOL DISTRICT

Public

Mathematics Teachers

SAN DIEGO STATE

College of Sciences

SDSU's Noyce Master Teaching Fellowship: Project Learn

Project Learn, SDSU Noyce

- Five-year project, 2013-2018
- 32 Mathematics and Science Master Teaching Fellows

Goals

To support the Fellows to

- improve already-exemplary classroom practices, and
- emerge into teacher leaders,

so that the Fellows can continue to support other teachers and students long after this project ends.

Fellows are Special!

- 126 applications for 32 Fellowships
- Applicants asked to demonstrate evidence of
  - Depth of content knowledge
  - Ability to identify and respond to students' mathematical and scientific thinking
  - Excellent teaching through submission of a video
  - Disposition as a learner who would contribute thoughtfully to a community of teachers

Intensive Professional Development

- Focus on students' content-specific understandings;
- Summer and Academic Year – 10 days per year
  - Examining Common Core Standards for Mathematics and Next Generation Science Standards,
  - Engaging in mathematics and science tasks,
  - Examining their own practice by sharing video clips in small-group and whole-group settings, and
  - Interviewing middle and high school students about their mathematical and scientific thinking;
- In between PD sessions, small group meetings and "homework."
- Work with colleagues

Emergence into Leadership Positions

- Serving as guide teachers for SDSU's student teachers;
- Serving as mentors for other teachers; and
- Attending and presenting at conferences.

Recap

- Application process was selective and rigorous. The Fellows are special!
- Fellows are emerging into leaders;
- Effort is collaborative and integrated across disciplines, districts, colleges, grade level, and funding sources;
- Support from district administrators is critical. Thank you!

Professional Development

The way we are currently teaching mathematics in the U.S. is problematic.

But our biggest long-term problem related to mathematics and science teaching in the United States is not how we teach now, but that we have no way of getting better.

-Stigler, J. W., & Hiebert, J. (1997). Understanding and improving classroom mathematics instruction: An Overview of the TIMMS Video Study. *Phi Delta Kappan* (September), 14-21.

Effective Professional Development

The most effective prospective and practicing teacher-learning experiences are

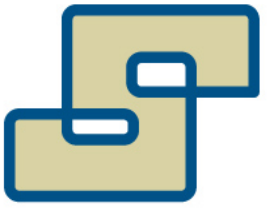
(a) content-focused,

(b) sustained,

(c) collaborative, and

(d) linked to children and classrooms

(Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Heller, Daehler, Wong, Shinohara, & Miratrix, 2011; Levine, 2006; Wilson & Berne, 1999).



STEP

STUDYING TEACHERS' EVOLVING PERSPECTIVES

Principal Investigators	Randy Philipp, PI Vicki Jacobs, co-PI
Faculty Associates	Lisa Clement Lamb Jessica Pierson Bishop
Graduate Student	John (Zig) Siegfried
Research Associate	Bonnie Schappelle
Project Coordinator	Candace Cabral
Student Assistants	Kelly Humphrey Jennifer Cumiskey

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STEP Participant Groups (*N*=129, 30+ per group)

K–3 Teachers

Emerging Teacher Leaders **ETLs**	At least 4 years of sustained professional development and some minimal leadership activities
Advancing Participants **APs**	2 years of sustained professional development
Initial Participants **IPs**	0 years of sustained professional development
Prospective Teachers **PSTs**	Undergraduates enrolled in a first mathematics-for-teachers content course

Average of 14–16 years of teaching per group; range 4–33 years

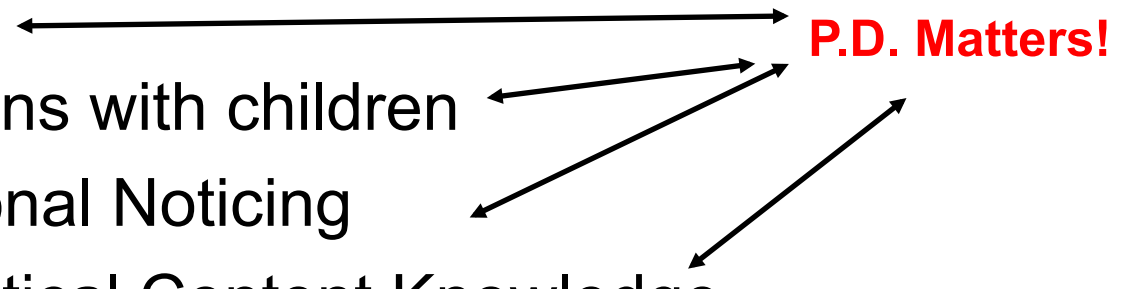
STEP
STUDYING TEACHERS' EVOLVING PERSPECTIVES

- Multi-year NSF-funded-project (2005–2012)

- Cross-sectional examination of the effects of sustained professional development focused on children's mathematical thinking

We are studying the perspectives of four groups of teachers:

- Beliefs
- Interactions with children
- Professional Noticing
- Mathematical Content Knowledge



Findings and Reflections

Beliefs about teaching ——— Beliefs about teaching

Beliefs about mathematics

Content items ——— Content items

Content (Ones, Andrew)

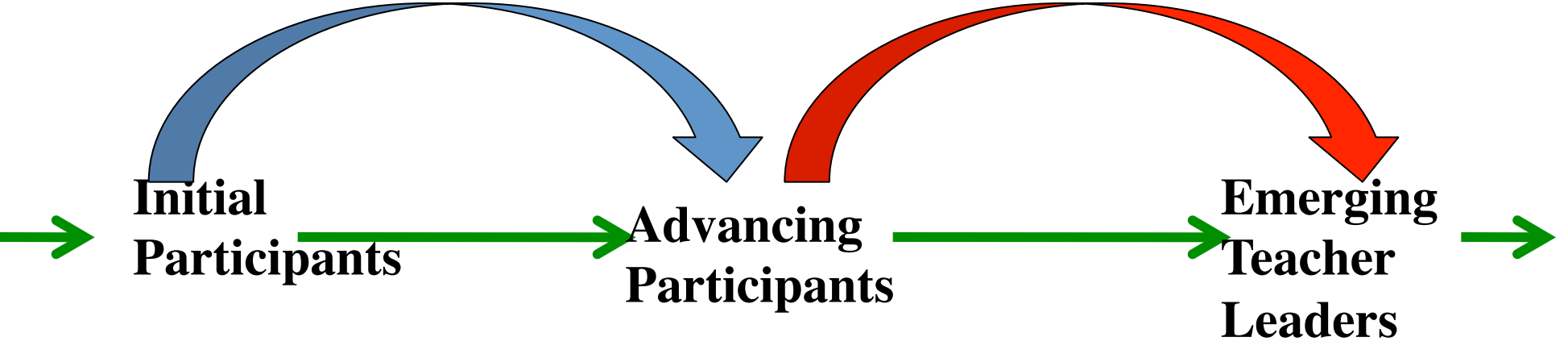
Content (Division)

Noticing: Attending

Noticing: Interpreting ——— Noticing Interpreting

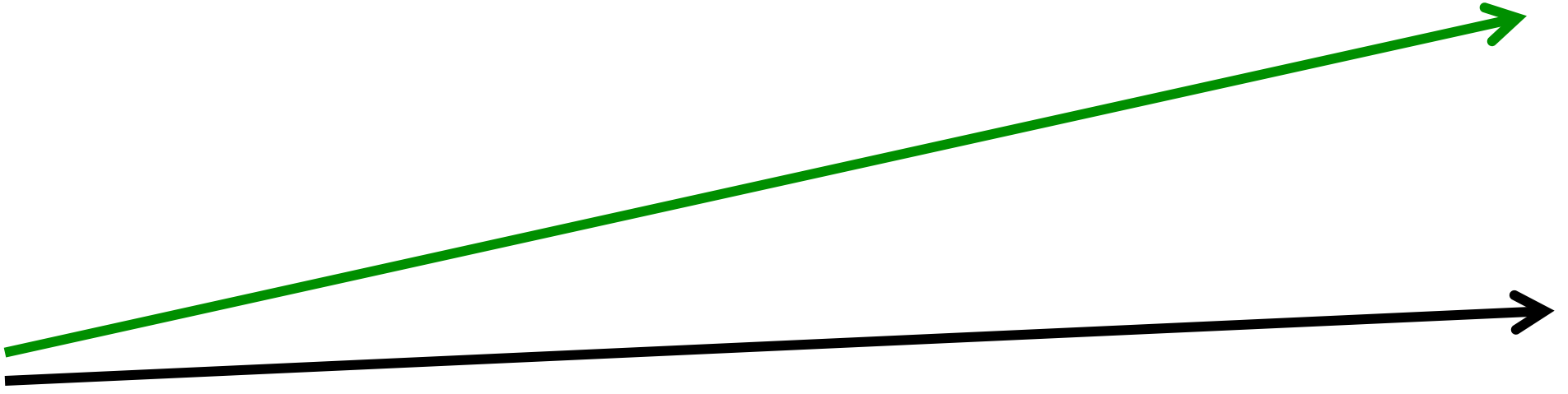
Noticing: Deciding how to Respond —— Noticing Deciding...Respond

Responsiveness



Findings and Reflections

Teachers' Growth Over Time



Key Points

- Experience Matters
- But not everything is learned just from experience
- Professional development is not just a pedagogical luxury
- *Growth* mindsets and *Fixed* mindsets about students learning (Dweck)
- Mindsets about teacher learning?

The Common Core State Standards
Eight Mathematical Practices

1) Make sense of problems and persevere in solving them.
2) Reason abstractly and quantitatively.
3) Construct viable arguments and critique the reasoning of others.
4) Model with mathematics.
5) Use appropriate tools strategically.
6) Attend to precision (in language and mathematics)
7) Look for and make use of structure.
8) Look for and express regularity in repeated reasoning.

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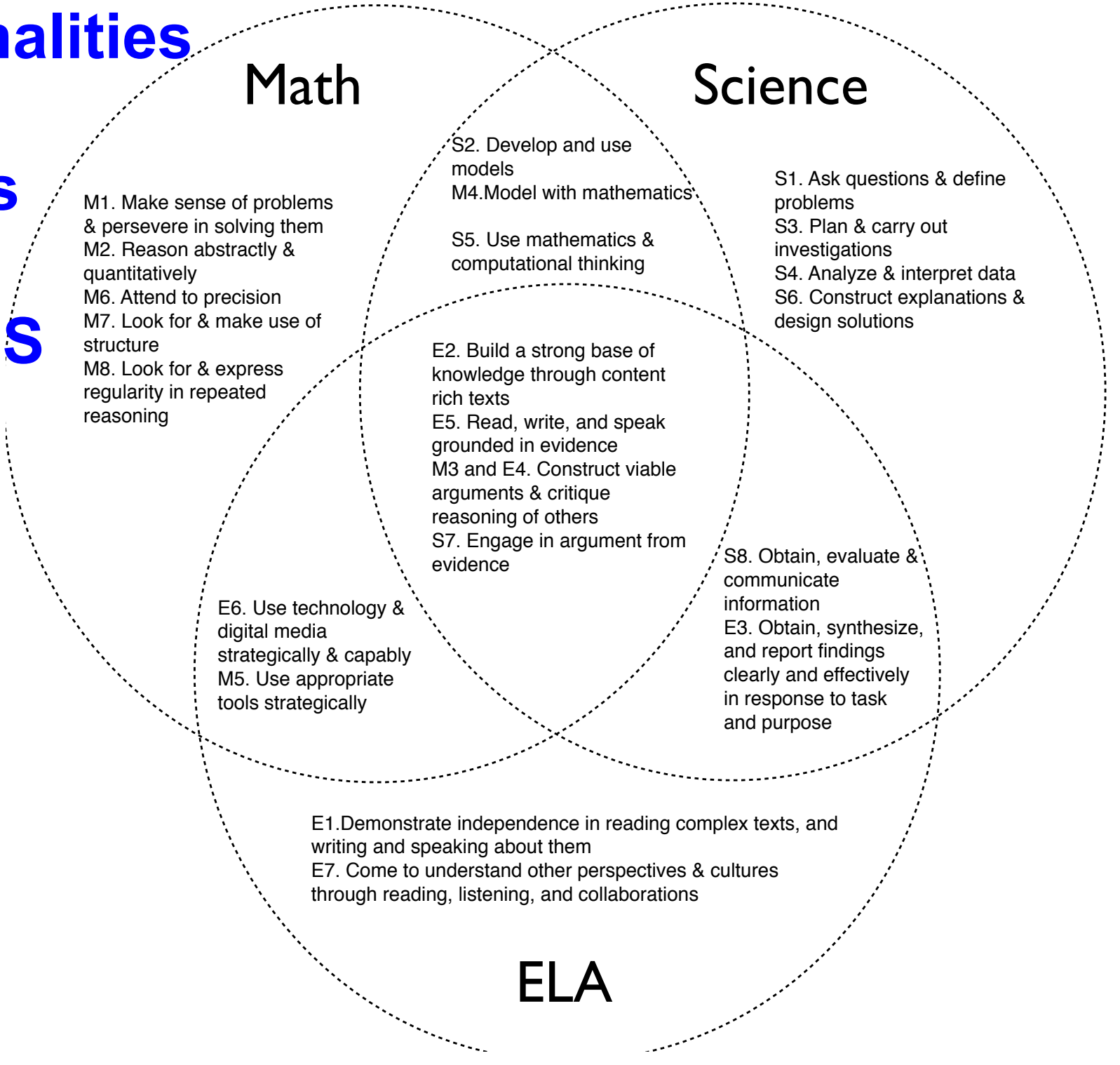
The 8 Science Practices of the Next Generation Science Standards (NGSS)

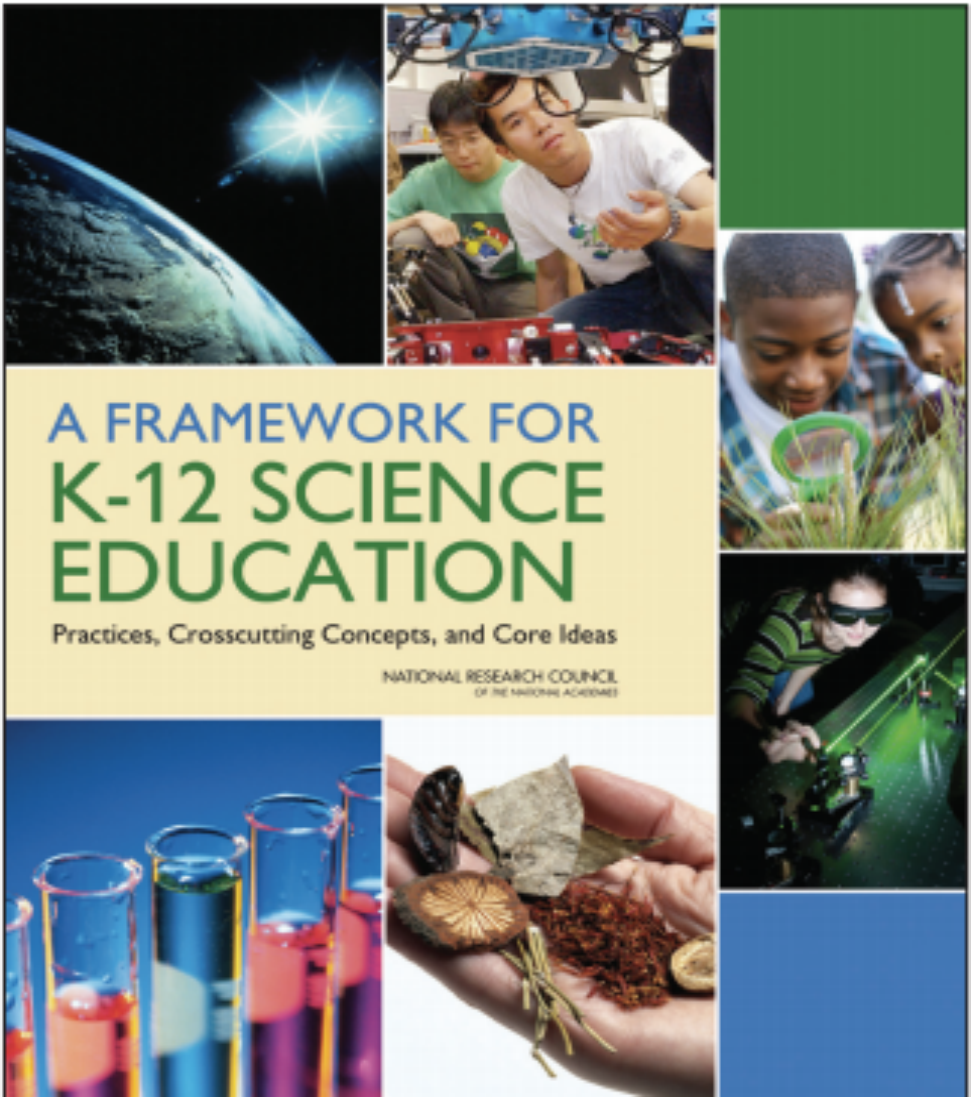
1) Ask questions and define problems
2) Develop and use models
3) Plan and carry out investigations
4) Analyze and Interpret Data
5) Use mathematics and computational thinking
6) Construct Explanations and Design Solutions
7) Engage in Argument from Evidence
8) Obtain, Evaluate, and Communicate Information

Commonalities between Practices in NGSS and CCSS



- **Next Generation Science Standards for Today's Students and Tomorrow's Workforce**

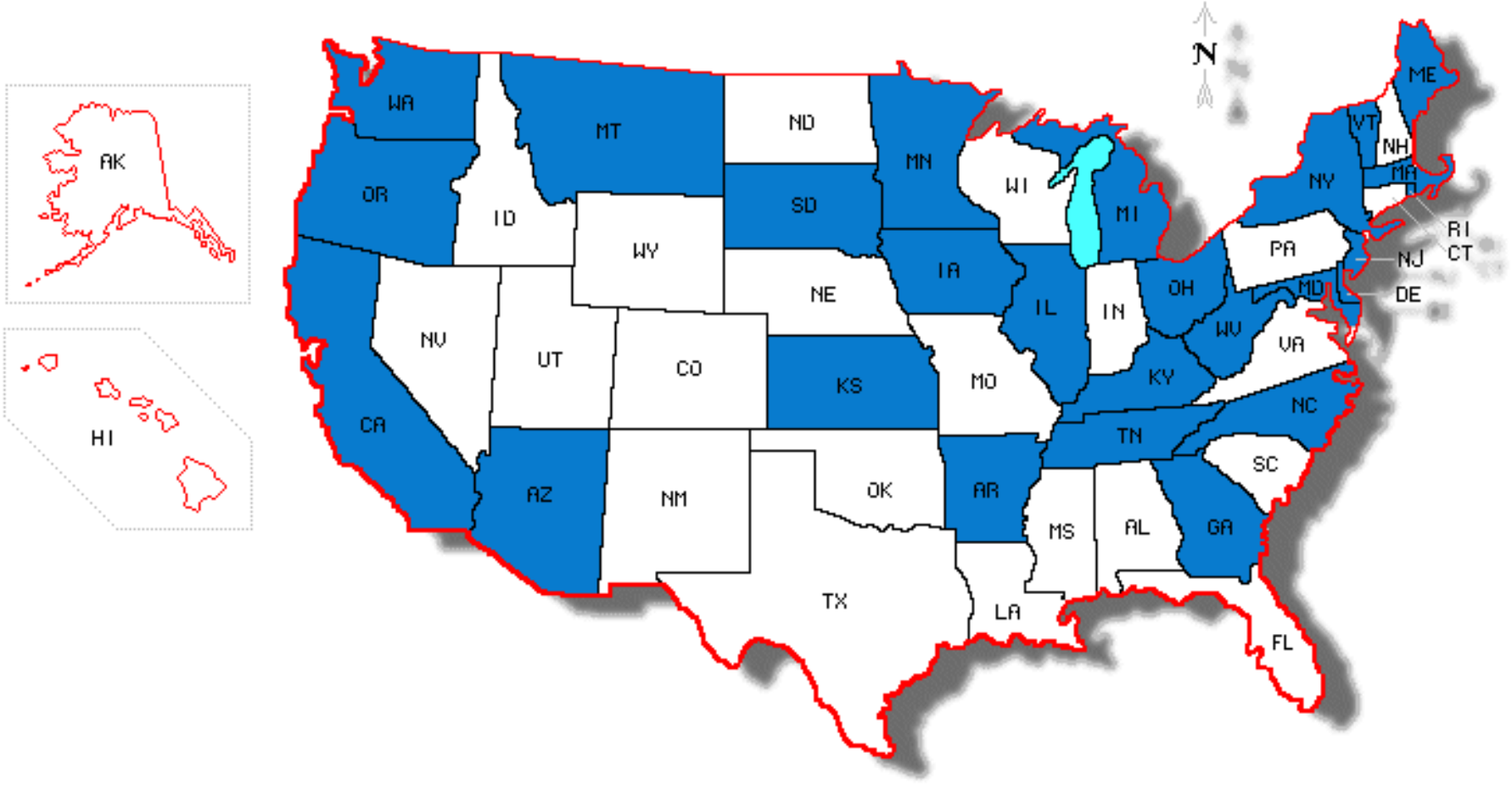
NEXT GENERATION SCIENCE STANDARDS



- Based on work done by the National Academies of Science and the National Research Council
- Honor the nature of science

NEXT GENERATION SCIENCE STANDARDS

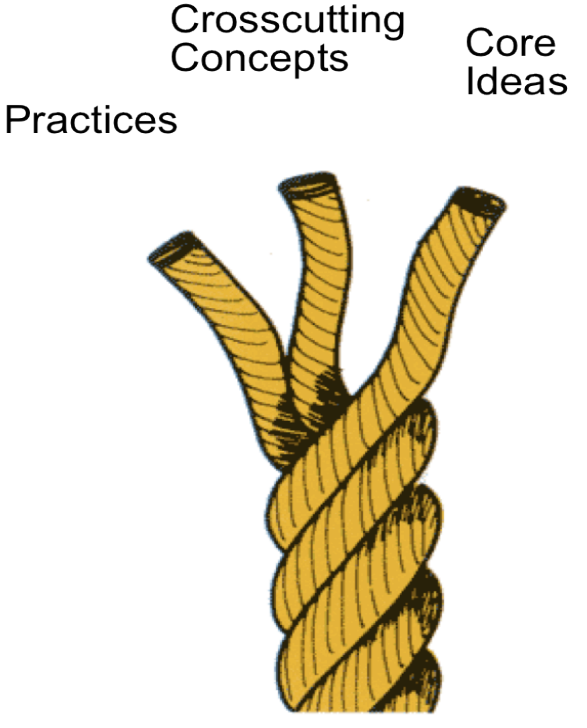
- 26 states participated in development (including CA)



NEXT GENERATION SCIENCE STANDARDS

Three Dimensions

- **Scientific and Engineering Practices**
- **Crosscutting Concepts**
- **Disciplinary Core Ideas**



NEXT GENERATION SCIENCE STANDARDS

- **California** SBE adopted NGSS in Fall 2013
- 2013-2014 Year of Awareness
- 2014-2016 Transition to Implementation
  - K-5 Integrates Life, Physical, Earth and Space, Engineering along with the practices and cross-cutting concepts
  - 6-8 Preferred model integrates Life, Physical, Earth and Space, Engineering along with the practices and cross-cutting concepts
  - 9-12 Local choice for integration or discipline-specific, along with the practices and cross-cutting concepts

SDSU Project Learn Noyce Teachers

- Leaders in examining own practice
- Transitioning to NGSS
- Focusing on student thinking and learning
- Supporting other teachers
- Recognizing the depth and complexity in science teaching and learning

Learning mathematics and science…

…is *doing* mathematics and science!

And now, a word from our Fellows…