INQUIRY SCIENCE

LANL
FOUNDATION

Investing in Learning & Human Potential

Presentation on the Next Generation Science Standards to the Legislative Education Study Committee

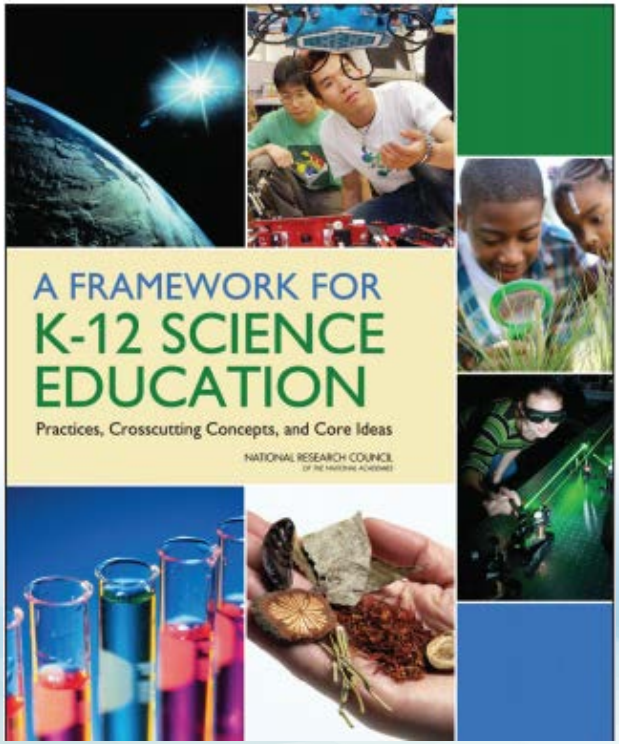
Gwen Perea Warniment

October 26, 2017

LANL FOUNDATION
Investing in Learning & Human Potential

ISEC! Inquiry Science Education Consortium
STEM LEARNING INITIATIVE

What is Inquiry?



K-12 science education should reflect the interconnected nature of science as it is practiced and experienced in the real world

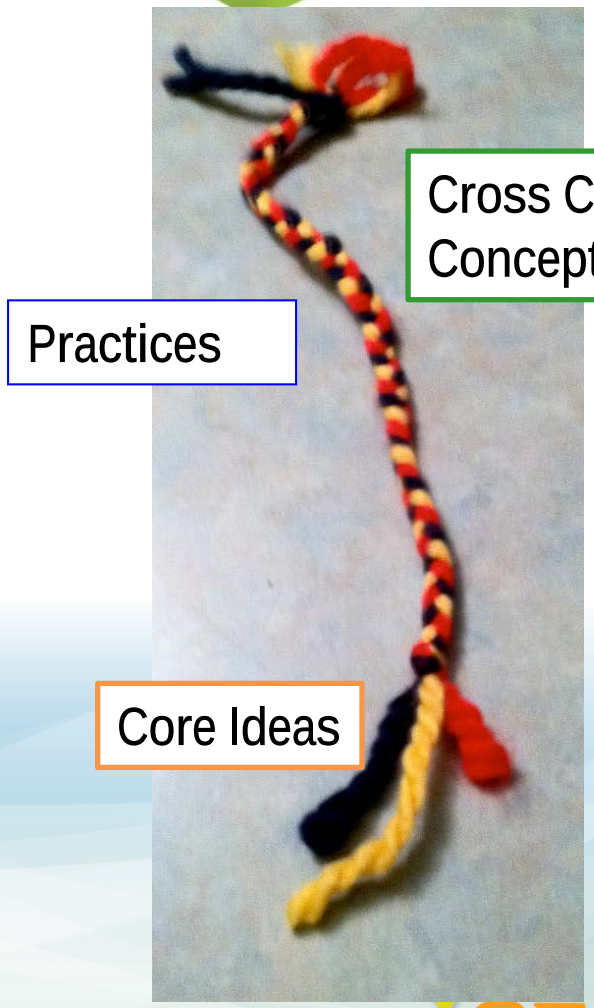
-NGSS – Appendix A

Three Dimensional Learning

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
The doing of science and engineering.	*The knowing of significant ideas that are* **learnable** *over multiple grades at increasing levels of depth and sophistication.*	*The using of intellectual tools that apply to the study of any phenomena.*

NGSS Architecture

- The 3 dimensions will be incorporated into *every standards statement.*
- Engineering is more prominent
- Science is updated
- Progression of learning revised throughout multiple years



LANL FOUNDATION
Investing in Learning & Human Potential

Inquiry Science Education Consortium
STEM LEARNING INITIATIVE

Scientific and Engineering Practices

1. **Asking questions and defining problems**
2. **Developing and using models**
3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. **Using mathematics and computational thinking**
6. **Developing explanations and designing solutions**
7. **Engaging in argument from evidence**
8. **Obtaining, evaluating, and communicating information**

Crosscutting Concepts

1. **Patterns** – organization and classification
2. **Cause and effect** – mechanism and explanation
3. **Scale, proportion, and quantity** - recognize what is relevant
4. **Systems and system models** – define the system under study
5. **Energy and matter** - flows, cycles and conservation
6. **Structure and function** – determine properties of things
7. **Stability and change** – determine rate of change or evolution

3-PS2 Motion and Stability: Forces and Interactions

3-PS2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

3-PS2-1. **Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.** [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]

3-PS2-2. **Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.** [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]

3-PS2-3. **Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.** [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]

3-PS2-4. **Define a simple design problem that can be solved by applying scientific ideas about magnets.*** [Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]

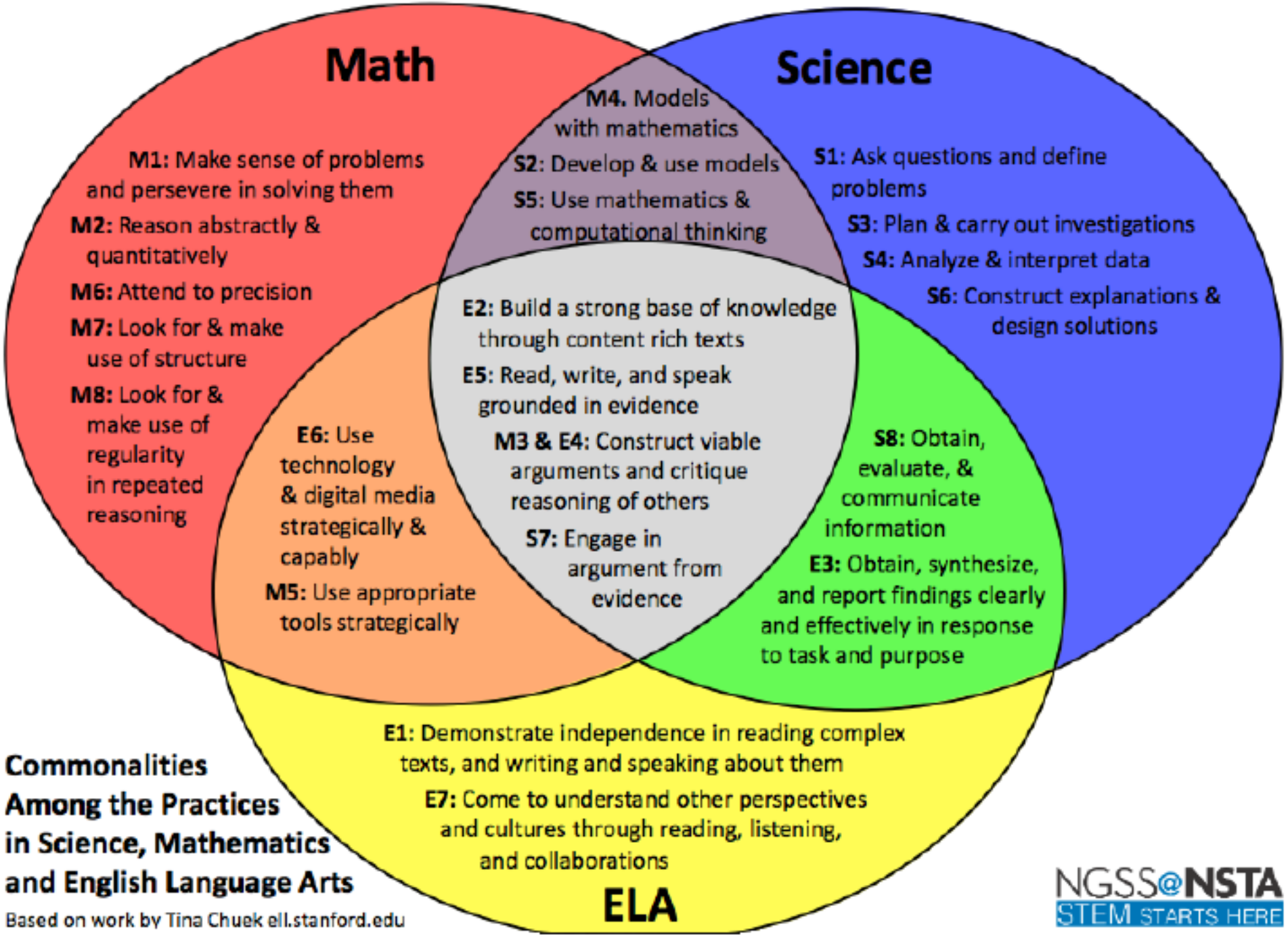
The performance expectations above were developed using the following elemen

FULL NGSS

LANL FOUNDATION
Investing in Learning & Human Potential

NEXT GENERATION SCIENCE STANDARDS

Education Consortium
STEM LEARNING INITIATIVE



Commonalities Among the Practices in Science, Mathematics and English Language Arts

Based on work by Tina Chuek ell.stanford.edu

NGSS@NSTA
STEM STARTS HERE

Implementation

LANL FOUNDATION
Investing in Learning & Human Potential

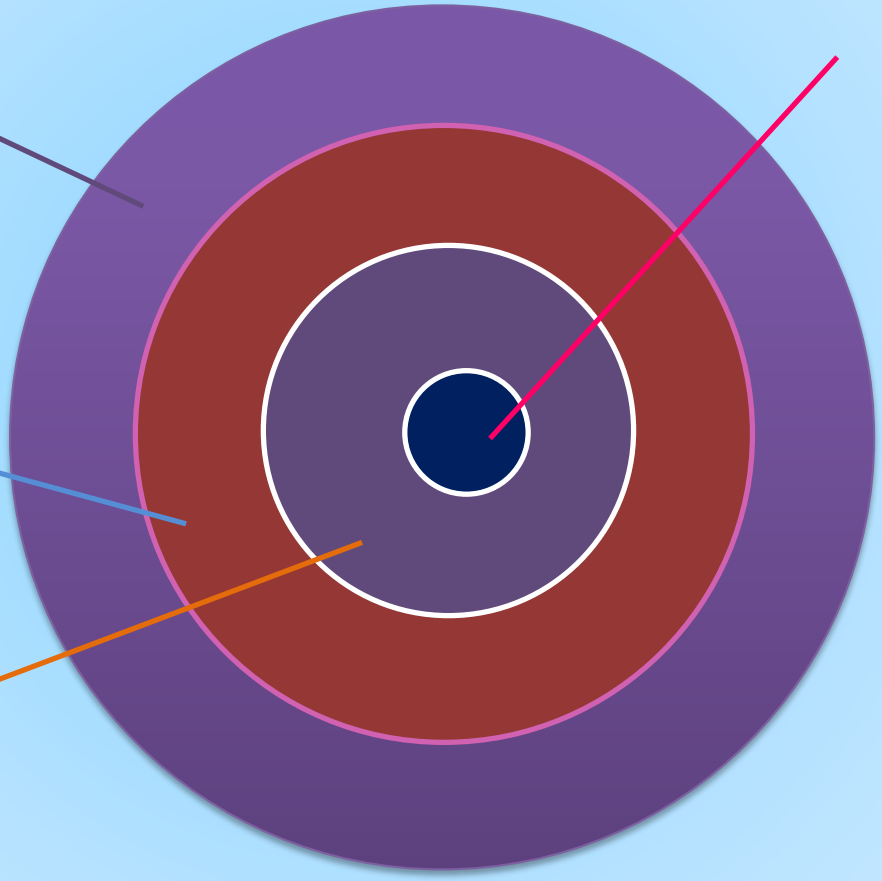
ISEC! Inquiry Science Education Consortium
STEM LEARNING INITIATIVE

Goals

Communication and Professional Learning

Reflective Practice with Systems of Support

Assessment from the "Bottom Up"



Equity:

Long-term Outcomes--Scientifically Literate Community and Well-Prepared Workforce

THREE STATE MODELS

WASHINGTON STATE

LANL FOUNDATION
Investing in Learning & Human Potential

ISEC!
Inquiry Science Education Consortium
STEM LEARNING INITIATIVE

Washington State Next Generation Science Standards Transition Planning Document

PHASE 1	PHASE 2	PHASE 3	PHASE 4
Spring 2014	2014 - 2015	2015 - 2016	2016 - 2017
Exploration, Awareness, and Statewide Capacity Building	Classroom Transitions, Equity and Practices	Leveraging Resources, Materials and Expertise	Statewide Application, Assessment and Coordination

ONGOING STATEWIDE COORDINATION AND COLLABORATION TO SUPPORT

Elements, Leads, and Tasks				
Communication (OSPI, State Science Leadership Team, LASER)				
Develop messages	General outreach on shifts	Ongoing messaging		
Statewide Capacity/Network Building (OSPI Programs; State Science Leadership Team)				
Identify existing expertise and gaps	Develop NGSS support networks	Ongoing support of leadership network		
Professional Learning (OSPI Programs; State Science Leadership Team, ESD Regional Science Coordinators, STEM teachers, Administrators, Informal/Community Educators)				
Identify Professional Learning needs (teachers, administrators, and community educators)	Professional Learning designed for all stakeholders	Professional Learning Implemented for teachers and administrators	Professional Learning Implemented for informal/community educators and ongoing adaptation of Professional Learning	
Instructional Practices/Shifts (OSPI Programs; State Science Leadership Team, ESD Regional Science Coordinators, STEM teachers)				
Focus on equity and integrating Science and Engineering Practices	Continued focus on equity and integrating SEPs and Cross Cutting Concepts	Integration of three dimensions (SEPs, CCCs, and DCIs)	Instructional shifts in place	
Instructional Materials and Curriculum (OSPI Programs; State Science Leadership Team, ESD Regional Science Coordinators, LASER)				
Evaluate existing materials	Adapt existing materials and explore (e) Innovations	Evaluate placement of kit materials and leverage materials and curriculum	Develop/evaluate new materials	
Assessment (OSPI)				
Analyze/align existing state assessment with NGSS (to the extent feasible)	Focus on classroom and formative assessment	Participate in multi-state assessment consortium with NGSS adopted states		
Data Collection (OSPI)				
Determine metrics to be tracked (e.g. course taking, student achievement, STEM identity, etc.)	Develop data collection plan	Track and report science related data		
Policy Shifts (OSPI, SBE, PESB, Legislature)				
Identify policy changes necessary to implement NGSS (e.g. PESB Teacher competencies, assessment)	Secondary Pathways; PESB Competencies	Assessment Piloting		

OREGON

LANL FOUNDATION
Investing in Learning & Human Potential

Inquiry Science Education Consortium
STEM LEARNING INITIATIVE

Year	Month	Work
2014	January	• ODE and Science Panel develop NGSS adoption, transition, professional development (PD), and implementation planning recommendations • State Board conducts first read of the NGSS and considers recommendations
2014	February	• ODE and Science Panel continue work on NGSS adoption, transition, PD, and implementation planning recommendations
2014	March/April	• State Board conducts NGSS second and third read and adoption vote • ODE and Science Panel continue work on NGSS transition, PD, and implementation planning
2014	May/June	• ODE and Science Panel develop NGSS transition, implementation, and PD plans • Develop budget and secure funding for PD • Develop systematic communication plan to raise awareness in educational and local communities • Include NGSS in existing summer PD and statewide conferences
2014	Summer	• PD on NGSS awareness and integration with Common Core State Standards • ODE and Science Panel develop PD, lessons, units, and formative assessments
2014	Fall-Winter	• Provide regional PD to Professional Learning Teams (Administrators, Lead Teachers, Early Adopters) • ODE and Science Panel develop PD, lessons, units, formative assessments
2015	Spring-Summer	• Follow up regional Professional Learning Teams PD • ODE and Science Panel develop PD, lessons, units, and formative assessments • ODE conducts NGSS Field Test
2015	Fall-Winter	• PD for all teachers and administrators • Pilot lessons, units, and formative assessments
2016	Spring-Summer	• Follow up PD for all teachers and administrators • Refine lessons, units, and formative assessments • ODE conducts NGSS Field Test
2016	Fall-Winter	• NGSS lessons, units, and work sample scoring rubric used statewide • ODE conducts NGSS Pilot Test • ODE and Science Panel provide ongoing NGSS transition and implementation support
2017	Spring-Summer	• ODE conducts NGSS Field Test • ODE and Science Panel provide ongoing NGSS transition and implementation support
2017	Fall-Winter	• ODE and Science Panel provide ongoing NGSS transition and implementation support
2018	Spring-Summer	• ODE staff lead development of NGSS Performance Level Descriptors, Standard Setting (Cut-Scores Determination), and Rubric Validation
2018	Fall-Winter	• SBE Adoption Process for NGSS Performance Level Descriptors and Cut Scores (Standard Setting) • ODE conducts NGSS Operational Test • ODE and Science Panel provide ongoing NGSS implementation support
2019	Winter-Spring	• NGSS Adopted Performance Level Descriptors and Cut Scores are in effect in Oregon schools

ARKANSAS

LANL FOUNDATION
Investing in Learning & Human Potential

Inquiry Science Education Consortium
STEM LEARNING INITIATIVE


Science Standards Timeline
2013
2014
2015
2016
2017
2018
AR Became NGSS Lead State: 2011
NGSS Released April 2013
SBE Endorses NGSS April 2014
Framework for K-12 Science Education PD
Provide School-level Support/Tools
Implementation Grades K-4 August 2016
Continue Communication Plan
Implementation Grades 5-8 August 2017
Implementation High School August 2018
2019
2012
Framework for K-12 Science Education PD
Curriculum and Instruction Aligned to AR Framework
NGSS Review Committee June 2013
Implement Communication Plan
AR Science Assessments Continue
Course Revision Committee Fall 2014
PD to Support New Standards and Assessments
Implement Science Assessment Revision Plan
Curriculum and Instruction
Assessment
Professional Development

Key Points

- Strategic and Thoughtful: Between 3-5 Years
- Attend to Horizontal Coherency
  - Professional Learning & Practice
  - Curriculum & Materials
  - Assessment & Feedback Loops
- Attend to Vertical Coherency
  - Cycles of Continuous Improvement

Other Salient Points

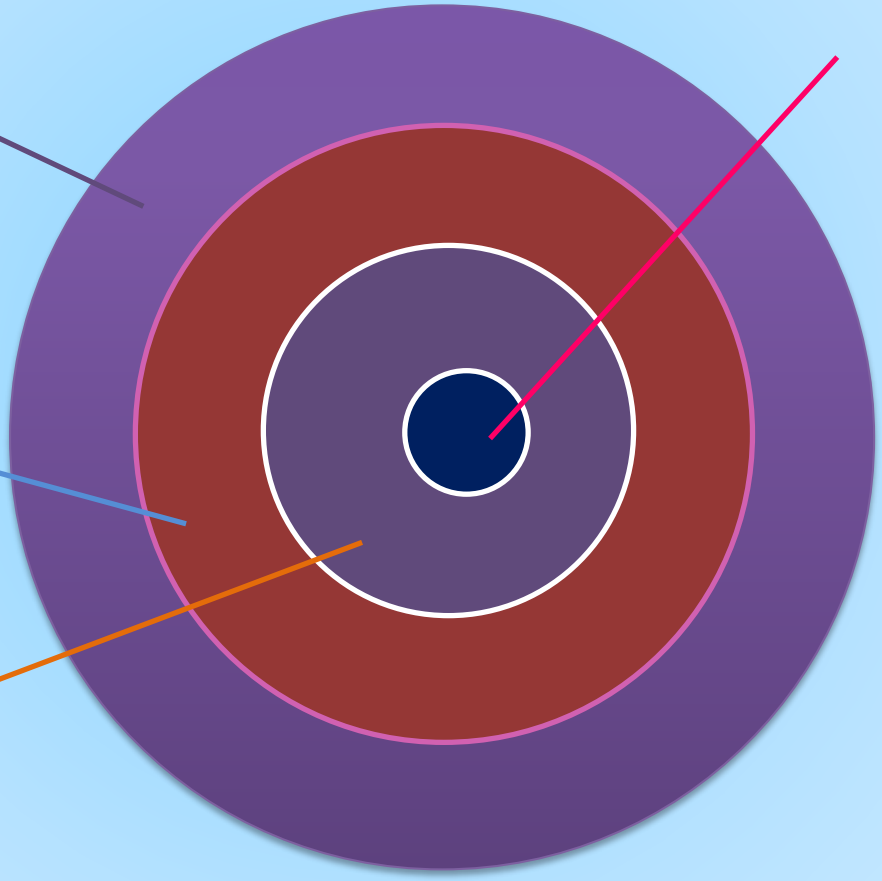
- Networks and Partnerships
  - State Partners
  - Industry
  - Regional Partners
  - National Partners
- Leadership is KEY
- Mind the New Mexico Context

Goals

Communication and Professional Learning

Reflective Practice with Systems of Support

Assessment from the "Bottom Up"



Equity:

Long-term Outcomes--Scientifically Literate Community and Well-prepared Workforce

What does this look like?

- Deep understanding of shifts called for in the NGSS
- Materials and Curriculum Planning
- Collective effort that recognizes systems support classroom efficacy
- Teacher Leadership in tandem with District and State Leadership
- On-going, Agile and Responsive Professional Learning
- Assessment offers clarity when understood and used correctly
- Community Engagement

Questions?

LANL FOUNDATION
Investing in Learning & Human Potential

Northern New Mexico
INQUIRY SCIENCE!
EDUCATION CONSORTIUM