

Rate Your Familiarity with the NM STEM Ready! Science Standards

On a scale of 1 to 4,

1. I have little/no awareness of the NM STEM Ready! science standards.
2. I have some knowledge of the NM STEM Ready! science standards.
3. I have begun planning how to implement the NM STEM Ready! science standards
4. I am already using the NM STEM Ready! science standards.



**Discover the
NM STEM Ready! Science Standards**

February 28, 2018

Patricia Carden, Math Specialist

Shafiq Chaudhary, Math & Science Specialist

What is your role?

Please choose which role best describes you:

- Teacher
- Instructional Coach
- School Administrator
- District Administrator
- Other (type role in the chat box)

Today's goals for the NM STEM Ready! science standards

- Gain knowledge and awareness about their development and structure.
- Understand the innovations.
- Learn about upcoming professional learning.

Today's goals for the NM STEM Ready! science standards

- **Gain knowledge and awareness about their development and structure.**
- Understand the innovations.
- Learn about upcoming professional learning.

Development of the Next Generation Science Standards (NGSS)



Previous national science education efforts

Adapted from NSTA web seminar: Karen Ostlund and Stephen Pruitt, *Introduction to the NGSS Second Public Draft*, January 2013

NM STEM Ready! Science Standards

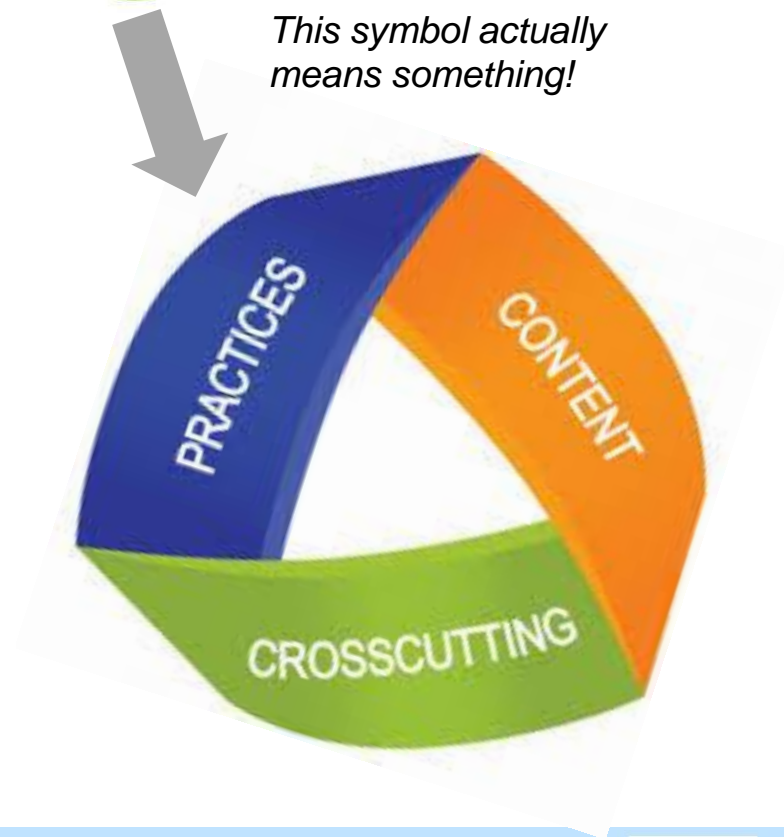


Together, the NGSS in their entirety,
plus the New Mexico 6
specific standards comprise the
NM STEM Ready! science standards.

The 3 Dimensions of the NGSS



This symbol actually means something!



Adapted from NSTA

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Christopher N. Ruszkowski
Secretary-Designate of Education

How to Read the Standards?

MS-PS1-4 Matter and its Interactions

Students who demonstrate understanding can:

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to predict and/or describe phenomena.

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.

PS3.A: Definitions of Energy

- The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (*secondary*)
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (*secondary*)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems.

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.]

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (2-LS2-1)
- Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to 2-LS2-2)

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **K.LS1.C** (2-LS2-1); **K.ESS3.A** (2-LS2-1); **K.ETS1.A** (2-LS2-2); **5.LS1.C** (2-LS2-1); **5.LS2.A** (2-LS2-2)

Common Core State Standards Connections:

ELA/Literacy –

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. (2-LS2-1)

MP.4 Model with mathematics. (2-LS2-1),(2-LS2-2)

MP.5 Use appropriate tools strategically. (2-LS2-1)

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS2-2)

Today's goals for the NM STEM Ready! science standards

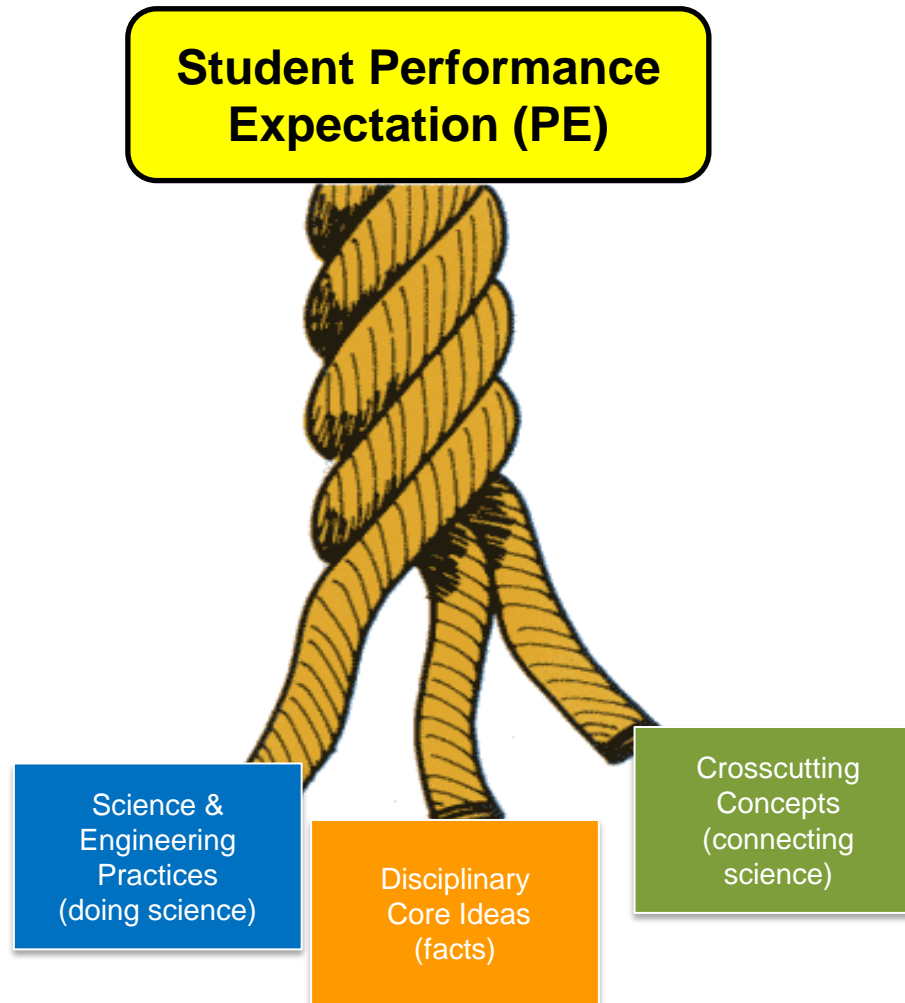
- Gain knowledge and awareness about their development and structure.
- **Understand the innovations.**
- Learn about upcoming professional learning.

Five Innovations of the NM STEM Ready! Science Standards

- **Innovation 1.** K-12 science education reflects three-dimensional learning.
- **Innovation 2.** NGSS standards are expectations of student performance.
- **Innovation 3.** NGSS incorporates engineering and the nature of science as practices and crosscutting concepts.
- **Innovation 4.** Science and engineering practices, disciplinary core ideas, and crosscutting concepts build coherent learning progressions from K to 12.
- **Innovation 5.** NGSS provides connections to Common Core State Standards for English Language Arts and Mathematics.

(Bybee, 2015)

Innovation 1: 3-Dimensional Learning



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Christopher N. Ruszkowski
Secretary-Designate of Education

Innovation 2: Performance Expectations

Performance expectations state what students should be able to do in order to demonstrate that they have met the standard.

-from EQuIP (2016)

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

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Students who demonstrate understanding can:

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.]

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices

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Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (2-LS2-1)
- Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to 2-LS2-2)

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **K.LS1.C** (2-LS2-1); **K.ESS3.A** (2-LS2-1); **K.ETS1.A** (2-LS2-2); **5.LS1.C** (2-LS2-1); **5.LS2.A** (2-LS2-2)

Common Core State Standards Connections:

ELA/Literacy –

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2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS2-2)

Disciplinary Core Ideas

Physical Science

- PS1: Matter and its interactions
- PS2: Motion and stability: Forces and interactions
- PS3: Energy
- PS4: Waves and their applications in technologies for information transfer

Disciplinary Core Ideas

Life Science

- LS1: From molecules to organisms: Structures and processes
- LS2: Ecosystems: Interactions, energy, and dynamics
- LS3: Heredity: Inheritance and variation of traits
- LS4: Biological evolution: Unity and diversity

Disciplinary Core Ideas

Earth and Space Science

- ESS1: Earth's place in the universe
- ESS2: Earth's systems
- ESS3: Earth and human activity

Disciplinary Core Ideas

Engineering, Technology, and Application of Science

- ETS1: Engineering design
- ETS2: Links among engineering, technology, science, and society

Crosscutting Concepts

1. Patterns
2. Cause and Effect
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter in Systems
6. Structure and Function
7. Stability and Change of Systems

Science and Engineering Practices

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

Innovation 3: Incorporating Engineering

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

| 2-LS2 Ecosystems: Interactions, Energy, and Dynamics | | |
|--|--|---|
| Students who demonstrate understanding can: | | |
| 2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.] | | |
| 2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.* | | |
| The performance expectations above were developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i> . | | |
| <p style="text-align: center;">Science and Engineering Practices</p> <p>Developing and Using Models Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</p> <ul style="list-style-type: none"> Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2) <p>Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</p> <ul style="list-style-type: none"> Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1) | <p style="text-align: center;">Disciplinary Core Ideas</p> <p>LS2.A: Interdependent Relationships in Ecosystems</p> <ul style="list-style-type: none"> Plants depend on water and light to grow. (2-LS2-1) Plants depend on animals for pollination or to move their seeds around. (2-LS2-2) <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people. (secondary to 2-LS2-2) | <p style="text-align: center;">Crosscutting Concepts</p> <p>Cause and Effect</p> <ul style="list-style-type: none"> Events have causes that generate observable patterns. (2-LS2-1) <p>Structure and Function</p> <ul style="list-style-type: none"> The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2) |
| <i>Connections to other DCIs in second grade:</i> N/A | | |
| <i>Articulation of DCIs across grade-levels:</i> K.LS1.C (2-LS2-1); K.ESS3.A (2-LS2-1); K.ETS1.A (2-LS2-2); 5.LS1.C (2-LS2-1); 5.LS2.A (2-LS2-2) | | |
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| <i>ELA/Literacy –</i> | | |
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| <i>Mathematics –</i> | | |
| MP.2 | Reason abstractly and quantitatively. (2-LS2-1) | |
| MP.4 | Model with mathematics. (2-LS2-1),(2-LS2-2) | |
| MP.5 | Use appropriate tools strategically. (2-LS2-1) | |
| 2.MD.D.10 | Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS2-2) | |

Innovation 4: Learning Progressions

Life Science Progression

INCREASING SOPHISTICATION OF STUDENT THINKING

| | K-2 | 3-5 | 6-8 | 9-12 |
|---------------------------------|---|---|--|---|
| LS1.A Structure and function | All organisms have external parts that they use to perform daily functions. | Organisms have both internal and external macroscopic structures that allow for growth, survival, behavior, and reproduction. | All living things are made up of cells. In organisms, cells work together to form tissues and organs that are specialized for particular body functions. | Systems of specialized cells within organisms help perform essential functions of life. Any one system in an organism is made up of numerous parts. Feedback mechanisms maintain an organism's internal conditions within certain limits and mediate behaviors. |

Innovation 5: Connections to Common Core

2-LS2 Ecosystems: Interactions, Energy, and Dynamics

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| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
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| <p>Developing and Using Models Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</p> <ul style="list-style-type: none"> Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2) <p>Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.</p> <ul style="list-style-type: none"> Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1) | <p>LS2.A: Interdependent Relationships in Ecosystems</p> <ul style="list-style-type: none"> Plants depend on water and light to grow. (2-LS2-1) Plants depend on animals for pollination or to move their seeds around. (2-LS2-2) <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people. (secondary to 2-LS2-2) | <p>Cause and Effect</p> <ul style="list-style-type: none"> Events have causes that generate observable patterns. (2-LS2-1) <p>Structure and Function</p> <ul style="list-style-type: none"> The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2) |

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade levels: ~~KL-ESS-1.C (2-LS2-1), K-ESS3.A (2-LS2-1), K-ETS1.A (2-LS2-2), J-ESS1.C (2-LS2-1), J-ESS2.A (2-LS2-2)~~

Common Core State Standards Connections:

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W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1)

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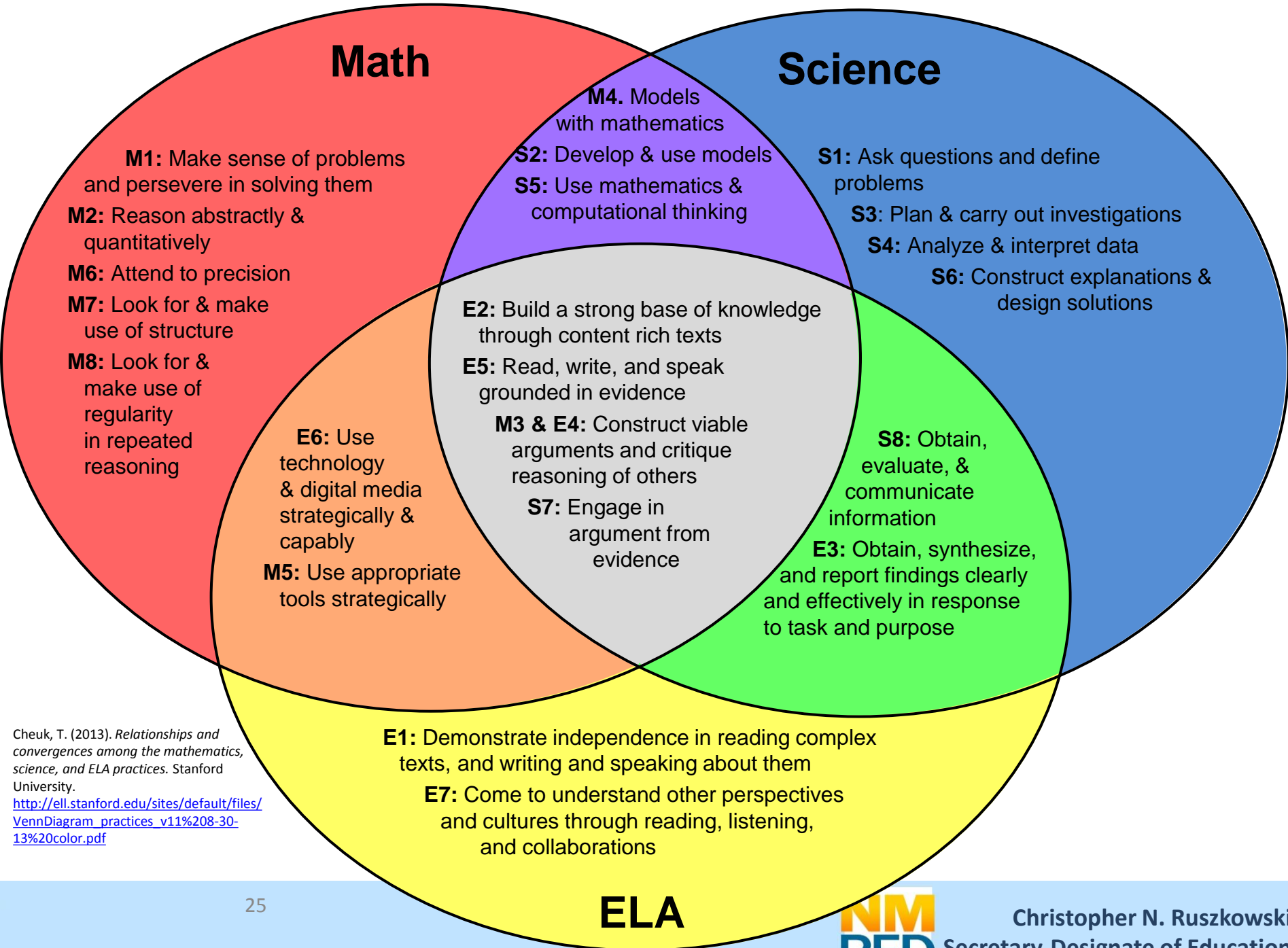
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MP.4 Model with mathematics. (2-LS2-1), (2-LS2-2)

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Cheuk, T. (2013). *Relationships and convergences among the mathematics, science, and ELA practices*. Stanford University.
http://ell.stanford.edu/sites/default/files/VennDiagram_practices_v11%208-30-13%20color.pdf

Today's goals for the NM STEM Ready! science standards

- Gain knowledge and awareness about their development and structure.
- Understand the innovations.
- **Learn about upcoming professional learning.**

Questions?

What is the official timeline for implementation of the new science standards?

“Our STEM Community working together for kids”



Standards

Current New Mexico state science standards taught in all grades

Professional Learning

Teacher/administrator professional learning on new science standards should include:

- Classroom instructional shifts
- 3-Dimensional structure
- Content knowledge
- Exemplar units

Curriculum & Instruction

- New instructional materials identified, developed, and reviewed
- **Educator** working groups recommend secondary course maps
- Exemplar grade level units are made available in Spring 2018



Standards

New Mexico STEM Ready! science standards take effect for all grades

Professional Learning

Continued **teacher/administrator** professional learning on new science standards should include:

- Classroom instructional shifts
- 3-Dimensional structure
- Content knowledge
- Exemplar units
- Formative assessments

Curriculum & Instruction

- State approved instructional materials available



Standards

New Mexico STEM Ready! science standards taught in all grades

Professional Development

On-going **teacher/administrator** professional learning on new science standards should include:

- Classroom instructional shifts
- 3-Dimensional structure
- Content knowledge
- Exemplar units
- Formative assessments

Curriculum & Instruction

- NM STEM Ready! science aligned instruction occurring in all classrooms
- NM summative assessment in Spring 2020

January 23, 2018

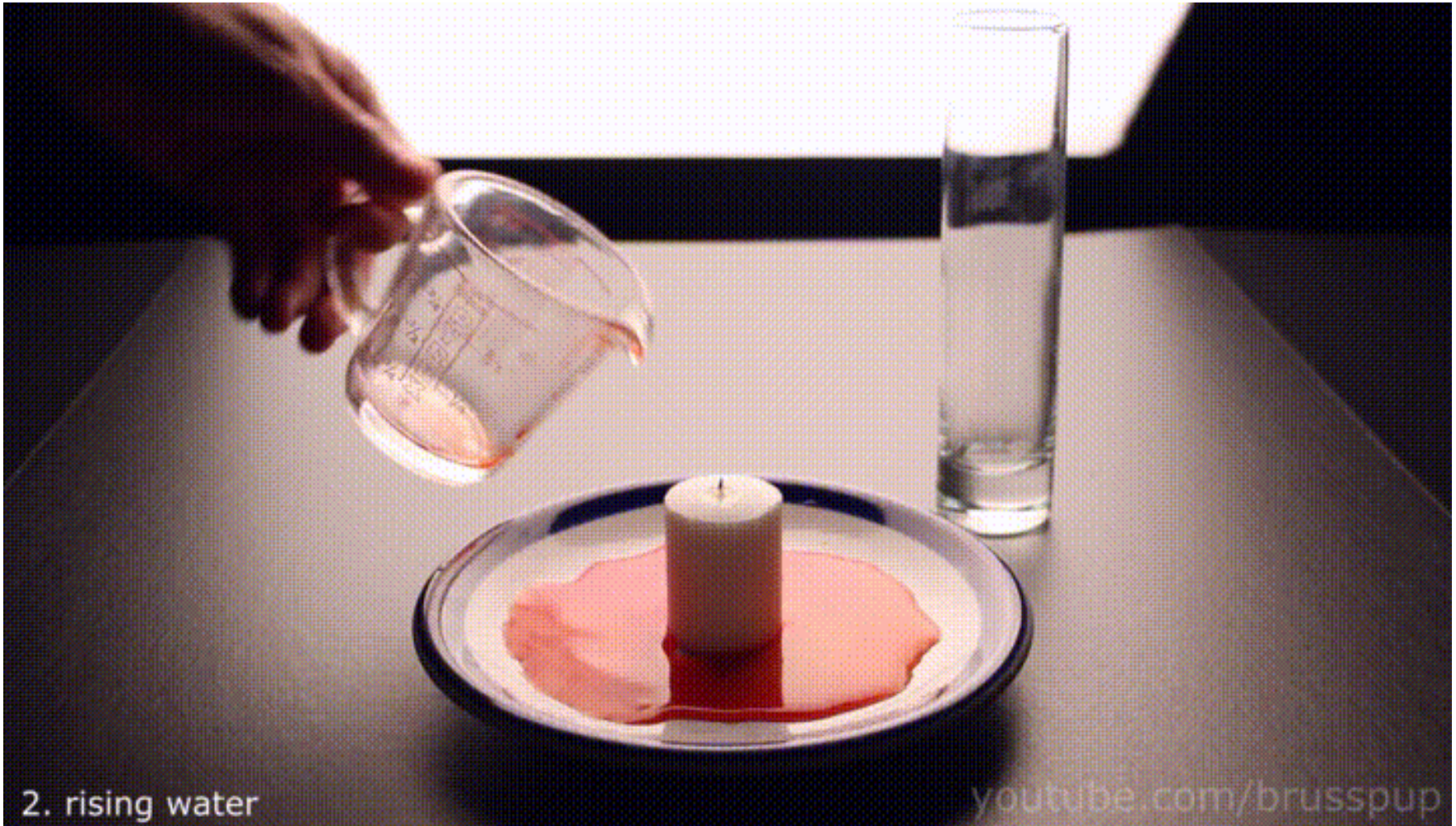
Upcoming Professional Learning Opportunities

- Webinars
- STEM Symposium
- Making Sense of SCIENCE
- [Instructional Materials](#)

Professional Learning:

<http://webnew.ped.state.nm.us/bureaus/math-science/professional-learning/>

Phenomena



2. rising water

[youtube.com/brusspup](https://www.youtube.com/brusspup)

Rate Your Familiarity with the NM STEM Ready! Science Standards

On a scale of 1 to 4,

1. I have some awareness of the NM STEM Ready! science standards.
2. I have gained knowledge of the NM STEM Ready! science standards.
3. I can start planning how to implement the NM STEM Ready! science standards.
4. I am ready for implementing NM STEM Ready! science standards.

Next Steps

Feedback Survey:

<https://www.surveymonkey.com/r/2LJ3JLS>

Next Webinar:

March 2018. Please visit the [Math and Science Bureau's Professional Learning page](#) for updated information.

Resources

Math and Science Bureau NM STEM Ready!
science page:

<http://webnew.ped.state.nm.us/bureaus/math-science/nm-stem-ready-science/>

Webinars:

<http://webnew.ped.state.nm.us/bureaus/math-science/nm-stem-ready-science/videos-and-webinars/>

Contact Information

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Shafiq Chaudhary, Math and Science Specialist

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References

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