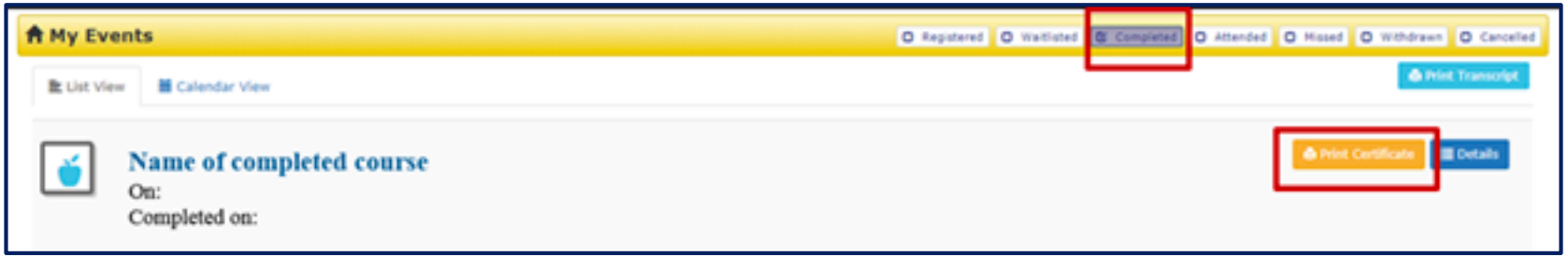
WELCOME!

Please review this information while we wait for all to join!

Attendance, Resources & PD Clock Hours

- **You must stay on the whole time- 1 hour- to receive credit**
- **YOU print your certificate through ADE Connect- please wait 24-48 hours of webinar before printing certificates**



- **AFTER WEBINAR- you will receive PDF of presentation and resource page**

Professional Development Opportunity:

Webinar: Constructing Explanations & Arguing from Evidence using Claims, Evidence, & Reasoning (CER)

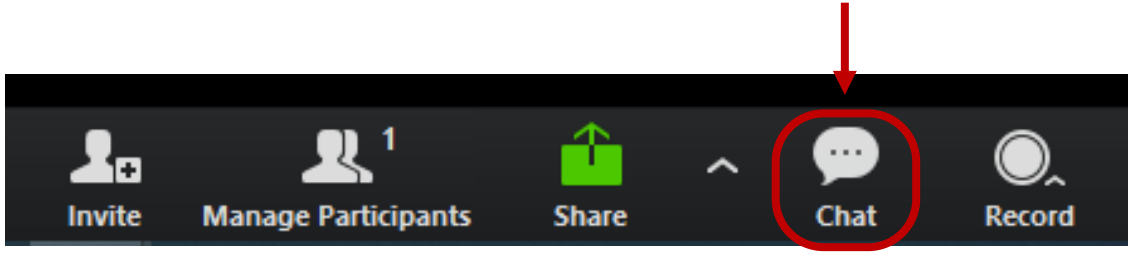
Dates offered: August 18th | August 25th | August 27th
4:00-5:00pm
Registration- FREE!
Register here: https://bit.ly/2AtlPRx

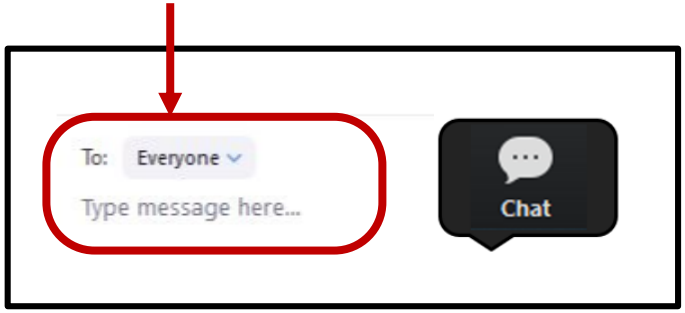
Hi!

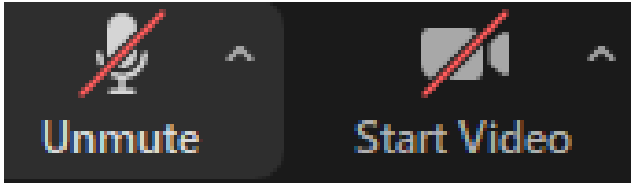
I'm Rebecca Garelli

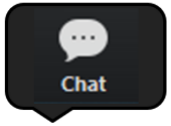
ADE K-12 Science & STEM Specialist

Webinar Housekeeping





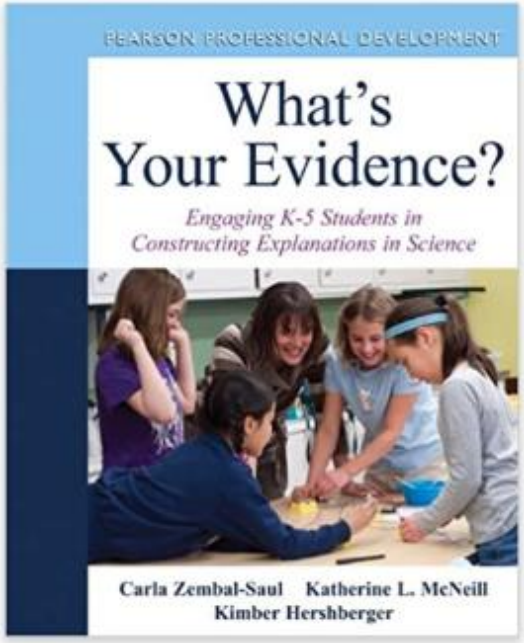




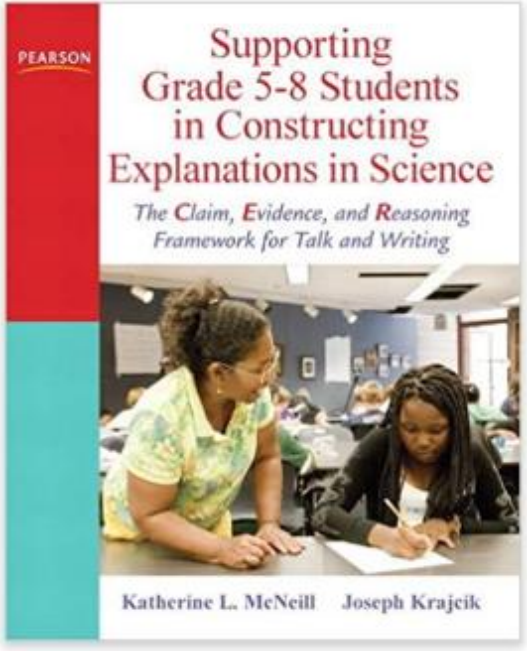
1. What is your current position or job title?

2. Have you had a chance to look at the new Arizona State Science Standards?

Recommended Books:



K-5



5-8

K-12

Goals:

- Gain a better understanding of the **instructional shifts** needed for three-dimensional science instruction and how this relates to the AzSS

- Explore the differences and connections between two of the Science & Engineering Practices (SEPs)- Constructing Explanations & Arguing from Evidence

- Learn how to engage students in speaking and writing like scientists through using a strategy called “Claims, Evidence, Reasoning (CER)”

NEW AZ Science Standards Comfort Level

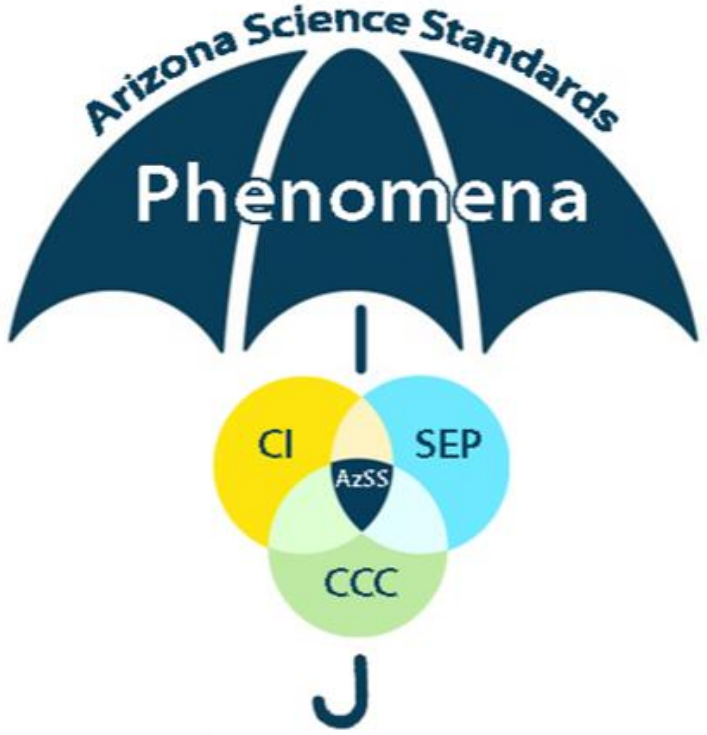
Chat

1- What?! We have new standards?!?

2- I've glanced at them….

3- In the process of transitioning…

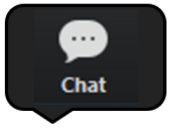
4- I am fully implementing them!



Overview of Shifts

What would you see less of?

What would you see more of?



Read the 4 boxes that connect to what we will discuss today- as we move forward in our learning, think about what aspects might be challenging for students.
Jot down one idea in chat.

SCIENCE EDUCATION WILL INVOLVE LESS:	SCIENCE EDUCATION WILL INVOLVE MORE:
Rote memorization of facts and terminology	Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based arguments and reasoning.
Learning of ideas disconnected from questions about phenomena	Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned
Teachers providing information to the whole class	Students conducting investigations, solving problems, and engaging in discussions with teachers' guidance
Teachers posing questions with only one right answer	Students discussing open-ended questions that focus on the strength of the evidence used to generate claims
Students reading textbooks and answering questions at the end of the chapter	Students reading multiple sources, including science-related magazine and journal articles and web-based resources; students developing summaries of information.
Pre-planned outcome for "cookbook" laboratories or hands-on activities	Multiple investigations driven by students' questions with a range of possible outcomes that collectively lead to a deep understanding of established core scientific ideas
Worksheets	Student writing of journals, reports, posters, and media presentations that explain and argue
Oversimplification of activities for students who are perceived to be less able to do science and engineering	Provision of supports so that all students can engage in sophisticated science and engineering practices

SEPs

The core ideas of Knowing science (CIs)

CCCs

Arizona Science Standards unique Using Science (CIs)

AzSS Snapshot: What You Should See Students "Doing," "Thinking," "Knowing," and "Using" in Science

A Framework/Big Ideas for K-12 Science Instruction's 3-Dimensions and AzSS Using Science

DO — Dimension 1: The Science and Engineering Practices

1. Asking questions and defining ns (p. 54)*
2. Developing and using mode (p.
3. Planning and carrying out investi ns (p. 59)*
4. Analyzing and interpreting data ( )*
5. Using mathematics and computa l thinking (p. 64)*
6. Constructing explanations and lutions (p. 67)*
7. Engaging in argument from evidence (p. 71)*
8. Obtaining, evaluating, and communicating information (p. 74)*

THINK — Dimension 2: The Crosscutting Concepts

1. Patterns (p. 85)*
2. Cause and effect (p. 87)*
3. Scale, proportion, and quantity
4. Systems and system model 1)*
5. Energy and matter (p. 9
6. Structure and function (p. 96)*
7. Stability and change (p. 98)*

KNOW — Dimension 3: The Core Ideas of Knowing S ence and The Core Ideas of Using Science

he Core Ideas of Knowing Science

P: Physical Science (p. 105)*

P1: All matter in the Universe is made of very small particles. (p. 20)**
P2: Objects can affect other objects at a distance. (p. 21)**
P3: Changing the movement of an object requires a net force to be ac it. (p. 22)**
P4: The total amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event. (p. 23)**

E: Earth and Space Science (p. 171)*

E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface a climate. (p. 24)**
E2: The Earth and our solar system are a very small part of one of many galaxies within the Universe. (p. 25)**

L: Life Science (p. 142)*

L1: Organisms are organized on a cellular basis and have a finite life span. (p. 26)**
L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms. (p. 27)**
L3: Genetic information is passed down from one generation of organisms to another. (p. 28)**
L4: The unity and diversity of organisms, living and extinct, is the result of

he Core Ideas of Using Science

U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. (p. 30 & 31)**

U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. (p. 32)**

U3: Applications of science often have ethical, social, economic, and/or political implications. (p. 23)**

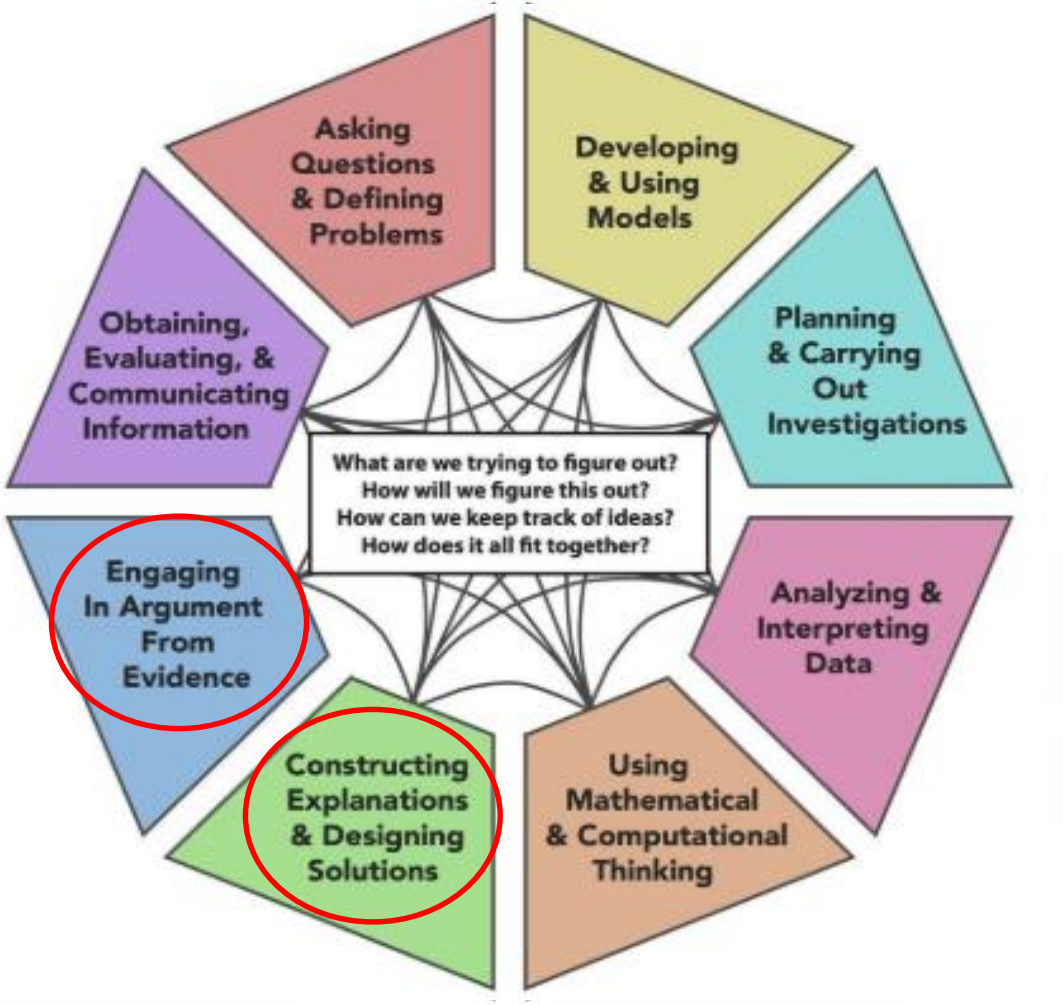
*A Framework for K-12 Science Education **Working with Big Ideas of Science Education

Updated: 3/4/20

Science and Engineering Practices

Dimension 1
What we do

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. Constructing Explanations and Designing Solutions
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating, and Communicating Information



Schwarz, C. V., Passmore, C. M., & Reiser, B. J. (2017). Moving beyond "knowing" science to making sense of the world. In C. V. Schwarz, C. M. Passmore & B. J. Reiser (Eds.), *Helping students make sense of the world through next generation science and engineering practices* (pp. 3-21). Arlington, VA: NSTA Press.

Examples of AzSS with These Two SEPs

K.L2U1.8

Observe, ask questions, and explain the differences between the characteristics of living and non-living things.

1.L2U1.8

Construct an explanation describing how organisms obtain resources from the environment including materials that are used again by other organisms.

2.E1U3.7

Construct an argument from evidence regarding positive and negative changes in water and land systems that impact humans and the environment.

5.P2U1.3

Construct an explanation using evidence to demonstrate that objects can affect other objects even when they are not touching.

7.L2U1.12

Construct an explanation for how some plant cells convert light energy into food energy.

8.E1U3.8

Construct and support an argument about how human consumption of limited resources impacts the biosphere.

Essential HS.P4U1.8

Engage in argument from evidence that the net change of energy in a system is always equal to the total energy exchanged between the system and the surroundings.

Essential HS.P2U1.5

Construct an explanation for a field's strength and influence on an object (electric, gravitational, magnetic).

Goals:

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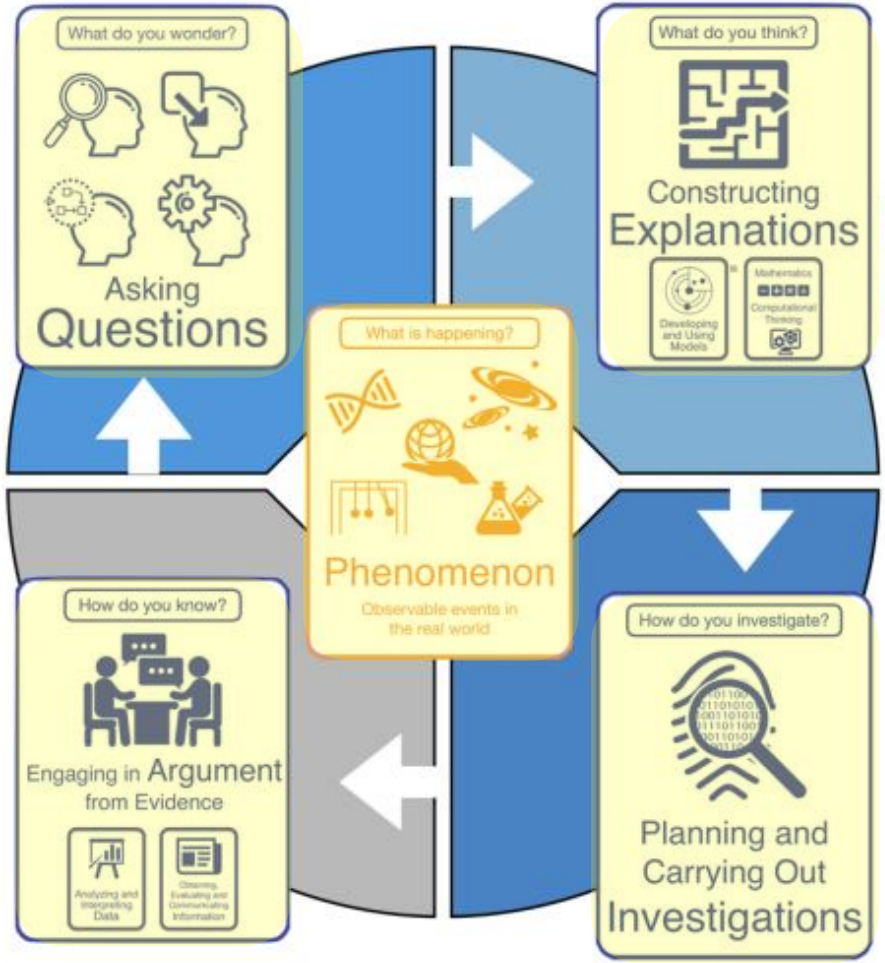
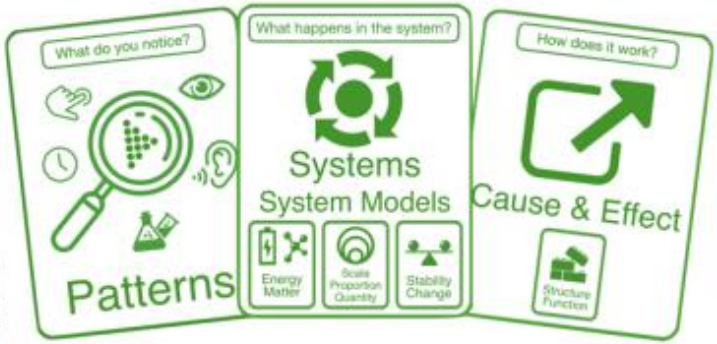


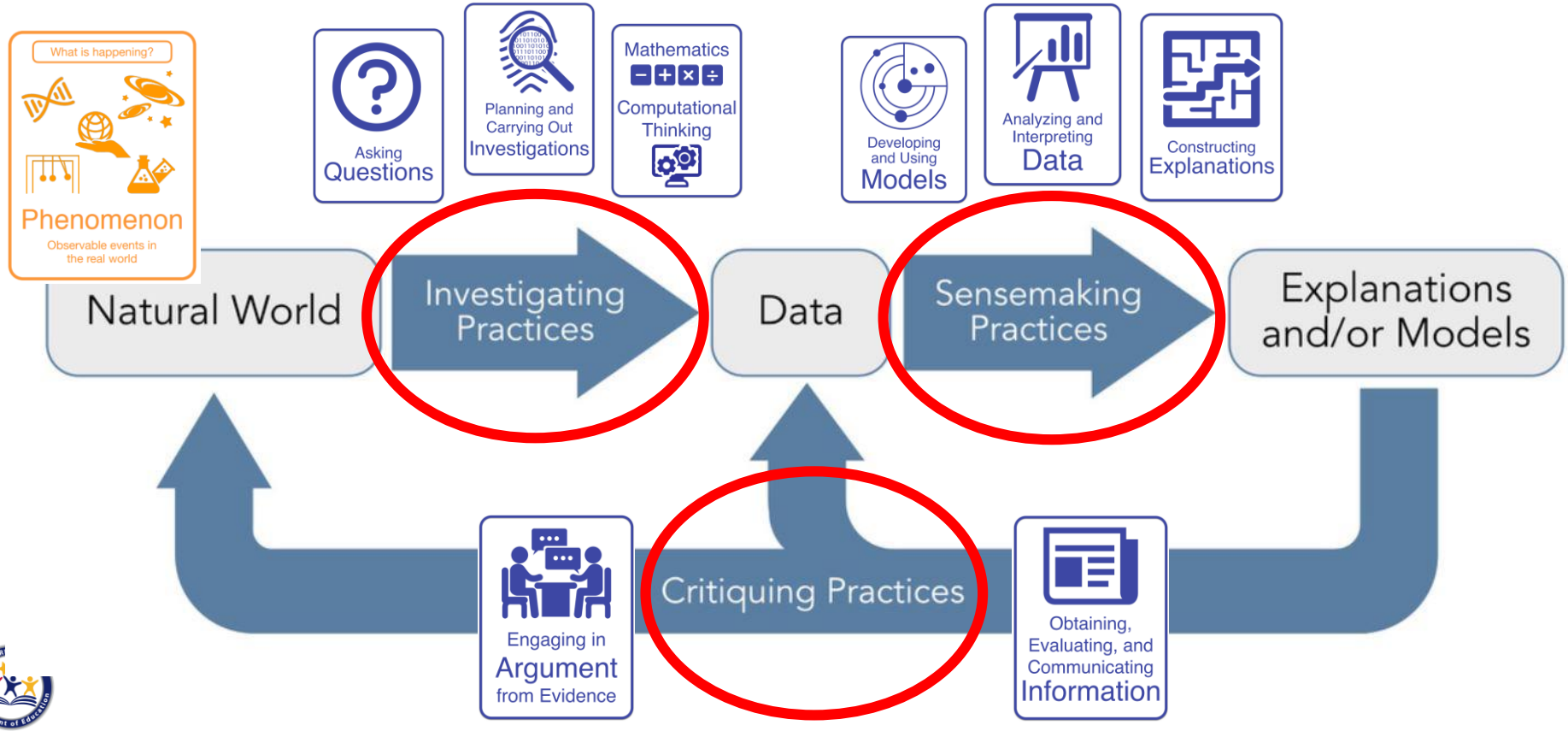


Scientific Inquiry

[Scientific Inquiry Poster](#)

[Scientific Inquiry Cards](#)

Grouping the Practices



3 Categories of Science & Engineering Practices

Investigating Practices

1. Asking Questions

3. Planning & Carrying Out Investigations

5. Using Mathematical & Computational Thinking

Sensemaking Practices

2. Developing & Using Models

4. Analyzing & Interpreting Data

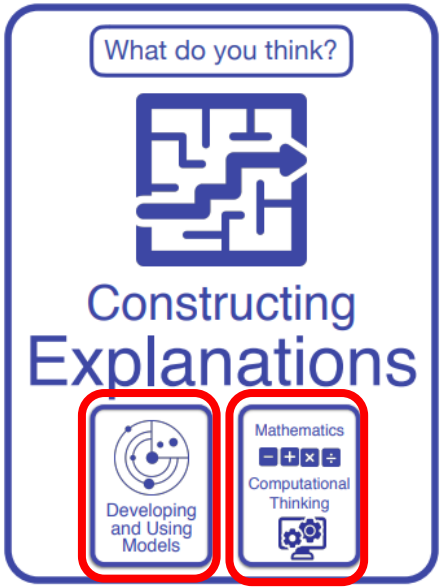
6. Constructing Explanations

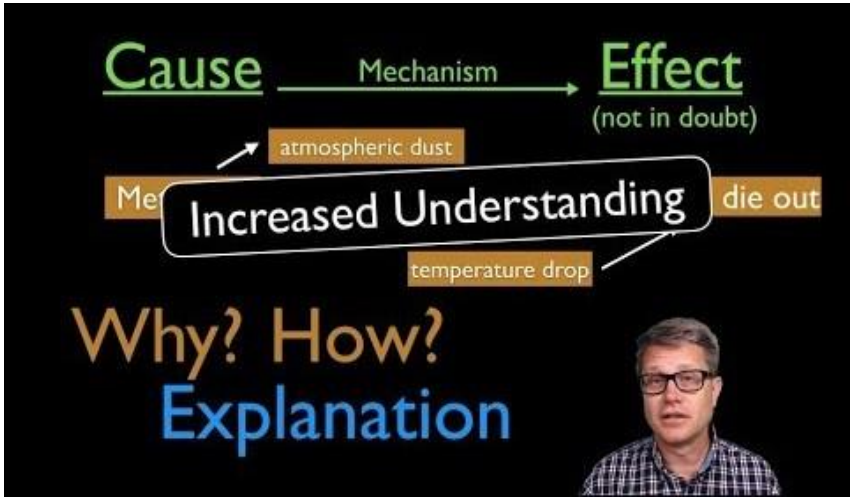
Critiquing Practices

7. Engaging in Argument from Evidence

8. Obtaining, Evaluating, & Communicating Information

SEP 6: Constructing Explanations Video





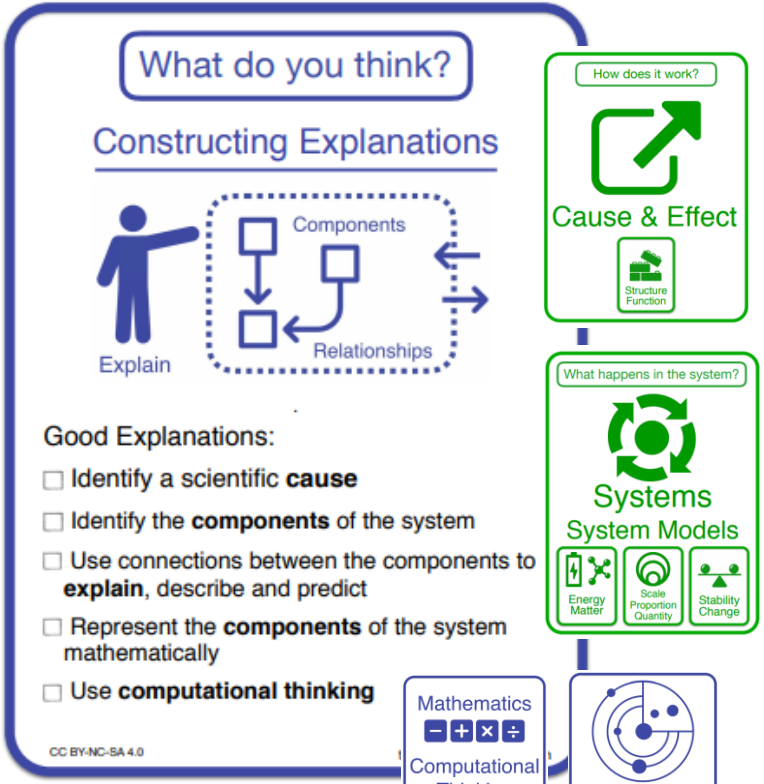
Sensemaking Practices

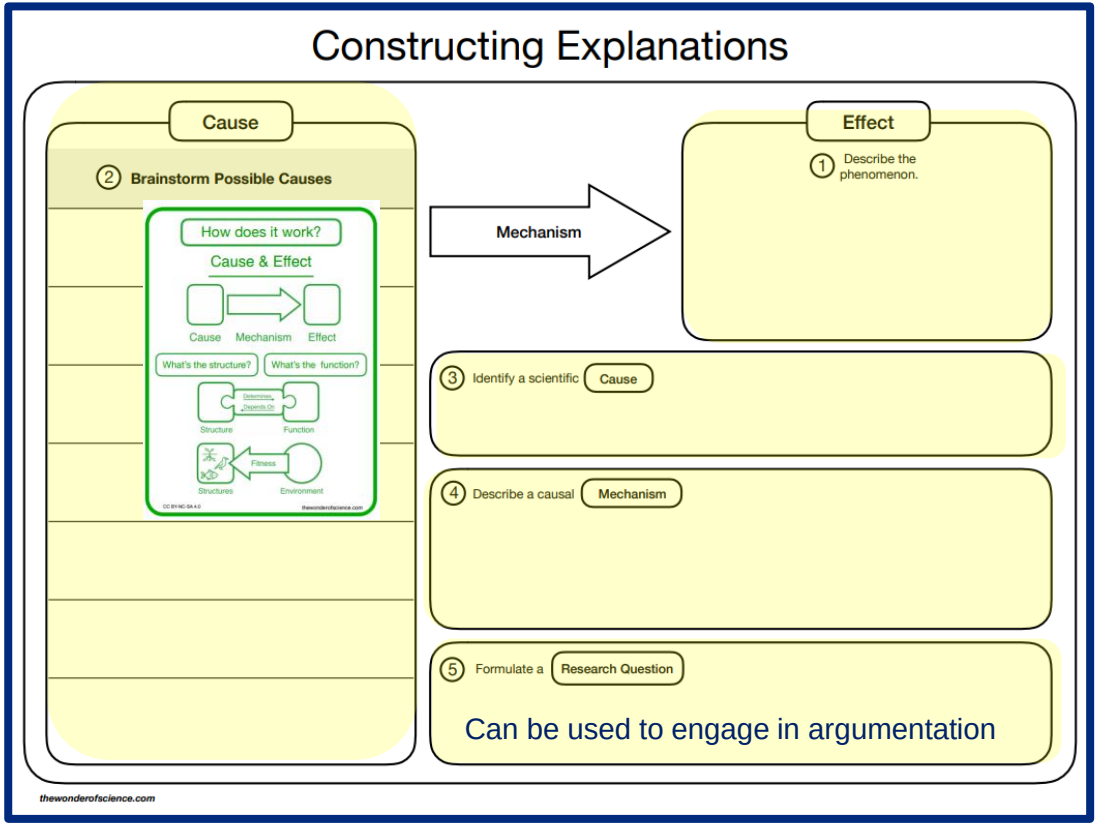
- 2. Developing & Using Models
- 4. Analyzing & Interpreting Data
- 6. Constructing Explanations

Chat

What resonated with you MOST about this SEP?
What *new* learning occurred for you?

SEP 6: Constructing Explanations Summary





PDF Version

Google Drawing Version

How does this relate to our standards?

What does this look like in the classroom?

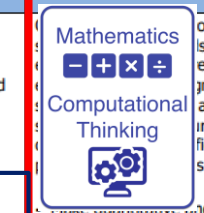
*Each bullet is called an element

*Can be used as objectives

K-12 Science and Engineering Practices* Progression Matrix of Elements

For use with *Arizona Science Standards*

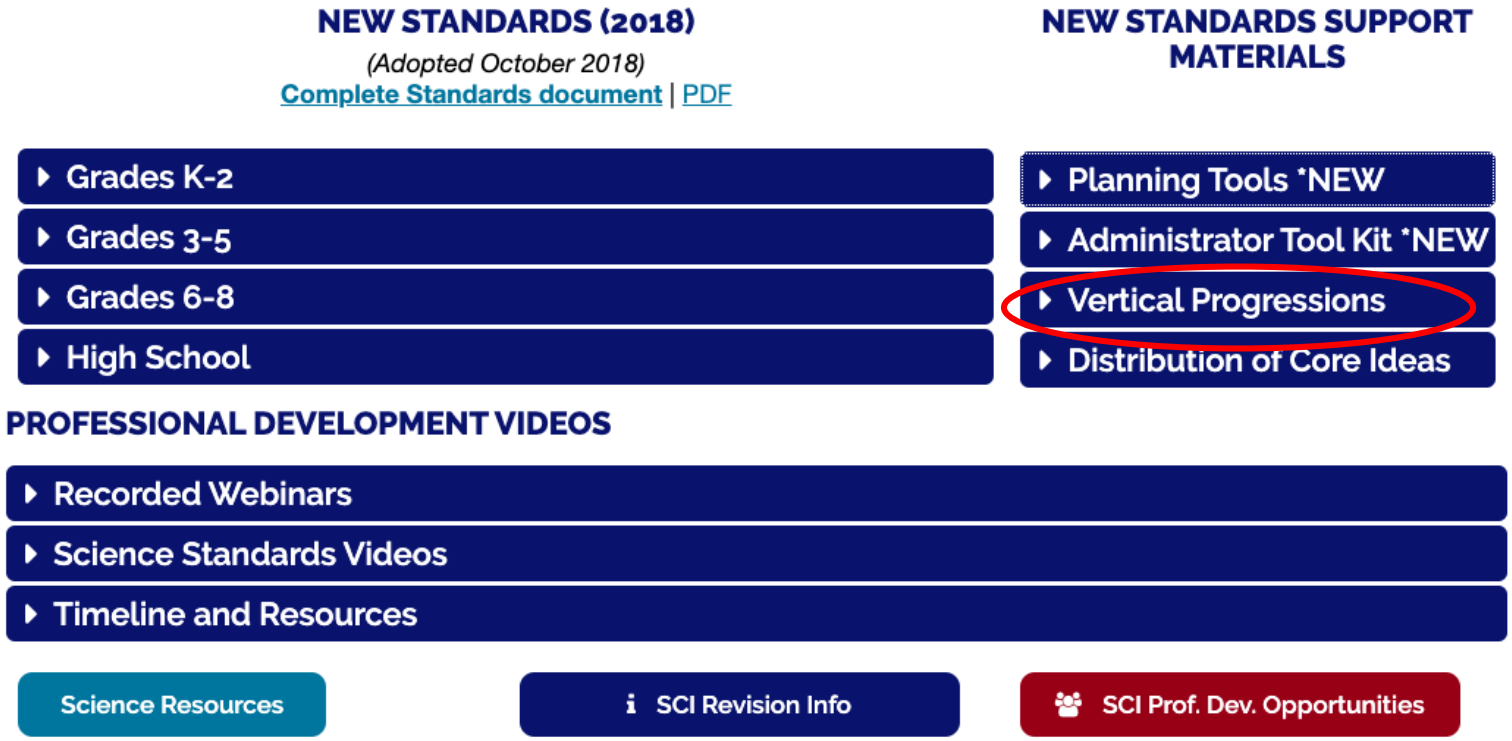
Science and Engineering Practices	K–2 Condensed Practices	3–5 Condensed Practices	6–8 Condensed Practices	9–12 Condensed Practices
Constructing Explanations and Designing Solutions *The end-products of science are explanations and the end-products of engineering are solutions.* The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories. The goal of engineering design is to find a systematic solution to problems that is based on scientific knowledge and models of the material world. Each proposed solution results from a process of balancing competing criteria of desired functions, technical feasibility, cost, safety, aesthetics, and compliance with legal requirements. The optimal choice depends on how well the proposed solutions meet criteria and constraints.	Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence or ideas in constructing explanations and designing solutions. • Use information from direct or indirect observations to construct explanations. • Use tools and materials provided to design a device or solution to a specific problem. • Distinguish between opinions and evidence in one's own explanations. • Generate and compare multiple solutions to a problem.	Constructing explanations and designing solutions in 3–5 builds on prior experiences in K–2 and progresses to the use of evidence in constructing multiple explanations and designing multiple solutions. • Construct explanations of observed quantitative relationships (e.g., the distribution of plants in the back yard). • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation. • Apply scientific knowledge to solve design problems. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the problem.	Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories. • Construct explanations for either qualitative or quantitative relationships between variables. • Apply scientific reasoning to show why the data are adequate for the explanation or conclusion. • Base explanations on evidence obtained from sources (including their own experiments) and the assumption that natural laws operate today as they did in the past and will continue to do so in the future. • Undertake design projects, engaging in the design cycle, to construct and implement a solution that meets specific design criteria and constraints. • Apply scientific knowledge and evidence to explain real-world phenomena, examples, or events. • Construct explanations from models or representations. • Apply scientific knowledge to design, construct, and test a design of an object, tool, process or system. • Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.	ons and designing ls on K–8 esses to gns that are and independent irces of evidence fic knowledge, s. nd qualitative claims regarding the relationship between dependent and independent variables. soning, theory, and ence to claims to o which the support the clusion. e explanations obtained from a e.g., scientific theories, er review. • Base causal explanations on valid and reliable empirical evidence from multiple sources and the assumption that natural laws operate today as they will continue to do wledge and evidence na and solve design o account possible s. d refine a solution orld problem, based dge, student- generated sources of evidence, prioritized criteria, and tradeoff considerations.



* Adapted by Achieve from: National Research Council (2011). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academy Press. Chapter 3: Science and Engineering Practices.

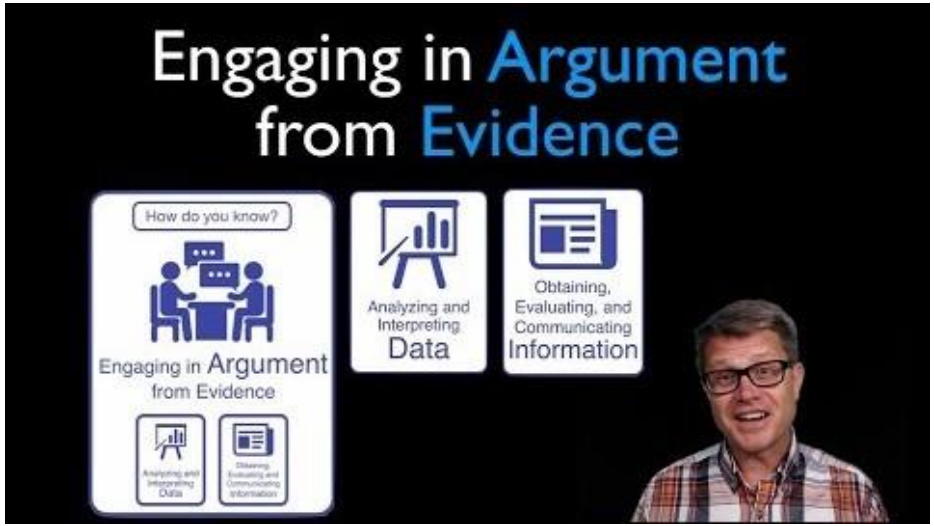
Vertical Progression Document

Science Standards Resources



ADE Science Standards Resources Website

SEP 7: Engaging in Arguing from Evidence Video



Chat

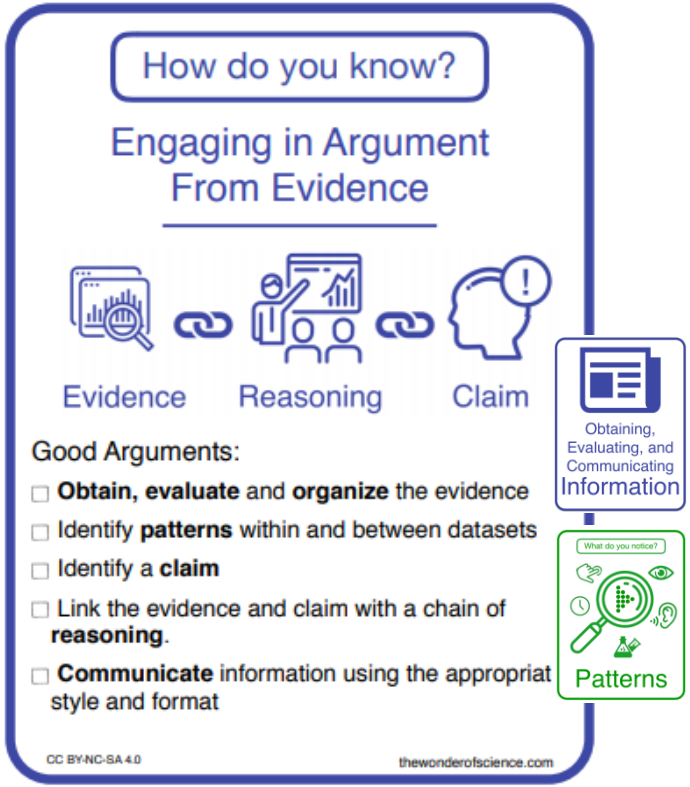
What resonated with you MOST about this SEP?
What is one take-away you have?

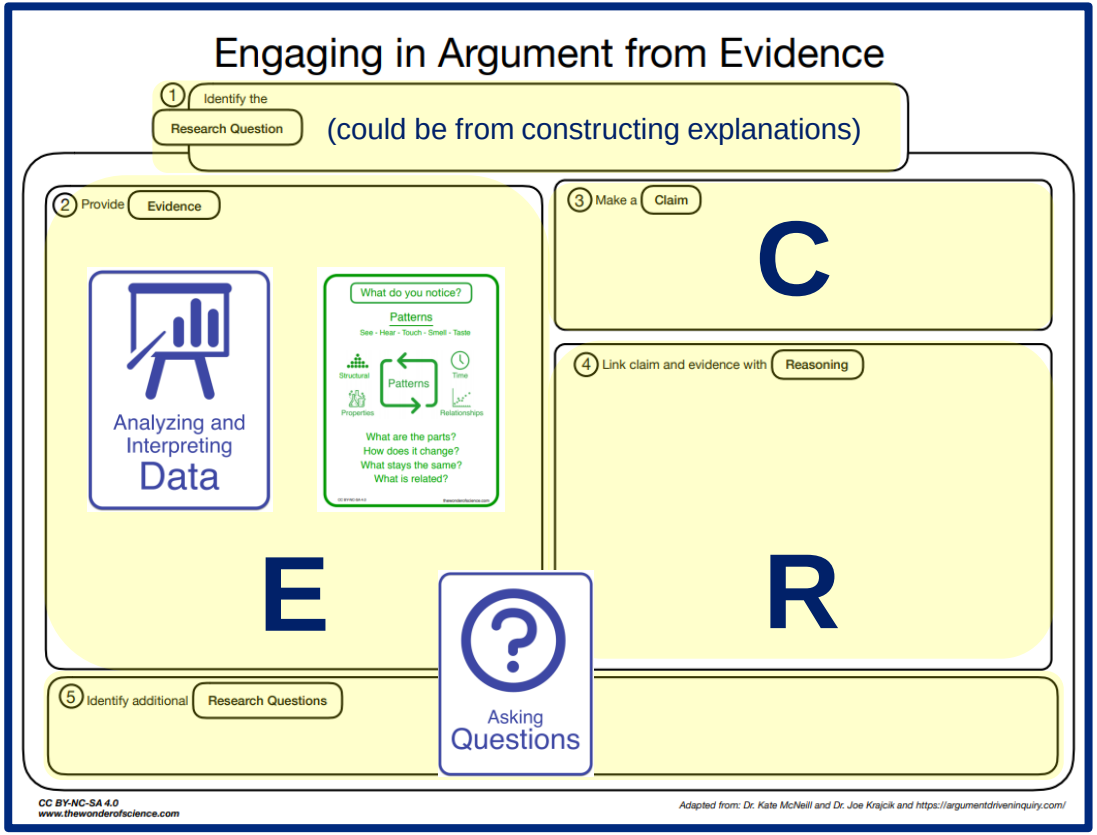
Critiquing Practices

7. Engaging in Argument from Evidence

8. Obtaining, Evaluating, & Communicating Information

SEP 7: Engaging in Arguing from Evidence- Summary





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K-12 Science and Engineering Practices* Progression Matrix of Elements

For use with *Arizona Science Standards*

Science and Engineering Practices	K–2 Condensed Practices	3–5 Condensed Practices	6–8 Condensed Practices	9–12 Condensed Practices
Engaging in Argument from Evidence *Argumentation is the process by which explanations and solutions are reached.* In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to identify strengths and weaknesses of claims.	Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world. ▪ Identify arguments that are supported by evidence. ▪ Listen actively to others' explanations and arguments and ask questions for clarification. ▪ Make a claim about the effectiveness of an object, tool, or solution that is based on relevant evidence.	Engaging in argument from evidence in 3–5 builds from K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world. ▪ Construct and/or support scientific arguments with evidence, data, and/or a model. ▪ Compare and refine arguments based on the strengths and weaknesses of the evidence presented. ▪ Respectfully provide and receive critiques on scientific arguments with peers by citing relevant evidence and posing specific questions. ▪ Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world. ▪ Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation for a phenomenon or a solution to a problem. ▪ Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. ▪ Respectfully provide and receive critiques on scientific arguments by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail. ▪ Compare two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts. ▪ Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system, based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.	Engaging in argument from evidence in 9–12 builds from K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world. Arguments may also come from current scientific or ence. ▪ ompeting d/or design evidence, offs), issues. dence, and tly accepted s to determine s. ▪ gument that is based on data and evidence that challenges another proposed argument. ▪ n about the ectiveness of a ects scientific t-generated ▪ esign solution based on npirical guments rs (e.g. ironmental,

Engaging in Argument from Evidence

Obtaining, Evaluating, and Communicating Information

* Adapted by Achieve from: National Research Council (2011). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academy Press. Chapter 3: Science and Engineering Practices.

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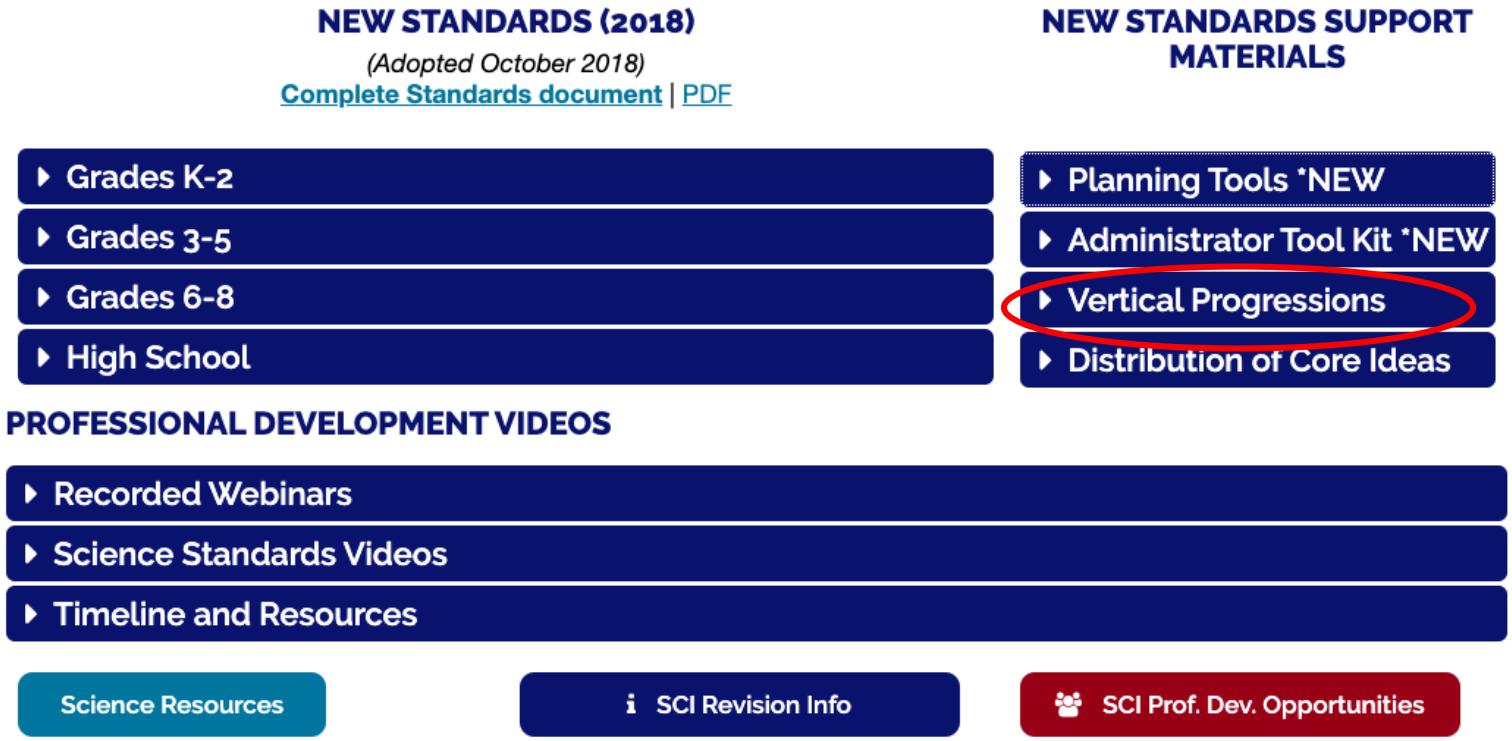


ADE Science Standards Resources Website

Key Differences Summary

6. Constructing Explanations	Students do not create scientific explanations.	Students attempt to create scientific explanations, but students' explanations are descriptive instead of explaining how or why a phenomenon occurs. Students do not use appropriate evidence to support their explanations.	Students construct explanations that focus on explaining how or why a phenomenon occurs. Students do not use appropriate evidence to support their explanations.	Students construct explanations that focus on explaining how or why a phenomenon occurs and use appropriate evidence to support their explanations.

Sensemaking Practice

7. Engaging in argument from evidence	Students do not engage in argumentation.	Students engage in argumentation where they support their claims with evidence or reasoning, but the discourse is primarily teacher-driven.	Students to engage in student-driven argumentation. The student discourse includes evidence and reasoning to support their claim. Students also agree and disagree, but rarely engage in critique.	Students engage in student-driven argumentation. The student discourse includes evidence, reasoning that links the evidence to their claim and critique of competing arguments during which students build on and question each other's ideas.

Critiquing Practice

McNeill, Katsh-Singer & Pelletier, 2015

FIGURE 4 Science Practices Continuum assessment tool

	Science practices	Level 1 (Not Present)	Level 2 (Emergent)	Level 3 (Proficient)	Level 4 (Exemplary)
Sensemaking science practices (continued)	6. Constructing Explanations	Students do not create scientific explanations.	Students attempt to create scientific explanations, but students' explanations are descriptive instead of explaining how or why a phenomenon occurs. Students do not use appropriate evidence to support their explanations.	Students construct explanations that focus on explaining how or why a phenomenon occurs. Students do not use appropriate evidence to support their explanations.	Students construct explanations that focus on explaining how or why a phenomenon occurs and use appropriate evidence to support their explanations.
	2. Developing and Using Models	Students do not create models.	Students create models. Students' models focus on describing natural phenomena rather than predicting or explaining the natural world. Students do not evaluate the merits and limitations of the model.	Students create models focused on predicting or explaining the natural world. Students do not evaluate the merits and limitations of the model.	Students create models focused on predicting or explaining the natural world. Students do evaluate the merits and limitations of the model.
Critiquing Science Practices	7. Engaging in argument from evidence	Students do not engage in argumentation.	Students engage in argumentation where they support their claims with evidence or reasoning, but the discourse is primarily teacher-driven.	Students to engage in student-driven argumentation. The student discourse includes evidence and reasoning to support their claim. Students also agree and disagree, but rarely engage in critique.	Students engage in student-driven argumentation. The student discourse includes evidence, reasoning that links the evidence to their claim and critique of competing arguments during which students build on and question each other's ideas.
	8. Obtaining, evaluating, and communicating information	Students do not read text for scientific information.	Students read text to obtain scientific information, but do not evaluate this information. Students also do not compare or combine information from multiple texts considering the strengths of the information and sources.	Students read and evaluate text to obtain scientific information. Students do not compare or combine information from multiple texts considering the strengths of the information and sources.	Students read and evaluate text to obtain scientific information. Students compare and combine information from multiple texts considering the strengths of the information and sources.

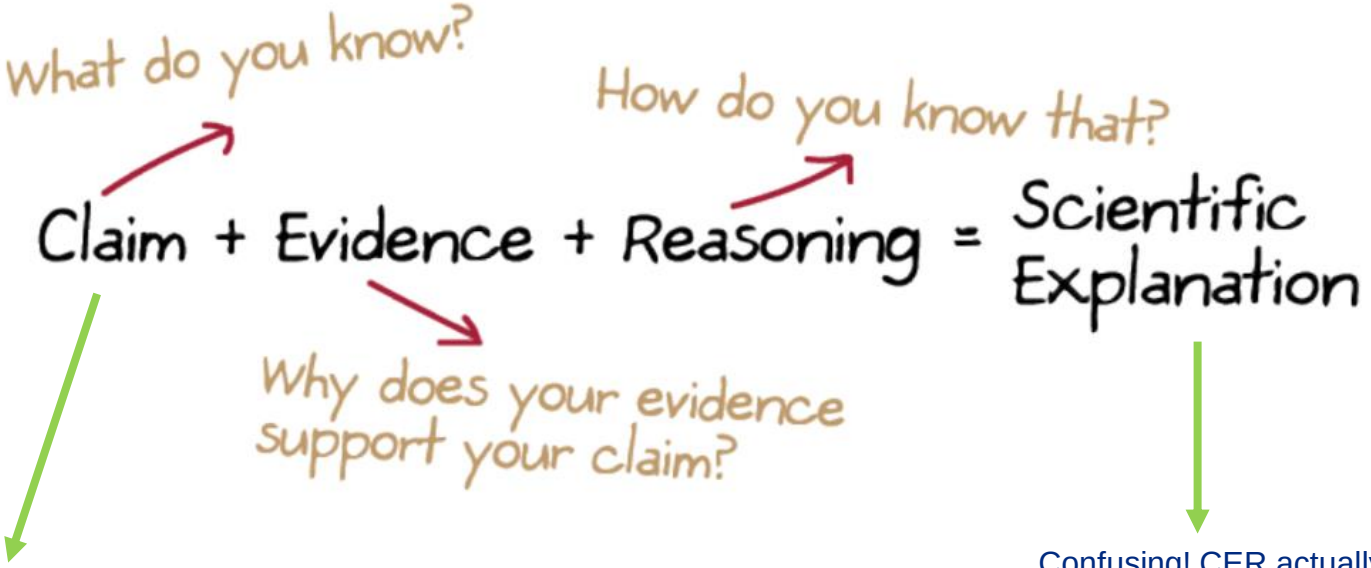
Goals:

- Gain a better understanding of the **instructional shifts** needed for three-dimensional science instruction and how this relates to the AzSS

- Explore the differences and connections between two of the Science & Engineering Practices (SEPs)- Constructing Explanations & Arguing from Evidence

- Learn how to engage students in speaking and writing like scientists through using a strategy called “Claims, Evidence, Reasoning (CER)”

The Basics of C-E-R



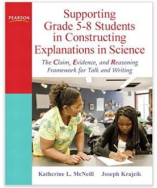
Claim is not an opinion- it is any idea- from investigation designs, questions, models, interpretations of data- that the students are supporting and can be questioned or revised

Confusing! CER actually reflects **only** the practice of Engaging in Arguing from Evidence (not constructing **explanations**)

see p. 212 for more info---------

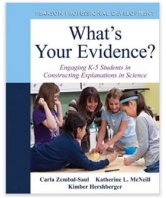
CER(R)- Claims, Evidence, Reasoning, Rebuttal

Claim: A statement that expresses the answer or conclusion to a question or problem.



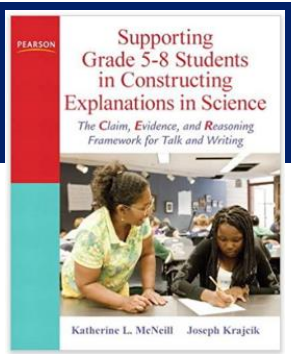
Evidence: Scientific data that supports the claim.

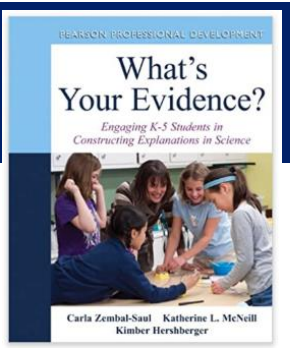
Reasoning: Provides a justification that links the evidence to the claim and explains why the evidence supports the claim using scientific principles.



Rebuttal: Recognizes and describes alternative explanations and provides counter evidence and reasoning for why the explanation is not appropriate.

Scientific Explanations Framework:





Handout 4—Variations of the Scientific Explanation Framework

Level of Complexity	Framework Sequence	Description of Framework for Students
Simple ↓ Complex	**Variation #1** 1. Claim 2. Evidence	**Claim** • A statement that answers the question **Evidence** • Scientific data that support the claim
	Variation #2 1. Claim 2. Evidence • Multiple pieces	**Claim** • A statement that answers the question **Evidence** • Scientific data that support the claim • Includes multiple pieces of data
	Variation #3 1. Claim 2. Evidence • Multiple pieces 3. Reasoning	**Claim** • A statement that answers the question **Evidence** • Scientific data that support the claim • Includes multiple pieces of data **Reasoning** • A justification for why the evidence supports the claim using scientific principles
	Variation #4 1. Claim 2. Evidence • Multiple pieces 3. Reasoning 4. Rebuttal	**Claim** • A statement that answers the question **Evidence** • Scientific data that support the claim • Includes multiple pieces of data **Reasoning** • A justification for why the evidence supports the claim using scientific principles **Rebuttal** • Describes alternative explanations, and provides counterevidence and reasoning for why the alternative explanation is not appropriate

Summary of Four Variations of the Scientific Explanations Framework

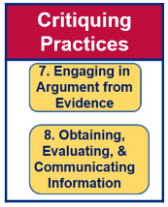
Variation	Grade Level	Description
Variation 1	K-2 (perhaps completed verbally)	1. Claim 2. Evidence
Variation 2	K-2, 3-5	1. Claim 2. Evidence • Multiple Pieces
Variation 3	3-5, 6-8	1. Claim 2. Evidence • Multiple Pieces 3. Reasoning
Variation 4	6-8, 9-12	1. Claim 2. Evidence • Multiple Pieces 3. Reasoning 4. Rebuttal

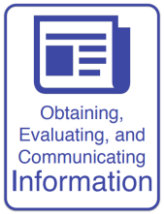
Table adapted from *What's Your Evidence* pg. 119

Middle School Classroom Example- Summative CER

Context:

- Summative CER (CL-Ev-R) at end of unit
- 7th grade
- Students collected evidence from a variety of sources over the course of the unit
- They engaged in investigations, developed models, presented ideas orally and critiqued each other's claims
- Issue based unit on erosion, weathering, and deposition
- Written final product

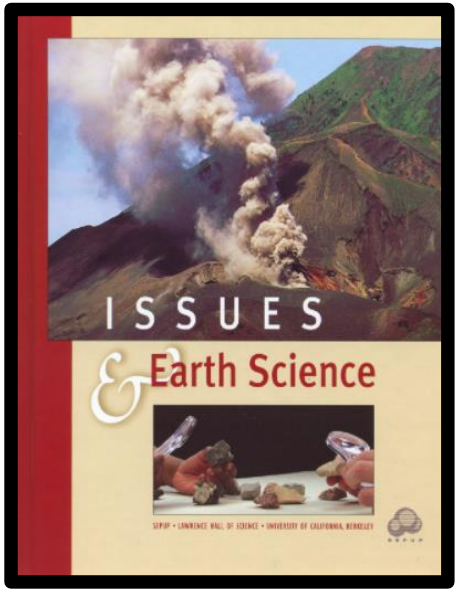




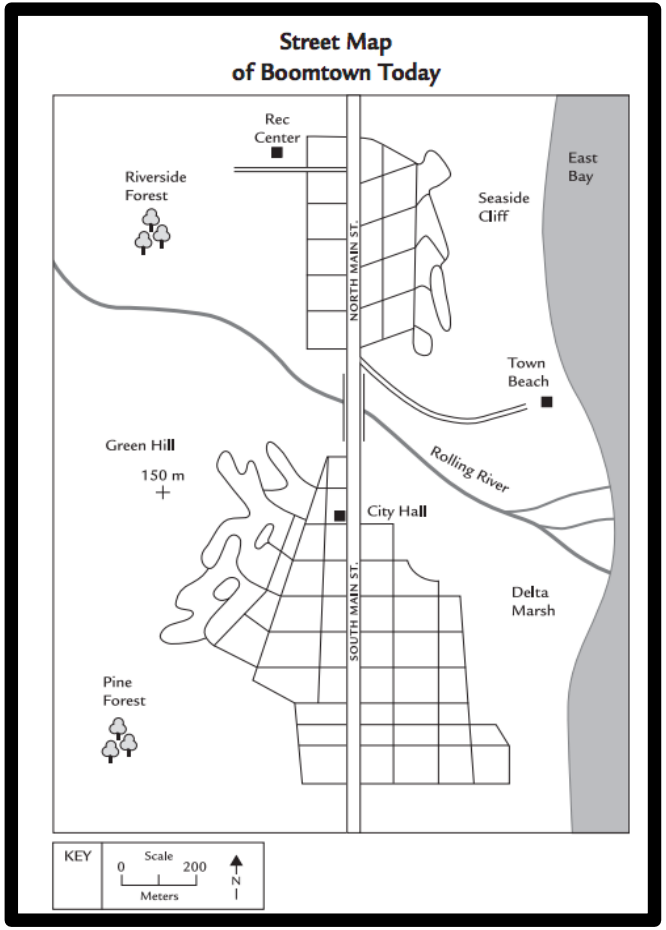
Issue/Anchoring phenomena of unit:
Boomtown is a fictitious town that has a rapid increase in population and not enough housing. The town is comprised of different landforms- a large hill, a marsh, and a cliff. Where should Boomtown build new apartments and houses?

WHERE COULD THE EVIDENCE COME FROM?

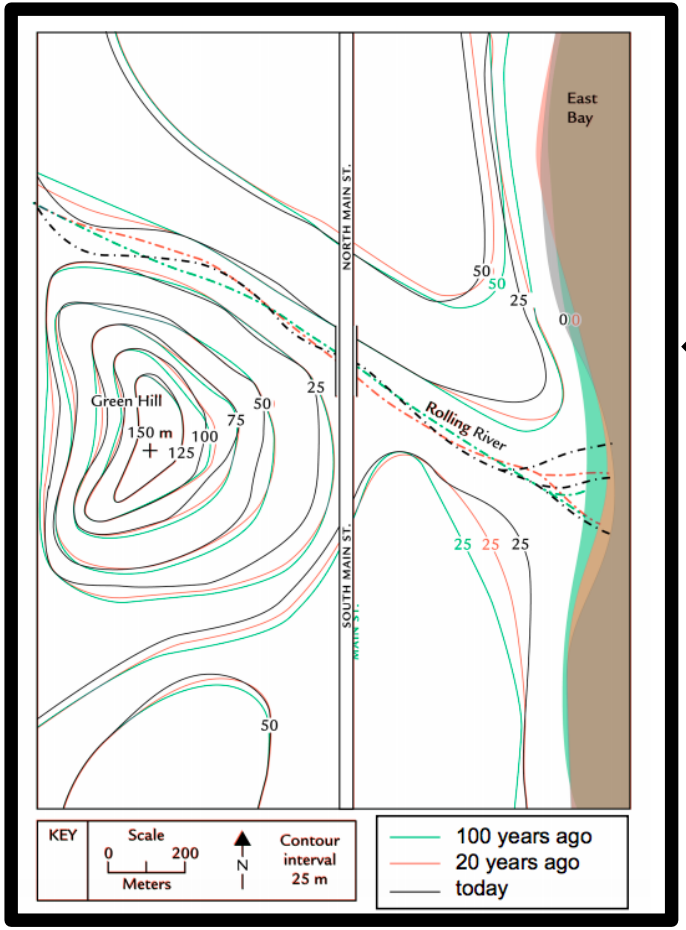
- **Any information from activities 24-35**



Act. 24


Street Map
of Boomtown Today
Rec Center
Riverside Forest
Seaside Cliff
East Bay
NORTH MAIN ST.
Town Beach
Green Hill
150 m
Rolling River
City Hall
SOUTH MAIN ST.
Delta Marsh
Pine Forest
KEY
Scale
0
200
Meters
N

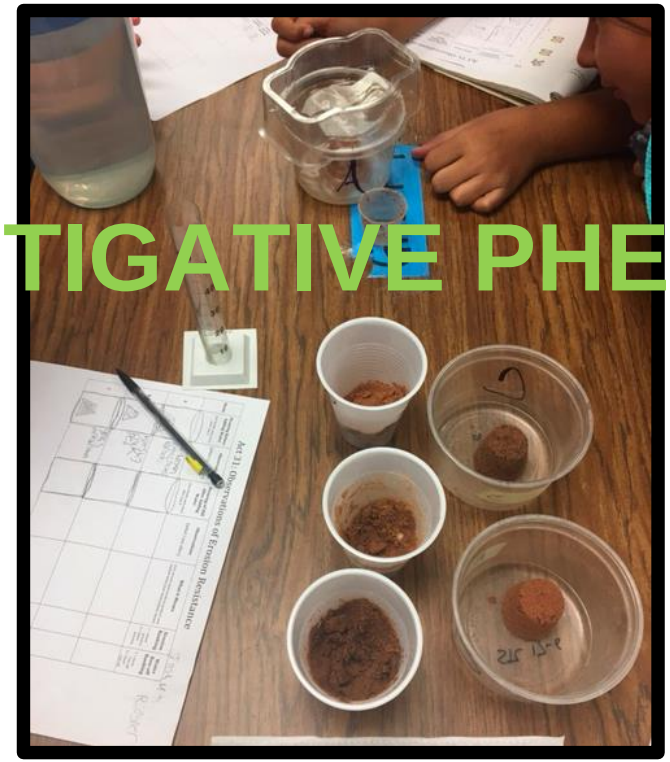
Act. 26

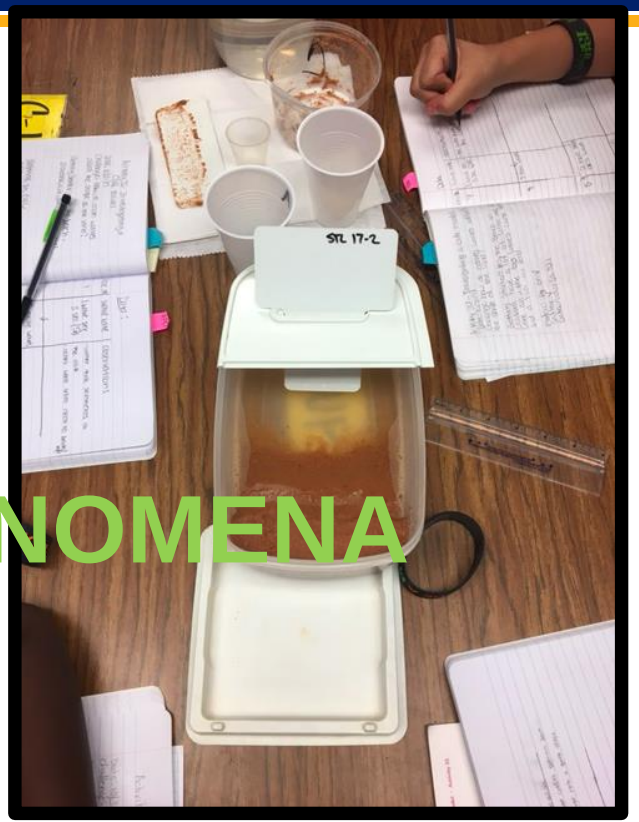

East Bay
NORTH MAIN ST.
SOUTH MAIN ST.
Green Hill
150 m
Rolling River
50
25
75
100
125
KEY
Scale
0
200
Meters
N
Contour interval 25 m
100 years ago
20 years ago
today

INVESTIGATIVE PHENOMENA

Act. 28
River, Canyon & Delta Model

Act. 31
Erosion Resistance on a Hill Model





Act. 32
Cliff Model/Wave Erosion

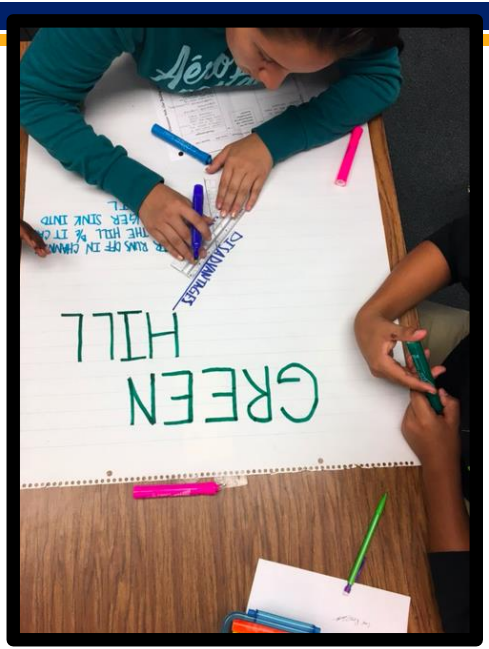
Circle your assigned building location: Delta Wetlands Green Hill Seaside Cliff

Advantages	What are the advantages and disadvantages of your building location?	Disadvantages

Discussion Web: Our Building Location

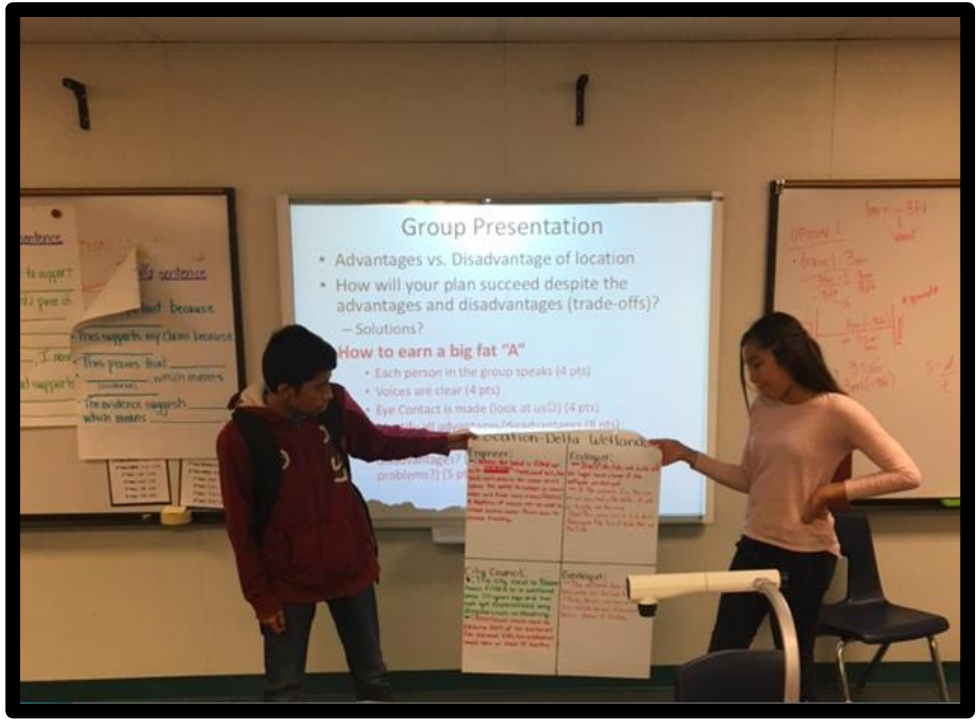
Evidence for the Geologist's Report

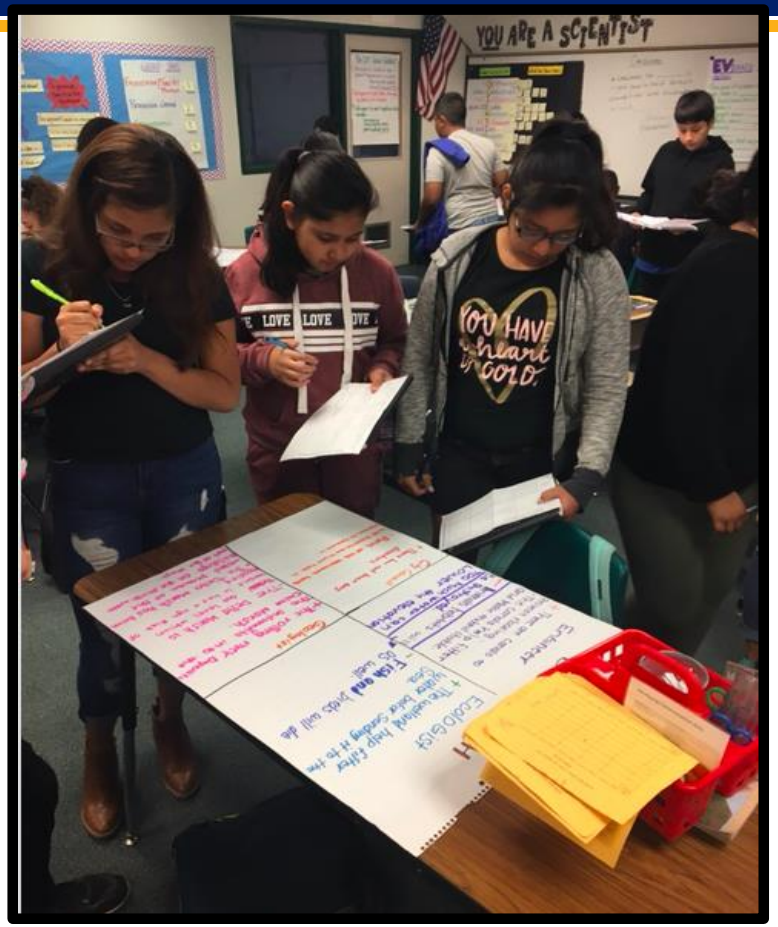
	Activity No.	Type of Evidence	Green Hill	Delta Wetlands	Seaside Cliff
Description and Location of Landform	24	Type of landform	hill		
	26	Current building in area	a lot on south east side, none on north side		
	28, 29, 31	Composition of landform	soft, loose soil		
Role of Earth Processes in Area	28, 29, 33	Earth processes related to the landform	weathering and erosion		
	26, 27, 28, 29, 32, 33	Water sources and flow	rainfall: rain runs down the hill into the Rolling River		
	27	Flood risk	low		
Topographical Changes and Land Stability Over Time	26	Changes in Topography	Southeast side has eroded since housing has been built, otherwise none.		
	26	Land stability	Good, except for southeast side		
Geological Issues	29, 30, 31, 32, 33	Potential Geological Problems for Construction	Accelerated erosion due to construction		



Activities 34 & 35

Obtaining, Evaluating, and Communicating Information





Group Presentations & Gallery Walk

TASK 1:
EVIDENCE
COLLECTOR

Activity 35- Evidence Collector

Location:_____

EVidence (what scientific facts or information will support your claim?)	**Reasoning** (why is this piece of evidence important?)	**Source** (Where did you get the evidence from?) Map, data table, activity #, notes, observations, text
1.	1.	
2.	2.	
3.	3.	
Trade-Off (-):	**Solution:**	
4.	4.	

TASK 2:
CL-EV-R
EXPLANATION

HIGHLIGHT **ONE** SENTENCE STARTER FOR EACH SECTION TO USE ON YOUR GRAPHIC ORGANIZER

CL-EV-R Scientific Explanation- Activity 35

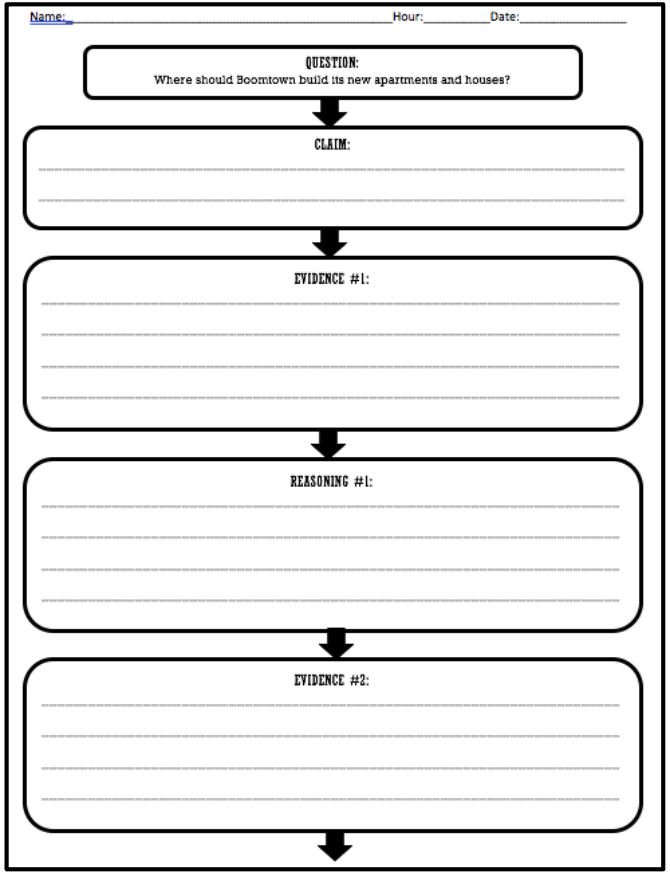
QUESTION: WHERE SHOULD BOOMTOWN BUILD ITS NEW APARTMENTS AND HOUSES?

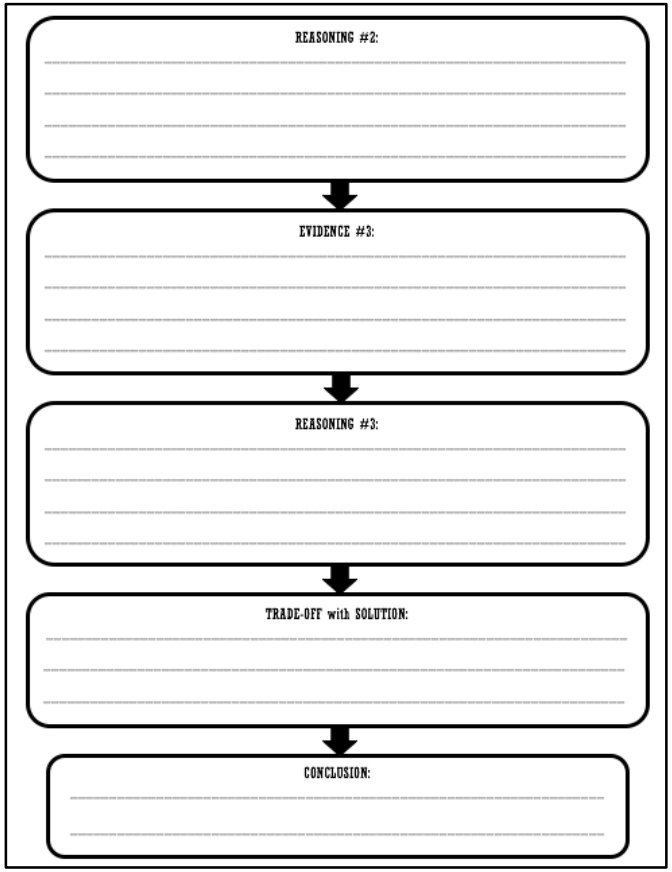
Claim *(Answer the question by choosing a location- Green Hill, Seaside Cliff, or Delta Marsh)*	The most ideal location to build houses/apartments in Boomtown is at the _____.
Evidence #1 *(Provide data to support your claim)*	o From the _____ activity, evidence to support my claim is _____. o One piece of evidence to support my claim is _____ from the _____ activity.
Reasoning #1 *(How does your evidence support your claim?)*	o This is important because _____. o This shows that _____. o This proves that _____. o This supports my claim because_____. o This evidence suggests that _____, which means_____.
Evidence #2 *(Provide data to support your claim)*	o Another piece of evidence from the _____ activity is _____. o Additionally, _____. o The second piece of evidence is _____.
Reasoning #2 *(How does your evidence support your claim?)*	o This is important because _____. o This shows that _____. o This proves that _____. o This supports my claim because_____. o This evidence suggests that _____, which means_____.
Evidence #3 *(Provide data to support your claim)*	o Another piece of evidence from the _____ activity is _____. o Additionally, _____. o The final (or third) piece of evidence is _____.
Reasoning #3 *(How does your evidence support your claim?)*	o This is important because _____. o This shows that _____. o This proves that _____. o This supports my claim because_____. o This evidence suggests that _____, which means_____.
Trade-Off & Solution *(losing one thing to gain another, advantage vs. disadvantage)*	o One disadvantage of this location is _____. o One drawback of this location is_____, however it can be solved by _____.
Conclusion *(Restate the Claim)*	o In conclusion, _____ o In sum, _____ o Therefore, _____

REMEMBER- Data can include any information from your observations, notes, maps, & data tables
Use information from the reports- engineer, ecologist, geologist, city council

TASK 2:
CL-EV-R
EXPLANATION

GRAPHIC ORGANIZER





CL-EV-R SCORING GUIDE

Scoring Guide

LEVEL	DESCRIPTION
Level 4 Above and beyond	Student accomplishes Level 3 and goes beyond in some significant way, such as: • including relevant evidence that was not studied in class. • evaluating the source, quality, or quantity of evidence. • proposing relevant experiments or research. • including a diagram or other visual aid to clarify his or her ideas.
Level 3 Complete and correct	Student takes a position, supports the position with accurate and relevent evidence, AND describes the trade-offs of his or her decision.
Level 2 Almost there	Student discusses one or more options using accurate and relevant evidence, and takes a position supported by the evidence, BUT reasoning is incomplete or part of evidence is missing.
Level 1 On your way	Student takes a position BUT provides reasons that are subjective, inaccurate, or unscientific.
Level 0	Student's response is missing, illegible, or irrelevant.
X	Student had no opportunity to respond.

Scaffolds & Supports for Summative CER(R) Success

- **Multiple opportunities for sensemaking, investigating, and critiquing**
- **Discuss clear expectations, set criteria- how many pieces of evidence? Where can evidence come from? What about trade-offs or risks vs benefits?**
- **Provide scaffolds, sentence starters, and supports- like a science notebook! Provide student discourse sentence starters or talk moves!**

Video of 7th Grade CER Notebook from Rebecca's Classroom

McNeill, Katsh-Singer & Pelletier, 2015

Almost done!

Next steps:

1. From EMS with a survey- MUST be filled out to receive PD Clock hours

2. From ME☺ with resources and a PDF of this presentation

3. PLEASE WAIT 24-48 HOURS TO PRINT YOUR CERTIFICATE!

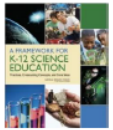
Constructing Explanations & Arguing from Evidence Using Claims, Evidence, & Reasoning- RESOURCE PAGE

Facilitator Contact Information:

Rebecca Garelli | K-12 Science & STEM Specialist | Rebecca.garelli@azed.gov | 602.364.2356

Science Standards Page | Science Resource Page | Science & STEM Webinars

RESEARCH USED TO DEVELOP THE AZ SCIENCE STANDARDS



Link to PDF version of Framework

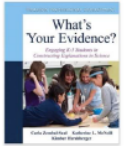
Link to PDF version of Big Ideas

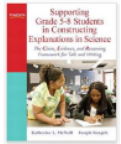
Pre-Reading Resource	Claims, Evidence, and Reasoning NSTA Article
Video #1	Constructing Explanations Video
Video #2	Engaging in Argument from Evidence Video
Resource Doc #1	New Vision for Science Education
Resource Doc #2	AzSS 3-D Snapshot
Resource Doc #3	3-D Planning Cards from The Wonder of Science
Resource Doc #4	Inquiry Cards from The Wonder of Science
Reference Doc #5	Assessing Science Practices Moving Your Class Along a Continuum
Website - The Wonder of Science	Graphic Organizers and Other Resources
Reference Doc #6	Vertical Progressions for Science & Engineering Practices
Reference Doc #7	Google Drive Folder of CER 7th Grade- Rebecca's Example
Examples of CER	Introduction to CER to Introduce to Students

RECOMMENDED BOOKS

What's Your Evidence? (K-5)
By: Carla Zembal-Saul, Katherine L. McNeill, & Kimber Hershberger

Supporting Grade 5-8 Students in Constructing Explanations in Science
By: Katherine L. McNeill and Joseph Krajcik





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- Certification Information
- Grants and Awards

ASSESSMENT INFORMATION

- General Science Assessment Information – National & State

ADE Science and STEM Resources Website

Thanks!

Any questions?

Please contact: Rebecca Garelli

Rebecca.Garelli@azed.gov