

Transitioning to New Science Standards: Targeted Support for Elementary Teachers (Day 2)



ADE State Initiated Professional Development
[Presenter(s) Name(s)]
[Location where PD is delivered]

Date PD Occurred

Norms/Housekeeping



Goals for Day 2

Increase understanding of science and engineering practices with a focus on:

- **Constructing Explanations and Designing Solutions**
- **Engaging in Argument from Evidence**

Increase understanding of coherence between disciplines through ELA writing, and science practices



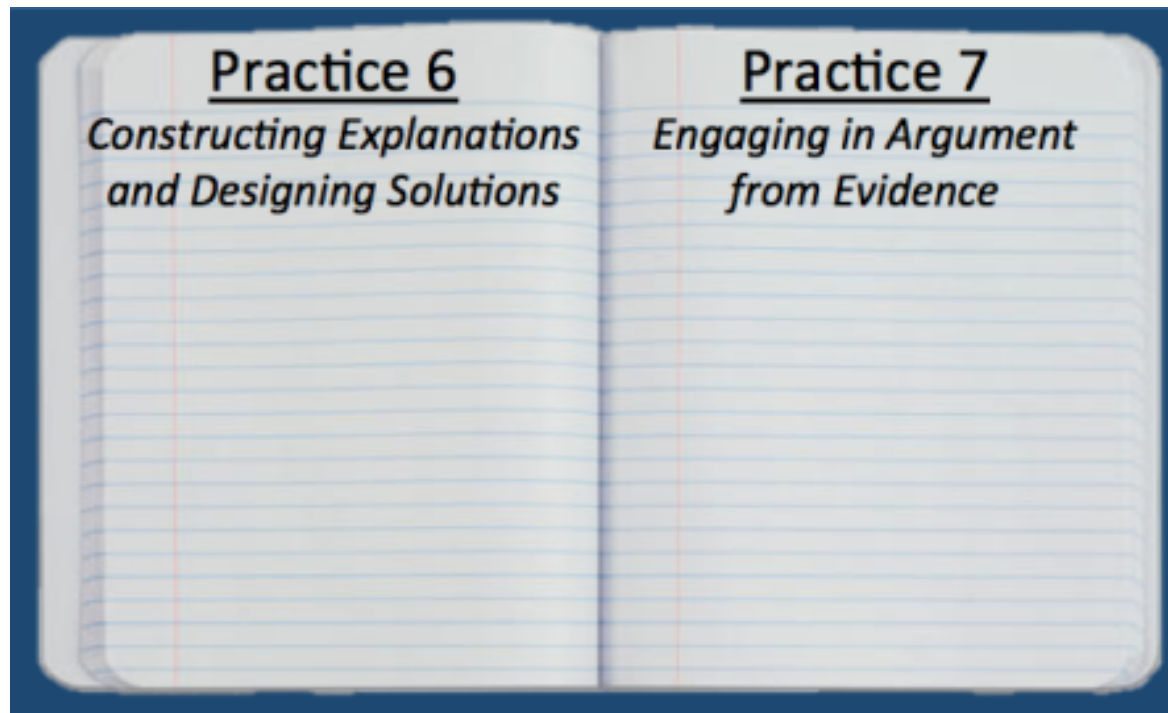
Guiding Questions

What is the relationship between the following two practices:
Constructing Explanations and Designing Solutions/
Engaging in Argument from Evidence?

- How might these practices look in an elementary classroom based on new science standards?
- What type of change needs to happen in instruction to align with new science standards?



What do you know about....



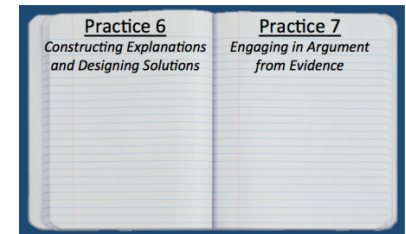
Notebook - T-chart pre-assessment

5



and Connect

- Read definition and research for Practice 6 & 7
- Revisit your t-chart to add new information from your reading.



The Pendulum Experience!

Exploring Practices Six and Seven





Phenomenal Phenomena

Video Time!

<https://www.youtube.com/watch?v=yVkdfJ9PkRQ>

or

https://www.youtube.com/watch?v=7_AiV12XBbl

Explaining Phenomenal Phenomena

- **Use drawings, diagrams, or labels to make your thinking visible after watching the video.**
- **Share the model, observations, and the questions you have created with your table group.**



What makes a pendulum swing faster or slower?

Working in your groups use the following materials to set up your pendulum investigation in any way that makes sense:

Paper clips

Washers (different sizes)

String

Meter stick



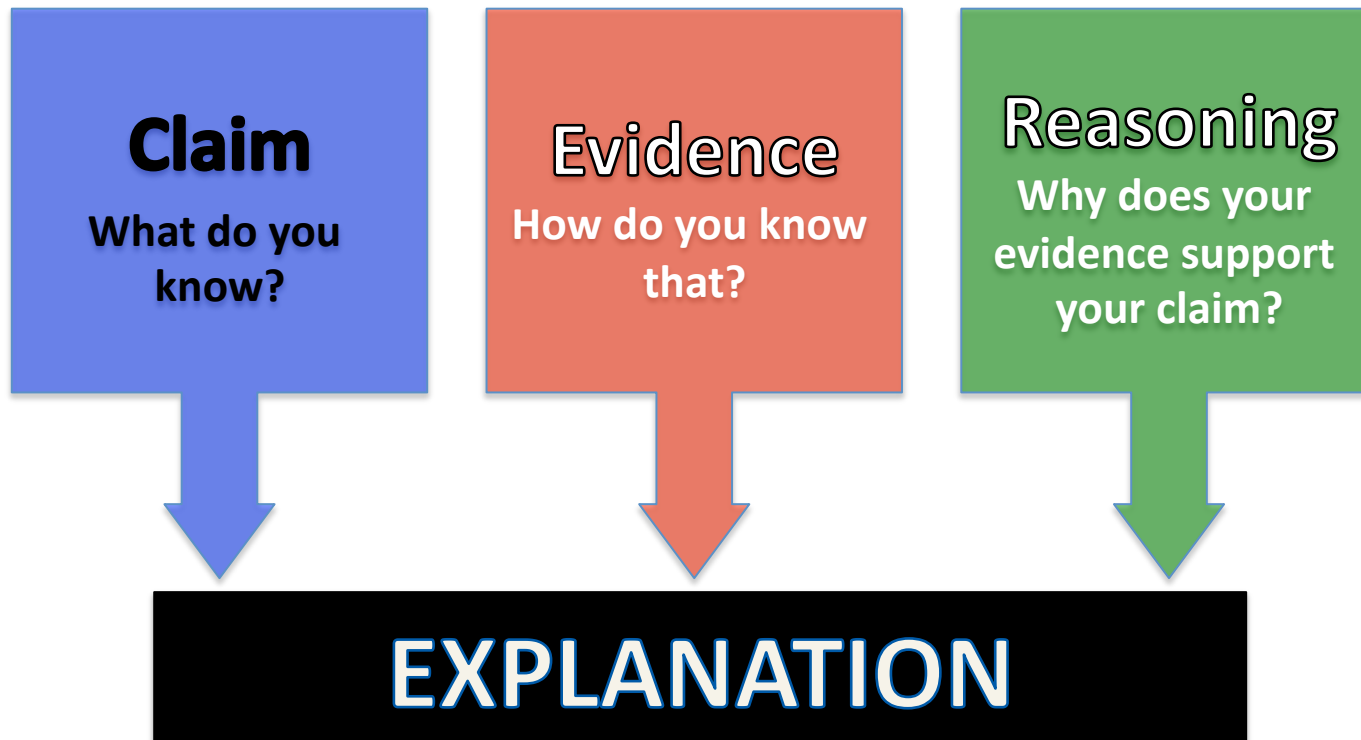
What makes a pendulum swing faster or slower?

- ✓ Plan and carry out your investigation
- ✓ Make observations
- ✓ Collect and record data
- ✓ Keep track of any questions you have



Claim

A claim is written as the answer or conclusion to a specific question or problem.



Claim

The claim is a testable statement or conclusion that answers the original question. The claim is the simplest part of an argument and often the part students find the easiest to include as well as to identify when they are critiquing other peoples' arguments. One of the purposes in focusing on scientific arguments is to help students include more than a claim in their writing.

Framework for Scientific Explanation by McNeill & Krajcik



Scientific Explanation: Claim

Working in your groups:

Write a claim based on the results of your experimental design.

“What makes a pendulum swing faster or slower?”



Reasoning

All evidence is data, but not all data is evidence.



Evidence

- Scientific data from the investigation or other sources (e.g., observation, reading, archive data or other sources) to support the claim.
- Data that is appropriate (scientifically relevant)
- Data that is sufficient (multiple pieces) to support the claim.

Framework for Scientific Explanation by McNeill & Krajcik



Scientific Explanation: Claim with Evidence

Does your evidence support your claim?

Support your claim with evidence to answer the question.
Revise your claim, if needed, to match the evidence.

“What makes a pendulum swing faster or slower?”



Examining Experimental Design

- **Why did you design the experiment the way you did?**
- **How did you decide what data counts as evidence?**
- **What are the strengths and limitations of your methodology?**



Engaging in Argument from Evidence

- **Compare the methodology of two groups and their explanation.**
- **Challenge the methodology by asking questions/ conducting an argument. (sample prompts)**
 - **What difference did the starting point make?**
 - **What difference did the number of weights make?**



Whole Group Debrief: Engaging in Argument from Evidence

- ✓ How did you approach the problem the same or differently?
- ✓ How did each group decide what data counted?
- ✓ How valid were the arguments from the group you shared your explanation with?

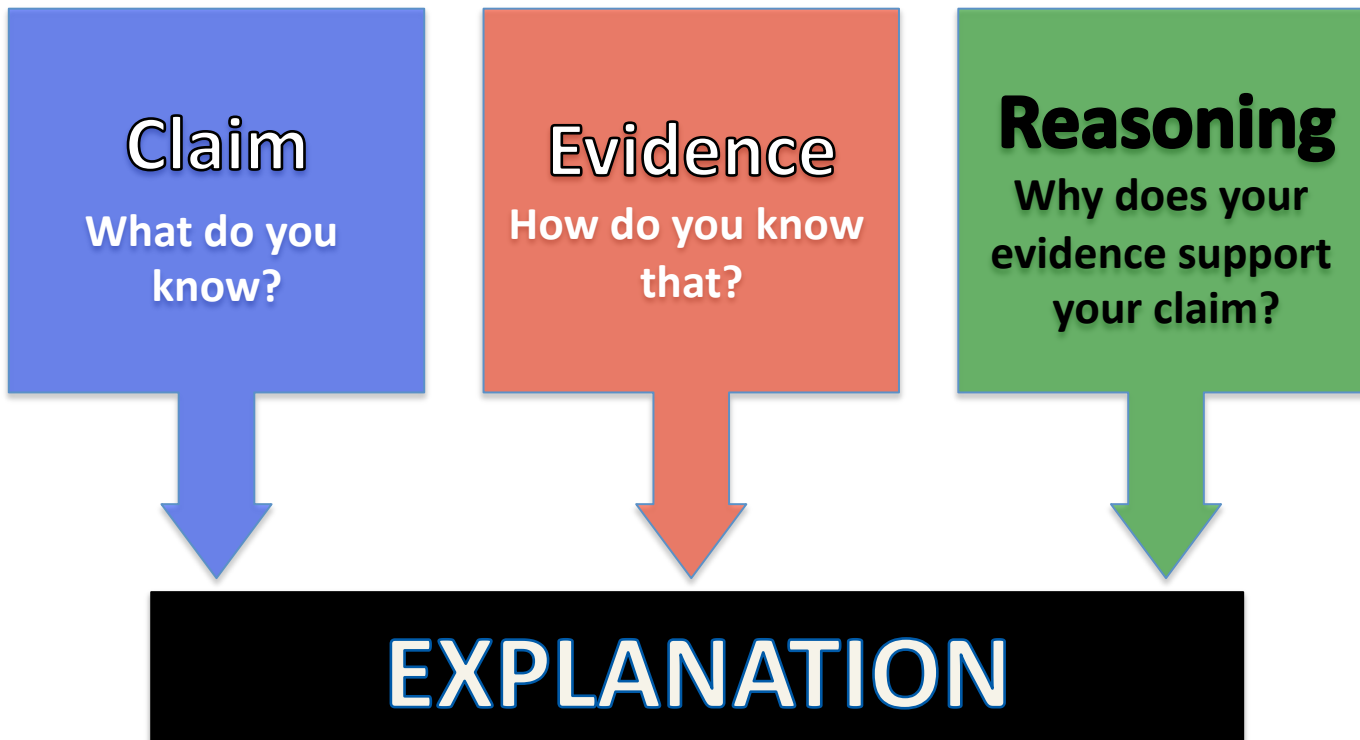
Classroom Connections:

- ✓ Why is this conversation important for your classroom?



Reasoning

Provides logical connections between the claim and the evidence.



Reasoning

- Provides logical connections between the claim and evidence.
- Includes scientific concepts, principles, theories and/or laws.
- Justifies why the evidence (data) supports the claim.

Framework for Scientific Explanation by McNeill & Krajcik



Adding another data point: “Read All About It!”

Use a “pairs read” strategy to read the Pendulum Reading text with a partner.

FIRST: Partner A reads a paragraph
Partner B summarizes the paragraph

THEN: Partner B reads a paragraph
Partner A summarizes the paragraph

Continue until assigned text is read.



Debrief Your Reading

- What additional information was gained from reading about pendulums?
- Add reasoning to your claim on your chart.



Make it a Scientific Explanation

On chart paper, label your explanation for “What makes a pendulum swing faster?” Your explanation should include:

Claim

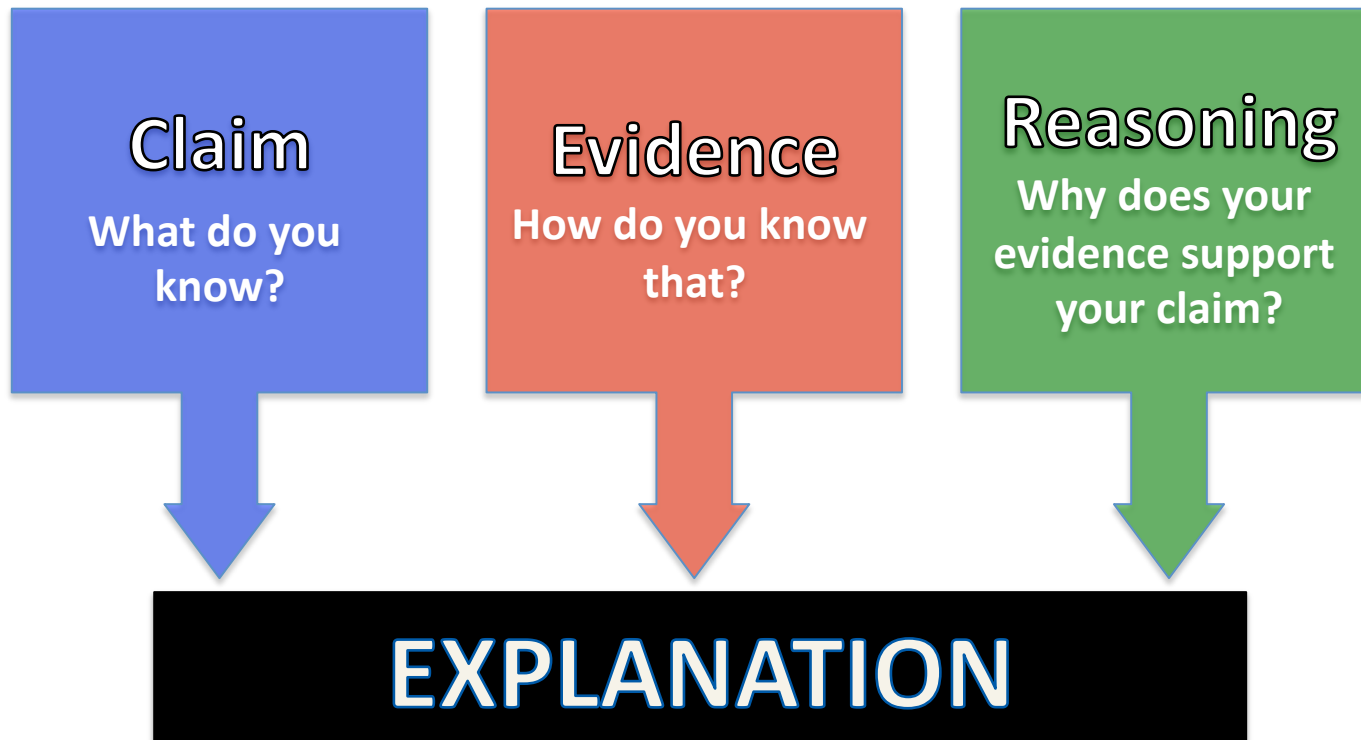
Evidence

Reasoning



Claim

A claim is written as the answer or conclusion to a specific question or problem.



Argumentation Fishbowl

Quality of the Explanation:

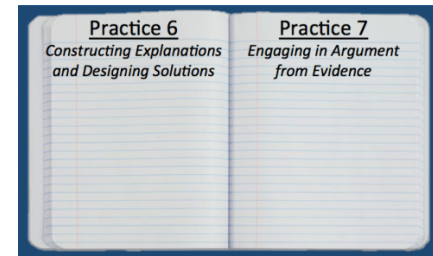
- To what extent is the claim clear and appropriate?
- Does the explanation provide sufficient and appropriate evidence to support the claim? What data is not included? Why?
- To what extent is the claim and evidence supported by scientific reasoning?





and Connect

- Revisit your Pre-think Chart for Practices 6 & 7
- Add any additional information to your charts



Sample Scientific Explanations

#1 - The length determines the swing. The data table shows that this is true. The mass might change it too if you have the right data to show it. We did not test that.

#2 - The length of the pendulum determines the pendulum's swing. The data in our experiment shows that the pendulum period decreases as the string length decreased. We ran the same test with different masses and found no big change.



Sample Scientific Explanations

#3 - The length of the pendulum determines the pendulum's period. We used 3 different string lengths of 10, 20, and 40 cm. We made sure to keep the drop angle the same and we calculated that a 10cm pendulum had 72 swings/minute. As we went down to 20 cm and 40 cm, the swings decreased to 56 and 42 swings/minute respectfully. We repeated the experiment using a 'bob' with a smaller mass and the periods were the same. The pendulum length determines the distance the pendulum travels and therefore affects the total amount of friction and slows the down the pendulum.



Sample Scientific Explanations

And now for something completely different....

#4 - The pendulum completes the period in a shorter length of time when the bob's mass is greater. Our evidence showed that when 2 pendulums were dropped from the same height, the pendulum with greater mass completed a period in a shorter length of time. This indicated that a greater mass on the bob will cause the pendulum to swing faster. This disproves Newton and Galileo.



Making Connections

ELA and Science



The Connection

ELA: Argumentative text

Science:

- Constructing Explanations (Practice Six)
- Engaging in Argument from Evidence (Practice Seven)



Compare the Standards

How is Text Type and Purposes #1 the same in 8th and 4th grade?

How are they different?

What are the implications for Writing in Science in Elementary Grades?



Think About the Students

Consider the thinking processes that could occur in a student's mind while they were engaged in the practice of argumentation in both content (ELA and science) areas.

What thinking processes occur regardless of the content area?



Exploring the Learning Progressions Practices Six and Seven



Progressing Through Practice 6

Constructing Explanations and Designing Solutions

- Work with your shoulder partner.
- Read the descriptors concerning Practice Six on the Progression Handout.
- Make a claim: At what grade band progression were you using Practice 6?
- What evidence do you have to support your claim?
- What reasoning connects the evidence to the claim?
- Where might you use this practice in your current work with students?



Progressing Through Practice 7

Engage in Argument Through Evidence

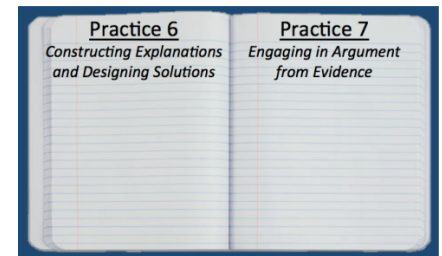
- Work with your shoulder partner.
- Read the descriptors concerning Practice Seven on the Progression Handout.
- Make a claim: At what grade band progression were you using Practice 7?
- What evidence do you have to support your claim?
- What reasoning connects the evidence to the claim?
- Where might you use this practice in your current work with students?





and Connect “Practices 6 & 7”

- Revisit your Pre-think Chart for Practices 6 & 7
- How has your thinking changed? How has your thinking remained the same?
- Write a summary describing the relationships between these practices.



Gots and Needs

