BETTERLESSON
PersonalizedPD

Science

PersonalizedPD's continuous learning process has teachers surface challenges in their classroom and try proven teaching strategies to find what works to accelerate student learning. Our 5,000+ proven strategies (pulled from the lessons of our highly-effective Master Teachers) are organized in a strategy browser by Student Growth Areas and corresponding Teaching Challenges. Our **Science Teaching Challenges are aligned to Next Generation Science Standards** and are organized within the SGAs to build in complexity from entry to mastery.

Student Growth Areas & Teaching Challenges

Asking Questions and Defining Problems

- Develop Curiosity
- Share Questions and Observations
- Develop Testable Questions
- Develop Meaningful Questions
- Accept and Elicit Feedback
- Define a Design Problem
- Develop Questions or Define a Problem

Developing and Using Models

- Identifying the Difference between a Model and an Object
- Use Scientific Models
- Develop Scientific Models
- Use Models to Solve Design Problems
- Identify Limitations and Inaccuracies
- Develop Models to Explain Phenomena
- Create and Use Models in an Iterative Process

Planning and Carrying out Investigations

- Work Safely and Appropriately
- Define the Purpose of an Investigation
- Make Predictions Regarding Outcomes
- Collect and Analyze Data
- Determine Which Variables Should be Used as Results
- Develop a Plan for an Investigation

Constructing Explanations and Designing Solutions

- Identify Claims and Facts
- Construct Testable Questions or Design Solutions
- Design Solutions to Solve Problems
- Plan Investigations
- Construct Evidence-Based Explanations
- Connect Evidence-Based Explanations
- Revise Scientific Explanations and Engineering Designs

Using Mathematics and Computational Thinking

- Identify Math Language
- Identify the Appropriate Math Concepts
- Apply Math to Support Investigation or Design
- Use Calculators, Computers, and Scientific Formulas
- Develop Math Models and Systems

Analyzing and Interpreting Data

- Collect Data and Select a Presentation Method
- Accurately Interpret Information
- Analyze Data
- Evaluate the Accuracy of Data
- Present Conclusions

Engaging in Argument from Evidence

- **Develop a Scientific Claim or Engineering Problem**
- Articulate Scientific Ideas or Engineering Problems
- Compose Claims-Evidence-Reasoning Statements
- Explicitly Assess Arguments or Design Problems
- Use Argumentation

Obtaining, Evaluating, and Communicating Information

- Appropriate and Precise Science Vocab
- Locate Appropriate Texts
- Navigate Texts to Identify
- Organize, Analyze, and Evaluate Information
- Interpret, Defend, and Produce Texts

How can I support students to develop a scientific claim or engineering problem?

INDICATORS OF SUCCESS

- Students, with support, are able to identify a scientific claim or engineering problem
- Students are able to identify a scientific claim or engineering problem
- Students are able to, with support, develop a scientific claim or engineering problem
- Students are able to develop a scientific claim or engineering problem

Sample Strategies

Ladder of Discourse: Found It!

Ladder of Discourse: Think Like a Scientist

Rung 1: Tweet

A "Tweet" is a simple text to self connection you make to the text. For example, when reading about telescopes you might think, "I have seen a telescope before."

Rung 2: Huh?

A "Huh?" is a vocabulary word, concept, or phrase that you don't understand when you read the text for the first time.

Rung 3: Found It!

A "Found It!" can be one of two things. It could be a place where you used context clues to find an answer to one of your "Huh?s". It could also be where you find a science connection that relates to your purpose for reading. For example, if you were reading about physical properties, you could find references to properties you already know or make a connection to a lab we have done in class.

Rung 4: Discourse

A "Discourse" is where you use the ideas in the text to come up with an idea or conclusion

In Leigh's science classroom, students engage in scientific literacy practices daily. Students make their thought processes visible when reading by using Talk to the Text Ladder of Discourse. By using this strategy, students recognize their reading process and identify how deeply they are connecting to their reading by sorting their thinking into the following categories: "Tweets", "Huh?", "Found it!", and "Discourse".

SOURCE: BetterLesson

GRADES: Middle School

QUESTIONS TO CONSIDER

How could this strategy support your students to organize, analyze and evaluate information they have obtained?

How could you use and adapt this strategy for your classroom?

KLEWS Chart

Students investigate the role of expansion joints in bridges and other devices to demonstrate that solids move, using a KLEWS chart to record information. After this graphic organizer is complete, it will be used to create a scientific model.

SOURCE: BetterLesson

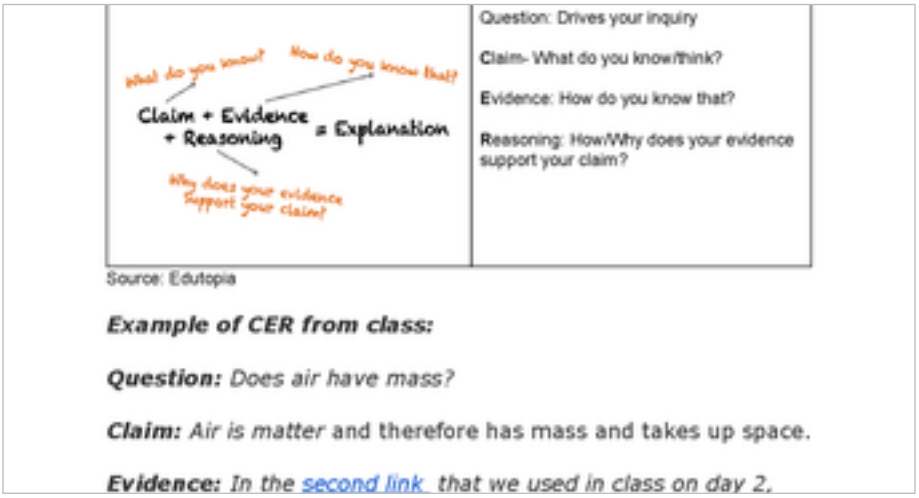
GRADES: Middle School

QUESTIONS TO CONSIDER

How could you encourage students to use this strategy as a way to identify and use evidence to support an explanation?

How could you modify this strategy to meet the needs of all students?

Modeling Claims-Evidence-Reasoning Statement



Source: Edutopia

Example of CER from class:

Question: *Does air have mass?*

Claim: *Air is matter* and therefore has mass and takes up space.

Evidence: *In the second link that we used in class on day 2,*

David models for students how to develop a claims-evidence-reasoning statement. He begins with a question, shows how the claim follows from the question, emphasizes that the evidence must be fact-based, and then helps students through the most difficult step of reasoning, which is explaining how the evidence supports the claim.

SOURCE: BetterLesson

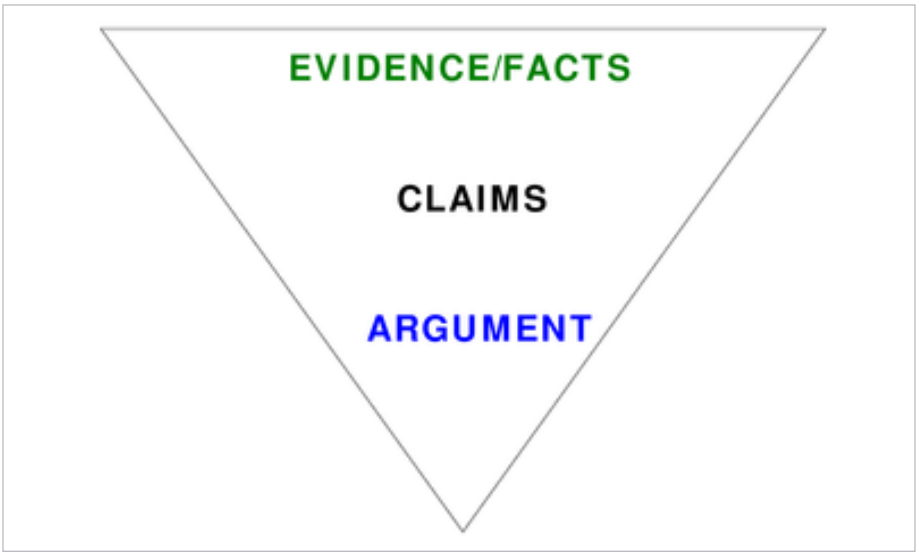
GRADES: Middle School

QUESTIONS TO CONSIDER

How could you help your students understand reasoning as the connection between our proof (evidence) and what we know (claim)?

How could you modify this strategy to support your students?

Argumentation Triangle Visual



Laura uses a different approach when introducing students to craft a scientific argument. Using an upside down triangle as a representation for how to construct arguments, students are guided to begin "at the end" and start with evidence. The base of the triangle (now at the top) is wide and large enough to hold evidence. It is where to start, and then move to the claim (middle of triangle) and end with the argument (at the point of the triangle).

SOURCE: BetterLesson

GRADES: All Grade Levels

QUESTIONS TO CONSIDER

How could this strategy support your students when thinking about writing a claim-evidence-reasoning statement?

How could you encourage students to visual this strategy when developing a claim?