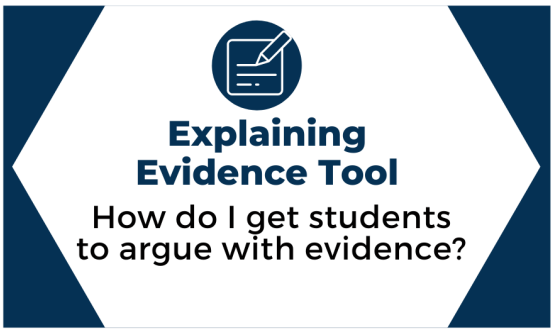
Best Practices Tool 4: Explaining Evidence

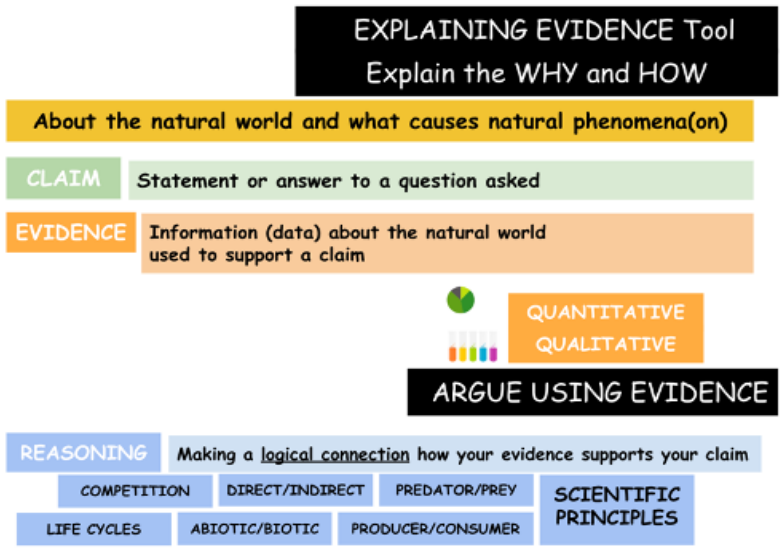
Learning Goal
Germination – Growth (primary and secondary) and Photosynthesis



Origin Lesson
Learning About (What)

How do plants respond to their environment? Have students plant sunflower seeds in pots of soil, water them, and put them in the window OR plant them outside in a school garden.

Students already seem to know that seeds need soil, water and sunlight to grow, but **this conception is actually incorrect** and planting and growing seeds this way only manufactures this misconception further because they think that what they are seeing is happening. A learning extension can be in the form of reading a book about seeds and plants but be careful that the information that the book uses is correct. **Note: Seeds don't need soil and sunlight to germinate, and plants don't get food from soil, sunlight or water.**



Best Practices Modified Lesson
Figuring Out (Why and How)

Have students spend 15 minutes observing the **Phenomenon** (different size plants growing near one another outside). During this time, students should make a two-column table with the headers, "I Notice" and "I Wonder" to help stimulate observations and questions.

Ask students where the plant seeds get the food (energy) they need and where does the plant get the food (energy) it needs. Ask students to draw an initial model of how and why some plants are taller or fatter, shorter and thinner. Students will make different **claims** based on prior knowledge from things they have heard, conceptions and guesses/ideas that they are not sure about. Explain that a "claim" is what we think about something, but because we seem to

	have different ideas about this, we need to collect some **evidence** to help us understand it better. Collecting evidence can, and will take many shapes, as you and your students think of investigations you can do to collect data. This typically starts well with putting seeds in baggies with wet paper towels and with dry paper towels. Put some in windows and some in the dark. You are building variable comparisons of evidence. You can dissect a soaked lima bean and find the embryo and cotyledon (starch), etc. Finally, begin to have students try and use reasoning (which tells others why your evidence makes more sense than someone else's evidence.) This is more challenging for elementary students, so sticking with only claim and evidence is perfectly acceptable at elementary grade levels.

Prompting Notes
When students share their thoughts with one another, it often begins with them sharing their **opinions** about the subject. Teach students early that their use of evidence makes the difference between opposing claims getting accepted or rejected. Every academic subject in addition to Mathematics and Science teaches about using evidence to support what is being said (claims), and so it is important to make that point explicit with students. Social studies teachers teach students how to use **sourcing** (*evidence*) to verify historical record, and Language Arts teachers teach students how **voice** (*evidence*) supports what is being said, by whom and when.

Guiding Discussion Lessons/Questions

1. Consider designing an interdisciplinary lesson where the mathematics, language arts, social studies and science teachers all explicitly talk about evidence in what they are teaching.

Additional Resources:

Engaging Students in the Scientific Practices of Explanation and Argumentation. Understanding a Framework for K-12 Science Education. NSTA K-12 Journals April/May 2012 . By Brian Riser, Leema Berland, Lisa Kenyon

Helping students write scientific explanations. NSTA Science Scope. September 2019. By Ann Novak, Katherine McNeill, and Joseph Krajcik.