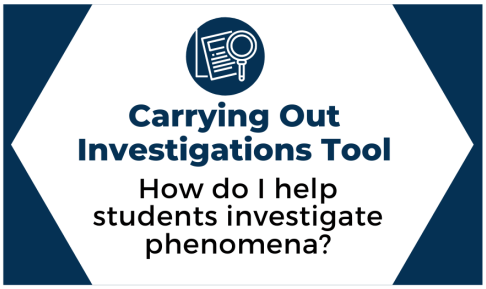
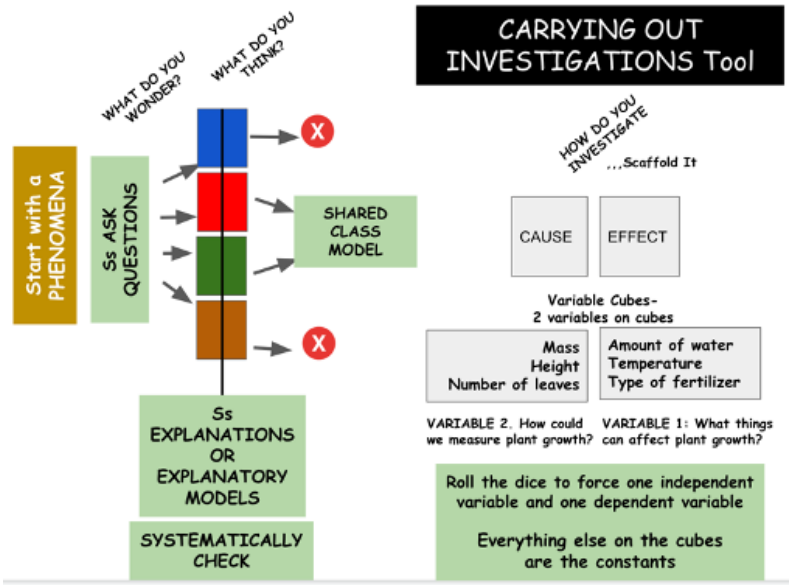
Best Practices Tool 3: Carrying Out Investigations

Learning Goal
Abiotic factors' influences on biotic organisms



Origin Lesson
Learning About (What)

Determining a local stream's health. Students measure the water temperature, depth and clarity. They may take some water samples and use kits to determine salinity, conductivity or dissolved oxygen. This can be a lot of measuring, but without much context to what it all means for the health of the stream and organisms in the stream, it is a hands-on activity. Certainly fun to be outside and in the water, but learning how to interpret data into evidence is a performance task that must be taught and practiced often.

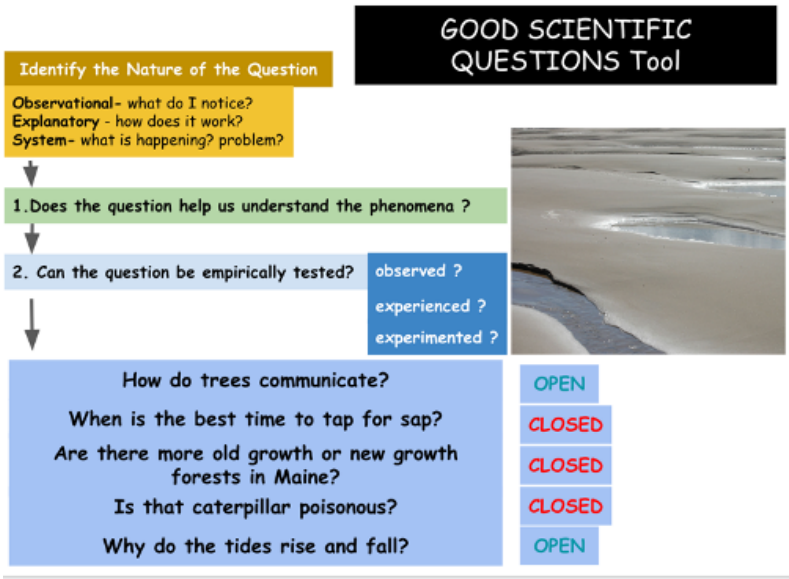


Best Practices Modified Lesson
Figuring Out (Why and How)

Have students spend 15 minutes observing the **Phenomenon** (the stream) and look for surrounding plant life and listen for wildlife (birds/insects.) During this time, students should make a two-column table with the headers, "I Notice" and "I Wonder" to help stimulate observations and questions.

Investigations can take many forms. They do not always have to include manipulating variables. It can be as simple as making observations and taking some sort of measurement (circumference of a tree, count the number of crayfish in a particular area of stream). What <u>defines</u> an investigation is that students are recording and interpreting data.

Carrying out investigations actually starts with student questions, like always, but now those questions need to be elevated a bit. The nature of the question will determine how successfully you can go about an investigation. Begin with



listening and guiding students' closed questions toward more open questions. For example, a student may ask "Is that fish poisonous?" You can guide this towards a more open-ended question like, "How do fish protect themselves from predators?" This will make data collection and interpretation a richer experience.

Streams can be monitored by seining, collecting, and counting small aquatic organisms (macroinvertebrates) such as insect larvae, crayfish and snails. Macroinvertebrates are highly effective barometers of a stream's health because they have varying tolerances to pollution. The presence, quantity and diversity of macroinvertebrates can be used as an overall indicator of stream health. This scoring technique is called the cumulative index value [total number of species divided by the total number of individuals across all taxa], and it helps determine if the quality of the stream is excellent, good, fair or poor.

Maine Audubon has a "Stream Explorers Guide" here if you'd like to try this out with your students.

Prompting Notes

Every time you teach, think how you can include data collection - i.e., have students interpret data you provide, have students collect their own data (preferred), have students interpret their data, etc. The more they see data as a story with patterns, the better they will get at designing investigations to capture snapshots of understanding their natural world – just like real science and scientists.

Guiding Discussion Lessons/Questions

1. Think about 2 lessons that you could swap in some sort of data collection/use of data that would elevate it into a best practice investigation lesson.

Additional Resources:

The integral role of laboratory investigations in science instruction. NSTA Position Statement. https://static.nsta.org/pdfs/PositionStatement_LabScience.pdf.