Criteria for Selecting Useful Phenomena

Scientific phenomena are occurrences in the natural and human-made world that can be observed and cause one to wonder and ask questions.

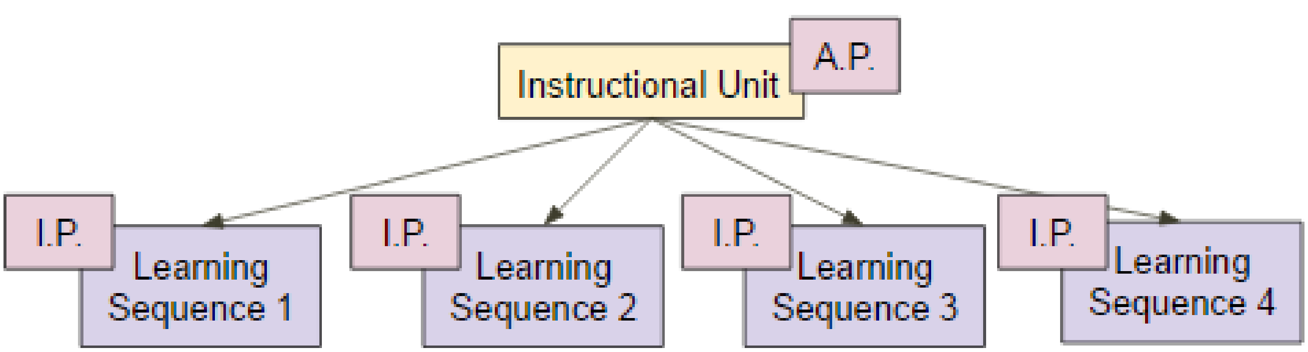
Phenomena-based instruction is a primary feature of the NGSS classroom. A three-dimensional learning approach requires students to use the Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas in concert to explore, investigate, and explain how and why phenomena occur. The complexity of a student explanation should be appropriate to the learning progression at the grade span.

Phenomena do not have to be phenomenal. Often simple events, when looking at them through a scientific eye, can elicit curiosity and questions in students and adults. Such wonderment is the beginning of engagement in which answers to questions are sought.

When choosing useful phenomenon for classroom use, the scale or size of phenomena is important. Determining the grain size of a phenomenon involves consideration of the length of instructional time required to teach it, the depth of student explanation possible, and the complexity of the phenomenon itself. Often an anchoring phenomenon can be broken down into smaller investigable phenomena in the same way a jigsaw puzzle can be broken down into individual pieces. By having students observe and explain smaller related investigative phenomena first, they can then be challenged to explain the larger and more complicated anchoring phenomenon.

Anchoring Phenomena
Anchoring phenomena are the focus of a larger instructional unit/instructional segment, and connect student learning across multiple weeks of instruction. They often require significant or in-depth understanding of several related science ideas as well as multiple lines of evidence and reasoning to adequately explain. Because of their size or scale, students may only be able to explain aspects of an anchoring phenomena.

Investigative Phenomena
Investigative phenomena are used in instructional sequences (across several lessons) to provide students personal experience with observable events where an evidence based explanation can be constructed. Investigative phenomena may relate to larger anchoring phenomena. They often require understanding or use of a fewer number of connected science ideas to explain.



Use the following guiding questions and criteria to help determine if a phenomenon under consideration is useful or not:

- ❑ Can students **observe** and/or **investigate** the phenomenon either through firsthand experiences (e.g., directly in a classroom, lab, or outdoor environment) or through someone else's experiences (e.g., through video presentations, demonstrations, or analyzing patterns in data)?
- ❑ Do students need to understand and use **Core Ideas**, **Science and Engineering Practices,** and **Crosscutting Concepts** to explain how and why the phenomenon occurs?
- ❑ By making sense of the phenomenon, are students building understanding toward grade-level **performance expectations**?
- ❑ Would student explanations of the phenomenon be **grade-level appropriate**?
- ❑ Is the phenomenon **anchored** in real-world issues or the student's local environment?
- ❑ Will students find making sense of the phenomenon **interesting** and **important**?
- ❑ Does the potential student learning related to the phenomenon justify the **financial costs** and **classroom time** that will be used?

For phenomena resources, visit: www.sciencephenomena.com
SDCOE NGSS Resource Center: https://ngss.sdcoe.net

This tool is an adaptation of the following resources:

Qualities of a Good Anchor Phenomenon for a Coherent Sequence of Science Lessons
from William R. Penuel and Philip Bell, Research + Practice Collaboratory

Three-dimensional instruction: Using a new type of teaching in the science classroom
from Joe Krajcik, NSTA Science Teacher

Criteria for Evaluating Phenomena
from Ted Willard, NSTA

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