

NGSS Reflection

Name _____

I plan to continue integrating NGSS into the 8T curriculum, and would appreciate your feedback on the parts that I have already realigned.

The core of NGSS lies in approaching science as a process for making sense of the natural world (as opposed to simply relaying science information). Sense-making in NGSS is embedded in the Science and Engineering Practices. So far, I have redesigned the following 8T activities in order to incorporate the NGSS Science and Engineering Practices more deliberately:

Lab 1: *Toy float* (exploring density, buoyancy, and the nature of science)

Lab 9: *Thermal Energy at Earth's Surface* (exploring the unequal heating of different earth materials)

Lab 13: *Making Sense of Stream Processes* (exploring stream discharge and then planning and carrying out an investigation of stream processes)

Lab 14: *Engineer and Build Your Own Levee* (investigating earth materials and then using them to design and build a levee)

- Choose any two of the activities listed above.
- For each activity, choose 2 science practices that you recall using for that activity. Do NOT choose the same practices (so you should have a total of four different practices).
- How did doing the activities compare to gaining science information through reading or lecture?
- How did doing the activities compare to more structured labs where you are guided step by step through a set of specific steps or procedures?

Activity	List two different Science & Engineering Practices that you recall using for each activity	On a scale of 1 to 5, this practice helped me to make sense of the science concept (1=strongly agree, 5=strongly disagree)	As a science learner, was using this practice more effective <i>or</i> less effective than reading/lecture Why?	As a science learner, was using this practice more effective <i>or</i> less effective than more structured labs Why?

Identify any practices that were difficult for you or came to you more easily. Please provide specifics.

Additional feedback about incorporating NGSS into 8T OR your thoughts about using NGSS in your own classroom.

NGSS Science Practices

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. (NRC, 2012)

1. Asking Questions and Defining Problems

Science begins with a question about a phenomenon, such as “Why is the sky blue?” or “What causes cancer?,” and seeks to develop theories that can provide explanatory answers to such questions. A basic practice of the scientist is formulating empirically answerable questions about phenomena, establishing what is already known, and determining what questions have yet to be satisfactorily answered.

2. Developing and Using Models

Science often involves the construction and use of a wide variety of models and simulations to help develop explanations about natural phenomena. Models make it possible to go beyond observables and imagine a world not yet seen. Models enable predictions of the form “if ... then ... therefore” to be made in order to test hypothetical explanations.

3. Planning and Carrying Out Investigations

Scientific investigation may be conducted in the field or the laboratory. A major practice of scientists is planning and carrying out a systematic investigation, which requires the identification of what is to be recorded and, if applicable, what are to be treated as dependent and independent variables (control of variables). Observations and data collected from such work are used to test existing theories and explanations or to revise and develop new ones.

4. Analyzing and Interpreting Data

Scientific investigations produce data that must be analyzed in order to derive meaning. Because data usually do not speak for themselves, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Sources of error are identified and the degree of certainty calculated. Modern technology makes the collection of large data sets much easier, thus providing many secondary sources for analysis.

5. Using Mathematics and Computational Thinking

In science, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks, such as constructing simulations, statistically analyzing data, and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable predictions of the behavior of physical systems, along with the testing of such predictions. Moreover, statistical techniques are invaluable for assessing the significance of patterns or correlations.

6. Constructing Explanations

The goal of science is the construction of theories that can provide explanatory accounts of features of the world. A theory becomes accepted when it has been shown to be superior to other explanations in the breadth of phenomena it accounts for and in its explanatory coherence and parsimony. Scientific explanations are explicit applications of theory to a specific situation or phenomenon, perhaps with the intermediary of a theory-based model for the system under study. The goal for students is to construct logically coherent explanations of phenomena that incorporate their current understanding of science, or a model that represents it, and are consistent with the available evidence.

7. Engaging in Argument from Evidence

In science, reasoning and argument are essential for identifying the strengths and weaknesses of a line of reasoning and for finding the best explanation for a natural phenomenon. Scientists must defend their explanations, formulate evidence based on a solid foundation of data, examine their own understanding in light of the evidence and comments offered by others, and collaborate with peers in searching for the best explanation for the phenomenon being investigated.

8. Obtaining, Evaluating, and Communicating Information

Science cannot advance if scientists are unable to communicate their findings clearly and persuasively or to learn about the findings of others. A major practice of science is thus the communication of ideas and the results of inquiry—orally, in writing, with the use of tables, diagrams, graphs, and equations, and by engaging in extended discussions with scientific peers. Science requires the ability to derive meaning from scientific texts (such as papers, the Internet, symposia, and lectures), to evaluate the scientific validity of the information thus acquired, and to integrate that information.