

A Guide for Getting Started with CLEAN, 3-Dimensional Learning, and NGSS

What is 3D Learning and NGSS and what are their benefits?

“How do I get started?” This is one of the first thoughts when starting to use the Next Generation Science Standards (NGSS) to guide your teaching and students’ learning. The NGSS create an open playing field with an infinite number of possibilities for combining diverse scientific phenomena into interesting problems and projects that have the potential to inspire instruction and motivate student learning.

The [NGSS](#) three-dimensional instructional model challenges science educators to rethink our lesson and unit planning process by the inclusion of the Science and Engineering Practices (SEPs or skills needed), Disciplinary Core Ideas (DCIs or content/topic), and Crosscutting Concepts (CCCs or connections between content/topics), as they bundle Performance Expectations (PEs or standards).

Why use CLEAN to teach about climate science and energy?

Climate science and energy technology are some of the most rapidly changing science and engineering fields. It is a challenge to have the time and knowledge to find credible and up-to-date climate science and energy educational resources. The Climate Literacy and Energy Awareness Network (CLEAN) is a comprehensive source of high-quality, NGSS-aligned resources for grades K-16.

The [CLEAN Collection](#) is a free online searchable database containing over 700 classroom-ready and data-rich lesson plans, activities, labs, demos, videos, and visualizations on climate and energy science.

All “Selected by CLEAN” resources come from trusted sources and have been rigorously reviewed by both research scientists and teaching experts to ensure their scientific accuracy and educational value. Some issues like climate change and energy production are rapidly evolving and the CLEAN Collection is supplemented and reviewed regularly.

Educators can quickly and easily search the CLEAN collection by the NGSS [at-a-glance matrix](#) or [topics](#), grade level, and resource type.

How can CLEAN be used to create NGSS-aligned units?

Within NGSS, the DCIs represent science core ideas (content), the SEPs lay out how core ideas are taught, and the CCCs weave the storyline of the units together.

The first step in planning units using NGSS is to identify the PE, or bundle of PEs, that meet your grade-level and discipline curricula requirements. The next step is to identify which specific DCIs, SEPs, and CCCs “unpack” the PE(s) selected in order to create a coherent storyline for your unit.

Since educators are most experienced in planning and teaching units by content area,

the DCIs are a logical starting point when creating NGSS-aligned units. The SEPs and CCCs are also entry points for developing units using NGSS.

What are phenomena and how are they used to build units?

Phenomena are observable events in nature and people's lives, such as the phases of the moon and the buoyancy of ships. To engage students in actively understanding (rather than passively being taught about) a science core idea, the phenomena should be framed in a way that connects to students' interests and identities.

Phenomena can connect to multiple NGSS DCIs and be used at both the lesson and unit level. A unit level phenomenon, or anchoring phenomenon, takes students the entire unit to be able to explain the science behind it in their own words. A lesson-level phenomenon builds students' understanding of the bigger science concept.

For more in-depth information about phenomena, see the [Phenomena for NGSS](#) teaching and learning website.

What strategies are used for planning and teaching units?

In tandem with selecting science standards, it is essential that the development, instruction, and revision of lessons be guided by an understanding of students and learning. There are a vast array of [Instructional Strategies](#), each with a unique process and set of expected learning outcomes, including:

- Problem-Based
- Project-Based
- Place-Based
- Phenomenon-Based
- Data-Based
- Solutions-Focused
- Argument-Driven Inquiry

Any one of these strategies has the potential to provide the structure and depth necessary to meet the NGSS. Select strategies that work well in your class. In choosing the right strategy, pair it to the science core ideas and the grade level of your class. For example, project-, place-, and phenomenon-based learning is especially powerful with students in middle school grades. For high school grades, students' learning thrives with argument-driven inquiry and phenomena-based, problem-based, and solutions-focused strategies.

How do I plan units using CLEAN and NGSS?

The CLEAN Get Started Unit [Planning Template](#) and its corresponding [Flowchart](#) provide step-by-step and visual guidance to develop instructionally-sound and science-content-rich units. The lesson template and flowchart are both available as downloads, which you can use to create your own CLEAN-based and NGSS-aligned units.

For examples, check out the units on [Phenology](#), [History of Oceans and Atmosphere](#), and [Debating the Grid](#).