

Information about the California NGSS for Parents and Guardians of 8th Graders

What are the Next Generation Science Standards?

The Next Generation Science Standards (NGSS) are a new set of science standards for kindergarten through high school. The NGSS were designed with the idea that students should have a science education that they can use in their lives. It should empower students to be able to make sense of the world around them. And it should give students the critical thinking, problem solving, and data analysis and interpretation skills they can use in any career, and that will help them make decisions that affect themselves, their families, and their communities. California and many other states have adopted the NGSS or very similar standards.

In order to accomplish this, the NGSS call for science learning in which students do not just memorize a set of science facts, but rather engage in figuring out how and why things happen. Core ideas in life science, Earth science, physical science, and engineering, are intentionally arranged from kindergarten through 12th grade so that students can build their understanding over time, and can see the connections between different ideas and across disciplines. To figure out these core ideas, while building the skills that will help them make sense of the world around them, students engage in the same practices that real scientists and engineers do. For example, students will develop and use models, analyze data, and make evidence-based arguments. They also learn to make sense of core ideas using crosscutting concepts that are useful ways of thinking about and making connections across different areas of science and engineering, for example thinking in terms of systems or cause and effect. The NGSS website provides additional information and resources for families.

The NGSS calls for these three dimensions—core ideas, practices, and crosscutting concepts—to work together in science classes. For example, students could plan and conduct investigations (a science practice) to find cause-and-effect relationships (a crosscutting concept) of potential energy, distance between magnets, and strengths of magnetic forces (a core science idea). Each Amplify Science unit has students engage as scientists or engineers in making explanations or designing solutions as they figure out a real-world problem. Students will use the three dimensions of the NGSS together as they build their understanding of the concepts and skills they can use in their lives.

Three-dimensional learning in the Amplify Science Middle School 8th Grade Course

The Amplify Science Grade 8 Physical Science Course includes nine units that support students in meeting the NGSS. The following unit summaries demonstrate how students engage in three-dimensional learning to solve real world questions and problems.

Harnessing Human Energy: Students help a team of rescue workers get energy to the batteries in their equipment. They ask questions, evaluate and analyze evidence and figure out how energy transfer works in a variety of systems.

Force and Motion: Students figure out ideas about force, velocity, mass, and collisions as they explain why a spacecraft failed to dock as expected. They use the concept of cause and effect to construct explanations and make visual models showing what went wrong.

Force and Motion Engineering Internship: Students design pods to be dropped to deliver emergency supplies. They explain why their designs are optimal using ideas about mass, velocity, collisions, and structure and function. They also define new engineering problems.

Magnetic Fields: Students plan and conduct investigations to figure out why the test-launch of a magnetic spacecraft did not go as planned. They use patterns in magnetic field lines, and evidence from articles, models, and experiments to learn about magnetic force and energy.

Thermal Energy: Students use mathematical thinking and evidence from articles, experiments, and models to decide which of two heating systems will best heat a fictional school. They construct explanations for what causes stability or change in thermal energy and temperature.

Phase Change: Students develop and use models to figure out if a lake on Titan, a moon of Saturn, froze or evaporated. They explain how energy transfer and attraction between molecules affect molecular motion at a small scale and phase change at a large scale.

Phase Change Engineering Internship: Students analyze data as they design devices that use phase change materials to keep babies warm. They obtain information from articles and hands-on investigations about how energy transfers as matter melts or freezes.

Chemical Reactions: Students figure out how changes at the atomic scale caused a large-scale problem in a town's water supply. They ask questions, use models, and read articles to learn about properties of substances, atoms and molecules, and chemical reactions.

Light Waves: Students' investigations of Australia's high rate of skin cancer lead them to figure out how energy from different wavelengths of light can interact with matter. They write arguments based on evidence they gather from models, articles, experiments, and data.