

## Grade 6

### What should my students learn across the year in science?

By the end of sixth grade, all students should reach the expectations outlined in the NYS standards. This means that no matter what curricular resources your school uses, there are certain experiences all students in sixth grade have. This learning map helps you know what your students should be learning in science across the year and details examples of research validated pedagogical practices that you can employ to create access to rich and culturally responsive grade level content.

#### Science

##### The Sixth Grade Experience: A Yearlong Look

All students benefit from science education. Science serves as a key instructional component of a high-quality educational program and should be prioritized for instruction **five** times per week in grade 6. Science empowers students to be able to make sense of the world around them. It also helps students develop the critical thinking, problem solving, and practices such as analyzing and interpreting data, predicting, and constructing explanations and arguments. Such practices are used in any career, and will help them make decisions that affect themselves, their families, and their communities.

Science learning is not about the memorization of a set of science facts, but rather about figuring out how and why things happen. Core ideas in life science, earth and space science, physical science, and engineering design are intentionally arranged from kindergarten through twelfth grade so that students build their understanding over time and see the connections between different ideas and across disciplines. To figure out these core ideas, students engage in the same practices that real scientists and engineers do. For example, students develop and use models, analyze data, and make evidence-based arguments. They also learn to make sense of core ideas using crosscutting concepts, such as systems or cause and effect, which are useful ways of thinking about and making connections across different areas of science and engineering. These three dimensions—core ideas, practices, and crosscutting concepts—to work together in science classes.

Grade 6 yearlong science teaching is focused in the understanding of *Energy and Matter* as a crosscutting concept. Focusing the conversations and investigations on such crosscutting concept help grade 6 students to develop an understanding of the qualitative aspects of energy, as well as the movement of energy across objects in a system. Students will also develop understanding of the relationships between objects' relative position and its different forms of energy. The integration of *Energy and Matter* as well as other crosscutting concepts such patterns, stability and change, and systems will help students build their knowledge of how the natural world works, and how to create solutions for identified problems they will research in class.

A high-quality science education means that students will develop an in-depth understanding of content and develop key skills—communication, collaboration, inquiry, problem solving, and flexibility—that will serve them throughout their educational and professional lives. To support a high-quality education, the NYCDOE designed a PK-8 Science [Scope & Sequence](#) for based on the [New York State P-12 Science Learning Standards](#), which provides guidance on what students should be learning and the learning sequence. The units for grade 6 in

the [Scope & Sequence](#) were designed to provide students with consistent and multiple ways to develop understanding of abstract concepts. Whether it is through ecosystems or circuit boards, students have tangible ways to concretely understand the flow and transfer of energy and matter. Following the sequence of units should provide multiple opportunities to cognitively develop their skills and ability to construct new knowledge on ideas and theories we can only study on their abstract level.

### **Amplify Science**

Many schools across the NYC DOE use our core curriculum option, Amplify Science, which is aligned with the NYC Science Scope & Sequence. The use of a shared curriculum, such as Amplify Science, engages students in the development of science and engineering practices, which integrates with the continual development of literacy skills. In Amplify Science, students' science learning incorporates reading and researching for evidence to support claims; gathering, analyzing and interpreting data during and after investigations, and constructing explanations and scientific arguments supported by their collected evidence. Amplify Science is also digitally accessible and lends itself to blended and remote instruction.

[Amplify Science](#), grades 6-8, has an arrangement of units that is aligned with the units of the Scope & Sequence. Grade 6 students learning science through Amplify, continue developing their science and engineering practices and continue deepening their knowledge on topics in science and engineering through investigations and science seminars.

***Harnessing Human Energy***, as a launching unit, addresses both the study of energy transfer and systems, as well as engineering design. The NYC Companion Lessons that will address the NYSSLS for this unit, allow students to make observations of the transfer of energy through electric devices. These series of lessons include opportunities for students to continue developing their literacy skills. Students use Active Reading to understand "Non-Touching Forces", as well as to compare and contrast electrostatic forces and magnetic forces. Students will continue expanding their knowledge and understanding of *Energy and Matter throughout* the rest of the unit and other investigations.

While launching units communicate expectations of a new way of learning science, core units in Amplify Science brings three-dimensional learning to students with consistent routines and opportunities to develop practice that include literacy skills. The following are brief descriptions of the Core Units and Engineering Internship for grade 6:

***Thermal Energy*** brings a real-life situation, providing students with ideas for getting involved in solving problems in their school community. Its phenomenon includes the role of students in their research and study of thermal energy, they will be prompt to propose two options to solve the problem with the school's water heater.

***Ocean, Atmosphere, and Climate*** provides the opportunity to study and understand how energy and matter flow through the living environment and how climate is different in different locations.

***Weather Patterns*** is a unit that lead students to continue the discourse about energy transfer through the effects of rainstorms in a community. While investigating various processes such as condensation and precipitation, students also learn how heat as energy moves air parcels from warmer places in the atmosphere to cooler ones.

***Populations and Resources*** sets the stage for students to begin their study and learning about ecosystems. As student ecologists, students use the fictional scenario presented to research why the changes to one population of organisms change others in the ecosystem.

***Matter and Energy in Ecosystems*** continues building student understanding of ecosystems. Students research plants and animals to provide advice in the types and species that “econauts” would include in their biodome.

***Earth’s Changing Climate provides*** students with opportunities to investigate and validate claims about why the Earth’s temperature is increasing.

#### **Special Note for Blended and Remote Instruction**

Lessons on *Energy and Matter* include many hands-on activities, providing students with tangible experiences in which they will observe the transfer and transformation of energy as well as the flow of matter. Such hands-on experiences are easily replaced by virtual laboratories using Phet Simulations and other virtual activities. Some examples are provided below.

- Electricity and Magnetism: [Circuit Construction Simulation](#)
- Engineering and Energy Transformations: [Energy Conversions](#)
- Ecosystems: [Ecology Simulations](#)
- Investigating Weather and Climate: [Weather, Climate, Atmosphere](#)
- Human Impact on Earth’s Climate: [Videos to Help Us Understand Climate Change](#)

## Grade 7

### What should my students learn across the year in science?

By the end of seventh grade, all students should reach the expectations outlined in the NYS standards. This means that no matter what curricular resources your school uses, there are certain experiences all students in seventh grade have. This learning map helps you know what your students should be learning in science across the year and details research validated pedagogical practices that you can employ to create access to rich and culturally responsive grade level content.

#### Science

##### The Seventh Grade Experience: A Yearlong Look

All students benefit from science education. Science serves as a key instructional component of a high-quality educational program and should be prioritized for instruction **five** times per week in grade 7. Science empowers students to be able to make sense of the world around them. It also helps students develop the critical thinking, problem solving, and practices such as analyzing and interpreting data, predicting, and constructing explanations and arguments. Such practices are used in any career, and will help them make decisions that affect themselves, their families, and their communities.

Science learning is not about the memorize a set of science facts, but rather about figuring out how and why things happen. Core ideas in life science, earth and space science, physical science, and engineering design are intentionally arranged from kindergarten through twelfth grade so that students build their understanding over time and see the connections between different ideas and across disciplines. To figure out these core ideas, students engage in the same practices that real scientists and engineers do. For example, grade 7 students develop and use models, analyze data, and construct many explanations that will demonstrate their knowledge of how particles change our world over time. They also learn to make sense of core ideas using crosscutting concepts, such as systems or cause and effect, which are useful ways of thinking about and making connections across different areas of science and engineering. These three dimensions—core ideas, practices, and crosscutting concepts—to work together in science classes.

Grade 7 yearlong science teaching is focused in the understanding of *Scale, Proportion and Quantity* as a crosscutting concept. Grade 7 units in the [Scope & Sequence](#) were designed to provide students with a coherent organization of new knowledge that drive students to understand matter beginning at the atomic level. The sequence of units is intentionally structured to investigate phenomena and build on content knowledge. Understanding the behavior of atoms will lead us better understand the motion of plate tectonics, and to better design systems that will minimize the impact of natural phenomena such as earthquakes.

A high-quality science education means that students will develop an in-depth understanding of content and develop key skills—communication, collaboration, inquiry, problem solving, and flexibility—that will serve them throughout their educational and professional

lives. To support a high –quality education, the NYCDOE designed a PK-8 Science [Scope & Sequence](#) for based on the [New York State P-12 Science Learning Standards](#), which provides guidance on what students should be learning and the learning sequence.

### **Amplify Science**

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[Amplify Science](#), grades 6-8, introduces the concept of Scale, Proportion and Quantity in the launching unit titled *Microbiomes*. This unit help you set the tone and expectations for science teaching and learning. Students will begin their use of *scale, proportion and quantity* by investigating how and why microorganisms keep the human body healthy. As students continue conducting investigations, the unit of *Metabolism* provides a continuation of learning about the human body in connection with atoms and molecules, and the units of *Phase Change and Chemical Reactions* will provide students with opportunities to deepen their knowledge about particles and their behavior under different conditions. The following sequence of units in Amplify Science is aligned to the units in the Scope and Sequence, addressing the NYSSLS pertaining to the grade while studying the investigative phenomena for each of the units.

***Microbiomes*** is the launching unit and is used to communicate the expectations to students of how they will be learning science throughout the year. The unit is designed to address core ideas integrating life and earth science.

***Metabolism*** is the first of the core units and continues deepening the learning of life science core ideas through the investigation and diagnose of symptoms a girl is having while going to the hospital.

***Phase Change*** is a unit in which students investigate the chemical properties and composition of bodies of liquid and ‘oceans’ in Titan, one of the moons in Saturn.

***Chemical Reactions*** leads students to take the role of student chemists to solve identify chemical substance in the water of a fictional community’s water system.

***Plate Motion*** provide a unique opportunity for students to learn about the role of geologists in determining how plate tectonics move over time and understand the value of gathering evidence to support an argument or claims that explain such phenomenon. This unit also contains an engineering internship, in which students apply their learning while explaining tsunamis.

**Rock Transformations** is a unit that continues the investigation of geological processes, composition, and history of rocks to better understand how rocks transform and shape. Students use and expand their knowledge and understanding of the flow of energy and matter to construct explanations of the transformation of rocks.

**Earth's Changing Climate Engineering Internship** is another design thinking unit in which students continue learning about climate change and apply their knowledge to design new technologies that will minimize the amount of carbon dioxide molecules released in the atmosphere.

**Special Note for blended and remote instruction:** Investigations at different scales involves the use of different kinds of materials to build physical models and the use and manipulation of digital animations. It is important to provide students with many opportunities to understand and learn how particles and molecules behave and move in spaces. These are concepts that are unobservable without the help of electron microscopes. Here are some activities you can incorporate in the storyline and investigative phenomenon of Amplify Science or any other curriculum of your choice.

- Structures and Properties of Matter: [Build a Molecule](#)
- Changing Properties of Matter and Energy: [Physical and Chemical Changes Interactive](#)
- Structures of Life: [Body Control Center](#)
- Geology: [Earth Science Interactives for Students](#)
- Minimizing Human Impact Through Engineering Design: [Washing Air – Teach Engineering](#)

## Grade 8

### What should my students learn across the year in Science?

By the end of eighth grade, all students should reach the expectations outlined in the NYS standards. This means that no matter what curricular resources your school uses, there are certain experiences all students in eighth grade have. This learning map helps you know what your students should be learning in science across the year and details research validated pedagogical practices that you can employ to create access to rich and culturally responsive grade level content.

#### Science

##### **The Eighth Grade Experience: A Yearlong Look**

All students benefit from science education. Science serves as a key instructional component of a high-quality educational program and should be prioritized for instruction **five** times per week in grade 8. Science empowers students to be able to make sense of the world around them. It also helps students develop the critical thinking, problem solving, and practices such as analyzing and interpreting data, predicting, and constructing explanations and arguments. Such practices are used in any career, and will help them make decisions that affect themselves, their families, and their communities.

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Grade 8 yearlong science teaching is focused in the understanding of *Stability and Change* as a crosscutting concept. The units for grade 8 in the [Scope & Sequence](#) were designed to provide students with a deep understanding of abstract scientific concepts such as waves, energy, forces, genetics, and evolution, in preparation to take Regents courses in high school. The concept of *Stability and Change* provides context to gain a better understanding of how natural systems remain consistent, as well as how change happens slow and steady over time.

##### **Amplify Science**

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constructing explanations and scientific arguments supported by their collected evidence. Amplify Science is also digitally accessible and lends itself to blended and remote instruction.

[Amplify Science](#), grades 6-8, introduces the concept of *Systems and System Models* in the launching unit titled *Geology on Mars*. The use and development of this crosscutting concept continues providing students with opportunities to discuss how the interactions of small parts makes whole systems work and operate in the natural world, which in turn provide also stability. Soon after investigating the *Geology on Mars*, students begin their studies of *Force and Motion*, which will lead students to learn about gravitational interactions and forces exerted to a space pod and an international space station. Throughout the units, students have multiple opportunities to conduct Active reading, evaluate claims, and construct their own explanations. The following is a brief description of the units.

***Geology on Mars***, as a launching unit, lead students to know the expectations and how science learning will be unfolded throughout the year. Students take the role of planetary geologists to search for evidence of water and materials that can be used for the provision of energy.

***Force and Motion*** is the first of the core units, and lead students to continue deepening their knowledge of the flow of energy and matter. Through this unit, students investigate a problem that occurred in a space mission, to help design solutions using their new knowledge of gravitational forces and motion. This unit is also accompanied by an engineering internship in which students will design a space pod.

***Earth, Moon, and Sun*** is a unit that combines the development of scientific ideas along with the development of literacy skills and visual arts, leading students to continue applying their knowledge about gravitational force and motion, to provide advice to an earth and space photographer.

***Magnetic Fields*** continues deepening the knowledge of gravitational forces and motion to investigate several issues concerning the design of a spacecraft that would be tested for launch.

***Light Waves*** is a unit that continues the study and investigation of the flow of energy and matter. Students gain a better understanding of how light, as a form of energy, interact with materials and how these interactions affect the world. In its connections to life science, students investigate why cancer rates are the highest in Australia, a country that is facing the larger ozone layer problem in the planet.

***Traits and Reproduction*** is a unit that provides the opportunity to make connections to life science, continuing the conversation about combinations and changing in the makeup of proteins that in turn makes genes. Students investigate genes and chromosomes to better understand the reasons for variability among the same species of spiders.

***Natural Selection*** is a unit that lead students to investigate the changes of newts over time, as they now have biological and chemical mechanism defenses.

**Evolutionary History** is a unit about the investigation of fossils, determining their age and place in Earth’s history. Students apply knowledge from the previous unit Natural Selection while gathering evidence and analyzing data.

**Special Note for blended and remote instruction:** All grade 8 units demand the use of different and practical examples to help students understand the abstract concepts addressed. You may want to assign short hands-on activities using everyday objects found at home, as well as animations and virtual labs in which students will continue learning about the effects of manipulated or independent variables. Below are some online activities that can be assigned for remote instruction.

- Energy, Forces and Motion: [Motion and Stability: Forces and Interactions](#)
- Earth's Place in the Universe: [3D Solar System Simulator](#)
- Growth, Development, and Reproduction of Organisms: [Molecular Workbench](#)
- Evolution, Natural Selection, and Adaptations: [Natural Selection](#)
- Evolution of Technology in Science: [Waves Intro](#)