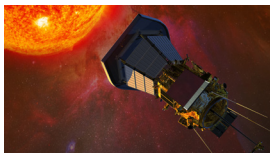
Stile

NEXT GENERATION SCIENCE STANDARDS

NGSS Middle School Scope and Sequence & Unit Guide

Suggested sequence of work

Grade 6



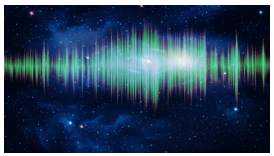
Our Place in Space
Journey to the Sun

Forces
Scaling walls

Food Chains and Food Webs
Predators and prey

Plants
Predatory plants

Physical and Chemical Change
The science of chocolate



Sound
Screaming in space

Grade 7

Active Earth
Feel the Earth move

States of Matter
Mission to Mars

Elements and Compounds
Disappearing helium

Energy
Biomimicry

Heat
The perfect pizza

Genetics
Mutations

Evolution
Sonar battles

Grade 8

Earth Systems
The greenhouse effect

Light
Bending light

Magnetism
Wireless electricity

Cells
Lab-grown meat

Body Systems
Cold-blooded killers

The Nervous System
Sniffing out cancer

How Stile aligns to the NGSS

Real-world phenomena drive the unit and connections are also made to advances in Science, Engineering, and Technology.

Disciplinary Core Ideas are covered throughout the core lessons of the unit.

Crosscutting Concepts are explored as students learn about Scale, Proportion, and Quantity.

Students apply **Science and Engineering Practices** as they develop an understanding of cell models.

Crosscutting Concepts of Structure and Function are explored as students visualize, model and describe the structure and function of cell organelles.

Cells

Introduction: Battle of the burgers

1.1 Lesson: The building blocks of life
1.2 Extension: Sizes of cells
1.3 Lesson: Introduction to microscopes
1.4 Practical activity: Using a microscope
1.5 Practical: Measuring with microscopes
1.6 Extension: Cell theory

2.1 Lesson: Parts of a cell
2.2 Lesson: Animal vs. plant cells
2.3 Practical activity: Make a cell model
2.4 Lesson: Cells under the microscope
2.5 Practical: Observing plant and animal cells

3.1 Lesson: Specialized cells
3.2 Project: Putting cells to work
3.3 Extension: Cell biology and Aboriginal art
3.4 Extension: Mythbusters – Cell division

4.1 Lesson: Science and society
4.2 Career profile

Glossary

Test: Cells

Students apply Science and Engineering Practices as they create thier own cell models.

Students apply Science and Engineering Practices as they conduct investigations to collect data as evidence to meet the goals of the investigation.

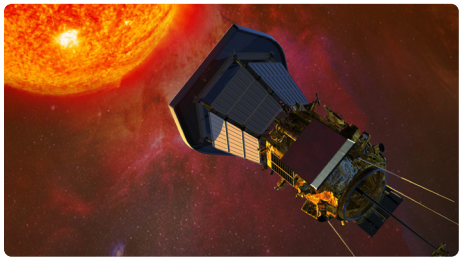
Connections to **Common Core State Standards in Literacy** are possible as students conduct a short research project on specialized cells, drawing on several sources.

Students explore a phenomenon from different perspectives through a Socratic Seminar. This also ties to **Common Core State Standards in Litearcy** as they can explore this issue through multiple avenues.

Career profiles showcase individuals exploring wonderful and fascinating careers related to STEM.

A summative test checks for understanding across the **Disciplinary Core Ideas**, as well as Science and Engineering Practices and Crosscutting Concepts.

Earth and Space Science



Our Place in Space : Journey to the Sun

How have observations over time changed different models of Earth in space?

In 2018, NASA launched the Parker Solar Probe on the first-ever mission to "touch" the Sun. The information it sends back is helping scientists solve many remaining puzzles about the object at the center of our Solar System. Through this context, launch into an exploration of Earth's place in space.

MS-ESS1-1

Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS1-2

Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

MS-ESS1-3

Analyze and interpret data to determine scale properties of objects in the solar system.

Active Earth: Feel the Earth move

How do we build future-ready cities?

The surface of Earth is continually changing. The movement of tectonic plates causes natural hazards that are outside of our control. People living under the threat of active volcanoes, earthquakes, and tsunamis can feel helpless. Learning about these natural hazards and how to mitigate them provides a sense of control and can even save lives. So how does understanding our active planet help society? Dig into this unit to find out more!

MS-ESS1-4

Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

MS-ESS2-1

Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

MS-ESS2-2

Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3

Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

MS-ESS3-2

Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

The Water Cycle : Recycling water in space

Would you ever drink your own urine?

As NASA sets its sights on Mars, an efficient way to recycle water is required in order to make the almost two-and-a-half year journey. Astronauts on the International Space Station have been testing a new system that filters their urine to produce drinking water. The new system could solve one of the problems of long-term space travel once and for all. Lift the lid on the water cycle with this space-age unit!

MS-ESS2-4

Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

MS-ESS2-5

Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

Resources: Sustainability

How has our use of resources changed over time?

A new study has given us fresh clues about the workings of an ancient civilization. But it also highlights how all humans depend on the natural world around us for resources. Renew your students' passion for learning as you explore how even in our high-tech world we rely on natural resources in countless ways.

MS-ESS3-1

Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

MS-ESS3-3

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*

MS-ESS3-4

Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

MS-ESS3-5

Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Life Science

Cells: Lab-grown meat

Could a $300,000 hamburger hold the key to feeding our growing population?

Scientists have discovered a way to produce meat using cultured cells instead of livestock. This discovery is paving the way for more ethical and sustainable food production methods, and could change the way we eat meat forever. Students will chew their way through this unit to discover the fascinating world of cells, and their potential to help solve a range of global issues.

MS-LS1-1

Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.

MS-LS1-2

Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Body Systems: Cold-blooded killers

What does it take to be a cold-blooded killer?

Until recently, scientists thought that boa constrictors killed their prey through suffocation, but a new study suggests it's another body system that fails. Students snake their way through this unit as they compare the body systems of humans with those of other animals.

MS-LS1-3

Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

MS-LS1-7

Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

Plants : Predatory plants

Why are some plants carnivorous?

Plants have special structures to absorb nutrients from the soil and air, but some live in locations where they can't get enough nutrition this way. The solution? Act like an animal. Carnivorous plants have evolved specialized cells and structures for luring and trapping prey. Capture your students' attention with this foray into the fascinating world of plants.

MS-LS1-4

Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

MS-LS1-5

Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

MS-LS1-6

Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

MS-LS2-4

Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-LS2-5

Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MS-LS1 From Molecules to Organisms: Structures and Processes

The Nervous System: Sniffing out cancer

Could machines sniff out cancers better than dogs?

Dogs have an amazing sense of smell that can detect cancers and other diseases. Now this ability is inspiring scientists to develop electronic detectors that could save lives. By learning how these devices work, students are introduced to the organization and basic functions of the human nervous system.

MS-LS1-8

Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

Food Chains and Food Webs: Predators and prey

Why do cats have slit-shaped pupils?

The answer relates to the one thing that connects all living things: food! The pupils of cats and other predators help them judge the precise distance to their prey and give them superior night vision. This eye-opening discovery will be the first of many as your students explore food chains and food webs.

MS-LS2-1

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2

Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-3

Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Evolution: Sonar battles

What do Mexican short-tailed bats and military submarines have in common?

The answer is that both use “sonar jamming” to gain an advantage over rivals. But while humans used science and engineering to develop sonar technology, bats evolved theirs in their own bodies over millions of years. Hang around and explore how evolution has allowed this to happen.

MS-LS3-1

Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

MS-LS3-2

Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

MS-LS4-1

Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

MS-LS4-2

Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

MS-LS4-3

Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.

MS-LS4-4

Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals’ probability of surviving and reproducing in a specific environment.

MS-LS4-5

Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

MS-LS4-6

Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Physical Science

NGSS · Scope & Sequence

Elements and Compounds: Disappearing helium

What happens if the world runs out of helium?

World supplies of helium were running low before the recent discovery of a large deposit in the East African Rift. The gas is rare on Earth because it's light enough to escape the atmosphere, but its unique properties also give it a wide range of important uses. Through this context, introduce your students to the incredible variety of elements and compounds that make up the complex world around us.

MS-PS1-1

Develop models to describe the atomic composition of simple molecules and extended structures.

MS-PS1-3

Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

MS-PS1-6

Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*

Physical and Chemical Change: The science of chocolate

What is the science of chocolate?

Humans have been enjoying cocoa for millennia. Today, cocoa beans are turned into delicious, melt-in-your-mouth chocolate by a sequence of physical and chemical changes. Bite into this unit and get a taste of the chemistry of chocolate, as well as many other examples of changing matter.

MS-PS1-2

Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

MS-PS1-5

Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

Magnetism: Wireless electricity

What is wireless electricity?

The world is fast becoming wireless. Now Disney Research Lab has invented a wireless charging room where devices can recharge automatically. It seems truly magical, but this ambitious project takes advantage of magnetism and its unique connection with electricity. Walk on in to this unit to find out more about this mysterious force!

MS-PS2-3

Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

MS-PS2-5

Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

States of Matter: Mission to Mars

Why is liquid water so important for humans to live on Mars?

A human settlement on Mars could become a reality in our lifetimes. But any future settlers will need liquid water to survive, and it seems to be in short supply on the Red Planet. Through this context, explore the states of matter that we interact with every day and apply the particle model to explain how they behave.

MS-PS1-4

Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

MS-PS2 Motion and Stability: Forces and Interactions

Forces: Scaling walls

How can you scale a wall like a gecko?

How do you climb up a sheer glass wall? If you're a gecko, just walk. But for humans, scaling walls this way only happened in fiction, until recently. Elliot Hawkes, an engineering student, did it in real life. Scale up your students' physics knowledge with this gravity-defying unit on forces.

MS-PS2-1	MS-PS2-2	MS-PS2-4
Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.*	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

Heat: The perfect pizza

How do you make the best pizza?

The best pizza chefs around the world know that cooking the perfect pizza requires a secret ingredient – the right balance of heat! Scientists have now confirmed that a wood-fired oven provides the optimal heat to achieve a crispy dough and evenly cooked toppings. Through this context, explore what heat is and the different ways it is transferred. Your students will be hungry to find out more!

MS-PS3-3

Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.*

MS-PS3-4

Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

Energy: Biomimicry

How can we learn from nature to improve energy technology?

Engineers design machines to harness energy in new and exciting ways. Living things also rely on using and saving energy to survive. So by studying living things, we can often learn how to improve our technology. This has inspired new designs for trains, surfboards, robots, and wind turbines!

MS-PS3-1

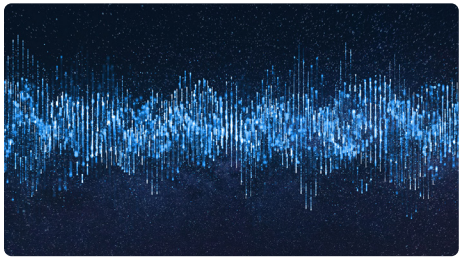
Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-PS3-2

Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

MS-PS3-5

Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.



Sound: Screaming in space

In space no one can hear you scream – or can they?

We think of space as a silent place – a vacuum through which sound waves cannot travel. But there are other types of waves that travel through space, and when converted into sounds they make for an eerie listening experience. From silent screams to what music looks like, tune your students in to the science of sound.

MS-PS4-1

Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

MS-PS4-3

Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

Light: Bending light

How do we turn a smartphone into a microscope?

Through their ability to bend light, lenses have been helping transform our lives for centuries. Peer into the amazing world of light with your students and discover a new type of lens that means you can now use your smartphone as a microscope.

MS-PS4-2

Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Engineering, Technology, and the Application of Science

Resources: Sustainability

How has our use of resources changed over time?

A new study has given us fresh clues about the workings of an ancient civilization. But it also highlights how all humans depend on the natural world around us for resources. Renew your students' passion for learning as you explore how even in our high-tech world we rely on natural resources in countless ways.

MS-ETS1-1

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3

Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4

Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Forces: Scaling walls

How can you scale a wall like a gecko?

How do you climb up a sheer glass wall? If you're a gecko, just walk. But for humans, scaling walls this way only happened in fiction, until recently. Elliot Hawkes, an engineering student, did it in real life. Scale up your students' physics knowledge with this gravity-defying unit on forces.

MS-ETS1-1	MS-ETS1-2	MS-ETS1-3
Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Heat: The perfect pizza

How do you make the best pizza?

The best pizza chefs around the world know that cooking the perfect pizza requires a secret ingredient – the right balance of heat! Scientists have now confirmed that a wood-fired oven provides the optimal heat to achieve a crispy dough and evenly cooked toppings.
Through this context, explore what heat is and the different ways it is transferred.
Your students will be hungry to find out more!

MS-ETS1-1	MS-ETS1-2	MS-ETS1-3
Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Energy: Biomimicry

How can we learn from nature to improve energy technology?

Engineers design machines to harness energy in new and exciting ways. Living things also rely on using and saving energy to survive. So by studying living things, we can often learn how to improve our technology. This has inspired new designs for trains, surfboards, robots, and wind turbines!

MS-ETS1-1

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3

Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Would you like to know more?
Stile's legendary team are here to help.

Get started on a **FREE 30 day trial**.
www.stileeducation.com/set-up-trial

www.stileeducation.com
educators@stileeducation.com
+1 323-301-7470