			Earth & Space Science **Grade 9** **Unit #1**
Course/Subject: Earth and Space Science	**Grade:** 9th	**Intro to Earth Science/Scientific Process**	**Suggested Timeline:** **3 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	**Unit 1: Intro to Earth Science/Scientific Process** Unit 2: Matter Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun Unit 7: The Universe Unit 8: The Atmosphere Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	Intro to Earth Science/Scientific Process
Unit Summary	This unit introduces the branches of Earth Science, scientific methods, and the measurement and analysis that they will use in their study of Earth Science.

Unit Essential Questions: 1. What is Earth Science and Why is it important? 2. How do you use the scientific method to solve a problem? 3. Why is it important to make accurate observations and when collecting data? 4. How are models used in the study of Earth and Space Science?	**Key Understandings:** 1. Earth and Space Science has 4 main branches 2. Science is a process that is trying to find an answer to a problem 3. Accuracy of measuring correlates to validity of data 4. In Earth science standard methods of evaluation are not always possible so models must be used

Focus Anchors Addressed in the Unit:

Anchor Number	*Anchor Description*
S11.A.1.1	Analyze and explain the nature of science in the search for understanding the natural world and its connection to technological systems
S11.A.2.1	Apply knowledge of scientific investigation or technological design to develop or critique aspects of the experimental or design process
S11.A.3.1	Analyze the parts of a simple system, their roles, and their relationships to the system as a whole.
S11.A.3.2	Compare observations of the real world to observations of a constructed model.

Important Anchors Addressed in the Unit:	
S11.A.1.1.1	Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the universal law of gravitation, how light travels, formation of moons, stages of ecological succession).
S11.A.1.1.2	Analyze and explain the accuracy of scientific facts, principles, theories, and laws.
S11.A.1.1.3	Evaluate the appropriateness of research questions (e.g., testable vs. not-testable).
S11.A.1.1.4	Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).
S11.A.1.3.1	Use appropriate quantitative data to describe or interpret change in systems (e.g., biological indices, electrical circuit data, automobile diagnostic systems data
S11.A.2.1.1	Critique of elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design
S11.A.2.1.3	Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
S11.A.3.1.1	Apply systems analysis,showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts.
S11.A.3.2.1	Compare the accuracy of predictions represented in a model to actual observations and behavior.
S11.A.3.2.3	Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps).

Misconceptions:	**Proper Conceptions:**
1. A theory can become a law. 2. You can change more than one thing in an experiment.	1. Theories are complex and usually are associated with multiple laws. Laws are simple and usually expressed as mathematical equations. 2. If you have too many variables in an experiment it is impossible to determine which is having an effect on your results

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Scientific method steps ● Appropriate measuring systems ● Lab report writing & peer review ● Use of models in Earth and Space Science	● Demonstrate knowledge and use of scientific method steps ● Accurately collect, convert, and display data ● Write a logical and accurate lab report ● Compare models and real data, explain advantages & disadvantages of each	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions in the world around them.

Academic Vocabulary:		
● Earth Science ● Geology ● Meteorology ● Astronomy ● Correlation	● Observation ● Inference ● Hypothesis ● Theory ● Accuracy	● Law ● Independent Variable ● Dependent Variable ● Control ● Precision

Assessments:

- Complete formal lab report
- Practice measurement & conversion handouts
- Model analysis
- Quiz/test

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- graphing and conversations
- History- correlation of past events to current events
- English - writing lab reports

Additional Resources:

- Earth Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books

Created By: Nicole Gutacker

			Earth & Space Science **Grade 9** **Unit #2**
Course/Subject: Earth and Space Science	**Grade:** 9th	**Matter**	**Suggested Timeline:** **3-4 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process **Unit 2: Matter** Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun Unit 7: The Universe Unit 8: The Atmosphere Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	Matter
Unit Summary	Matter consists of atoms, either of one type (elements), or in combination with other types (compounds). Physical and chemical properties identify matter and are used for placement on the periodic table. Chemical bonds form between atoms during chemical reactions. Substances also combine to form mixtures that are not chemically bonded.

Unit Essential Questions:

1. How can we classify matter using physical & chemical properties?
2. How do I represent an atom's parts using information from the periodic table?
3. How is the periodic table organized and used to predict the properties each element?
4. How do we differentiate between elements, compounds and mixtures?
5. How do elements form chemical bonds?

Key Understandings:

1. A physical property of matter can be observed without changing the composition of the substance. In contrast a chemical property describes how a substance reacts with other substances to produce different substances.
2. An atom consist of electrons surrounding the nucleus that is made up of protons and neutrons.
3. The atomic number of an atom is equal to the number of protons in the atom the mass number is equal to the sum of the protons and the neutrons in the atom.
4. An isotope is an atom that has the same number of protons as other atoms of the same element, but different numbers of neutrons.
5. Elements of the periodic table are arranged in groups that are based on similarities in the chemical properties of the elements.
6. A compound is a substance made up of an atom of two or more different elements joined by chemical bonds.
7. Ionic bonds occur when electrons are transferred from one atom to another.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.A.3.2.3	Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps).
S11.C.1.1.1	Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., protons, neutrons, electrons).
S11.C.1.1.2	Explain the relationship between the physical properties of a substance and its molecular or atomic structure.
S11.C.1.1.3	Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories.
S11.C.1.1.4	Explain how the relationships of chemical properties of elements are represented in the repeating patterns within the periodic table

Important Anchors Addressed in the Unit:	
S11.C.1.1	Explain the relationship between the structure and properties of matter.

Misconceptions:	**Proper Conceptions:**
1. Atomic mass is the sum of all electrons, neutrons, and protons. 2. Ionic and covalent bonding are interchangeable.	1. Atomic mass is the sum of the neutrons and protons. 2. Ionic bonding electrons are transferred; in covalent bonding electrons are shared.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Physical & chemical properties of matter ● Structure of an atom ● Periodic table arrangement, families & trends ● Elements, compounds and mixtures ● Ionic & covalent bonding	● Identify & classify matter according to physical & chemical properties ● Draw accurate models of atoms ● Identify elements on periodic table by family, class and period ● Predict element properties using knowledge of periodic familie ● Explain and diagram transfer of electrons during ionic & covalent bonding ● Differentiate pure substances and mixtures	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between the physical and chemical world around them.

Academic Vocabulary:		
● Matter ● Element ● Isotope ● Ion ● Mixture	● Atom ● Proton ● Compound ● Ionic Bond ● Solution	● Electron ● Neutron ● Molecule ● Covalent Bond ● Bohr's Model

Assessments:

- Handouts and practice worksheets
- Labs
- Quiz/test
- Drawings of atoms
- Guided readings
- Periodic table coloring activity

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- calculating atomic mass and bonding ratios
- History- of atomic model and periodic table
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books

Created By: Nicole Gutacker

			Earth & Space Science **Grade 9** **Unit #3**
Course/Subject: Earth and Space Science	**Grade:** 9th	**Minerals/Rocks**	**Suggested Timeline:** **4-5 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter **Unit 3: Minerals/Rocks** Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun Unit 7: The Universe Unit 8: The Atmosphere Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	Minerals/Rocks
Unit Summary	The solid portion of Earth is made up of minerals and rocks that give it unique characteristics. Minerals are usually inorganic, crystalline solids with repeating internal chemical structures and a characteristic set of properties. Rocks and Minerals are used to make millions of products that help support and better life on Earth.

Unit Essential Questions:

1. What is the solid composition of the earth?
2. What is a mineral and how are they classified?
3. What is a rock and how are they classified?
4. How are rocks changed by geological processes?

Key Understandings:

1. A mineral is a natural inorganic solid that has chemical composition and a crystalline structure.
2. Seven physical properties that help distinguish one mineral from another or color, streak, luster, cleavage and Fracture, hardness, crystal shape, and density.
3. Special properties that can Aid and identifying certain minerals include fluorescence and phosphorescence, double refraction, magnetism, and radioactivity.
4. The three major types of rocks are igneous rock sedimentary rock and metamorphic rock.
5. The rock cycle describes the natural process through which each type of rock can change into another type of rock.
6. Igneous rocks classified according to their composition.
7. Chemical sedimentary rock forms from minerals that were once dissolved in water, and organic sedimentary rocks form from the remains of living things.
8. Clastic sedimentary rocks form from the fragments of pre-existing rocks that are compacted and cemented together.
9. Metamorphism changes one type of rock into another.
10. Rocks change from one type to another through process on the rock cycle.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.D.1.1.1	Classify and describe major types of rocks (i.e., igneous – granite, basalt, obsidian, pumice; sedimentary – limestone, sandstone, shale, coal; and metamorphic – slate, quartzite, marble, gneiss) and minerals (e.g., quartz, calcite, dolomite, clay, feldspar, mica, halite, pyrite) by their origin and formation.
S11.A.3.1.1	Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts.
S11.A.2.2.1	Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality).

Important Anchors Addressed in the Unit:	
S11.D.1.1	Explain and analyze the forces in the lithosphere that continually shape Earth.

Misconceptions:	**Proper Conceptions:**
1. Rocks and Minerals are the same thing.	1. Actually Minerals are the building blocks of minerals. It is like saying a rectangle and squares are the same. Squares are rectangles and Minerals are rocks.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Mineral composition of the earth's crust ● Physical properties of minerals: color, crystalline shape, density, hardness, fracture & cleavage, luster, streak and special properties ● Rocks are mixtures and classified by their formation ● The rock cycle: igneous, metamorphic and sedimentary rocks – how they form and are classified	● Explain the mineral composition of the solid portion of the earth ● Use physical and chemical properties to identify minerals ● Identify parts of the rock cycle ● Classify different rocks based on physical properties	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between rocks/minerals and human endeavours.

Academic Vocabulary:

● Mineral ● Silicate ● Non-Silicate ● Streak ● Cleavage ● Laccolith ● Batholith ● Stock ● Sill ● Nonfoliated	● Luster ● Fracture ● Mohs Hardness Scale ● Density ● Rock Cycle ● Dike ● Volcanic Neck ● Chemical Sedimentary Rock ● Organic Sedimentary Rock ● Contact Metamorphism	● Igneous Rock ● Intrusive Igneous Rock ● Extrusive Igneous Rock ● Felsic ● Mafic ● Clastic Sedimentary rock ● Stratification ● Metamorphism ● Foliation ● Regional Metamorphism

Assessments:

- Mineral identification lab
- Crystallization lab

- Rock cycle activity
- Handouts/practice sheets
- Guided readings
- Quiz/test

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- graphing
- History- Mohs Scale
- English - writing lab reports/ Research project on Mineral Uses

Additional Resources:

- Earth Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters
- Mineral and rock samples

Created By: Nicole Gutacker

			Earth & Space Science Grade 9 **Unit #4**
Course/Subject: Earth and Space Science	**Grade:** 9th	**Plate Tectonics/Deformation of the Crust**	**Suggested Timeline:** **4-5 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter Unit 3: Minerals/Rocks **Unit 4: Plate Tectonics/Deformation of the Crust** Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun Unit 7: The Universe Unit 8: The Atmosphere Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	Plate Tectonics/Deformation of the Crust
Unit Summary	Many of the most dramatic features of Earth's surface are the result of deformation of the crust. The theory of plate tectonics explains the formation, movement, and subduction of earth's plates. The lithosphere is constantly moving and as plates move and collide they form mountains, trenches, volcanoes, etc. Seafloor spreading is used to explain how earth is cycling the lithosphere.

Unit Essential Questions: 1. How does Earth's crust respond to stress? 2. What are the driving features of plate tectonics? 3. How is plate tectonics used to explain the features of the earth's crust? 4. What is continental drift and what evidence supports it? 5. What events can occur at the different plate boundaries?	**Key Understandings:** 1. The three main types of stress are compression, which squeezes rocks together; tension, which pulls rocks apart ; and shear stress, which bends and twists the rocks. 2. Folds form when rock is bent without breaking. Faults form when blocks of rock on one side of a fracture moves relative to the block on the other side. 3. Collisions that form mountains can occur between an oceanic plate and a continental plate, between an oceanic plate and another oceanic plate, or between two continental plates. 4. Fossils, Rock, and climate evidence supports the hypothesis of continental drift. However,Wegener could not explain the mechanism by which the continents move. 5. New ocean floor is constantly being produced through seafloor spreading, which creates ocean ridges and changes in topography of the seafloor. 6. Seafloor spreading provides evidence that tectonic plates move and change. 7. The theory of plate tectonics proposed that the change in the Earth's crust are caused by very slow movement of tectonic

	plates. Earthquakes, volcanoes, and in between divergent, convergent and transform. 8. Tectonic plates meet at three types of boundaries - Divergent, convergent, and transform. 9. Tectonic plates are part of a connecting system that is driven by differences in density and heat. 10. Continents Collide warm supercontinents and then break apart in a cycle called the supercontinent cycle.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.D.1.1.2	Explain the processes that take place at plate boundaries and how these processes continue to shape Earth (e.g., volcanic activity, earthquakes, mountain building, mid-ocean ridges, deep-sea trenches, new land being formed).
S11.A.3.3.1	Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.
S11.A.3.3.2	Compare stationary physical patterns (e.g., crystals, layers of rocks, skeletal systems, tree rings, atomic structure) to the object's properties.
S11.A.3.3.3	Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).
S11.A.1.3.2	Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis).
S11. A.2.2.1	Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality).

Important Anchors Addressed in the Unit:	
S11.D.1.1	Explain and analyze the forces in the lithosphere that continually shape Earth.

Misconceptions:	**Proper Conceptions:**
1. The theory of plate tectonics and continental drift are the same thing.	1. Continental Drift is the concept that the plate were once joined and have since moved plate tectonic explains the mechanism by which the plates move.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Changes in the weight of earth's crust causes deformation ● Stress causes bending & breaking of rock ● Mountains form due to stress ● The earth's crust is made up of several blocks called plates that move ● Plate movement is due to sea floor spreading and convection currents in the mantle ● Volcanoes & earthquakes occur at plate boundaries ● Wegener's hypothesis	● Explain how faults, folds and mountains form in the crust ● Summarize the theory of plate tectonics ● Identify different plate boundaries & their unique features ● Identify and describe the evidence that supports continental drift ● Explain how sea-floor spreading provides a mechanism for continental drift ● Through inquiry, determine the evidence that supports Wegener's theory on continental drift.	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions of plate tectonics and how that affects them.

Academic Vocabulary:

- Continental Drift
- Plate Tectonics
- Paleomagnetism
- Lithosphere
- Asthenosphere
- Divergent Boundary
- Convergent Boundary
- Transform Boundary
- Mid-Ocean Ridge
- Deformation
- Isostasy
- Stress
- Strain
- Fault
- Fold
- Terrane
- Seafloor Spreading
- Pangea
- Panthalassa
- Magma
- Lava
- Hanging Wall
- Foot Wall

Assessments:

- Continent puzzle
- Seafloor spreading model
- Seafloor mapping lab
- Clay model of plate boundaries
- Manipulate faults
- Handouts/practice sheets
- Guided readings
- Quiz/test

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math
- Math-History-WW2
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Environmental Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters

Created By: Nicole Gutacker

			Earth & Space Science Grade 9 **Unit #5**
Course/Subject: Earth and Space Science	**Grade:** 9th	**EMS/Telescopes, Planetary Motion and the Moon**	**Suggested Timeline:** **3-4 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust **Unit 5: EMS/Telescopes, Planetary Motion and the Moon**	Unit 6: The Sun Unit 7: The Universe Unit 8: The Atmosphere Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	EMS/Telescopes, Planetary Motion and the Moon
Unit Summary	Astronomy is the study of universe. The universe is organized into galaxies. Telescopes use the electromagnetic spectrum to view the universe. The solar system consists of the sun, planets, and other bodies that revolve around the sun. The heliocentric model places the sun is at the center of the solar system. Kepler developed laws that explain planetary motion.

Unit Essential Questions:

1. How is the universe organized?
2. How do we measure distances in space?
3. What role do telescopes play in observing space?
4. How is the electromagnetic spectrum used to investigate the universe?
5. How do the Earth & moon move through in the solar system?
6. How was the modern model of the solar system developed?
7. How do we use Kepler's laws to predict planetary motion?
8. How do Newton's laws of motion support Kepler's laws?

Key Understandings:

1. Column a proposed an Earth-centered model of the universe. Copernicus proposed a sun-centered model.
2. Kepler's first law states that orbits of planets are ellipses with the Sun at one focus. The second law states that planets closer to the Sun travel faster than those farther away. The Third Law relates a planet's average distance from the Sun to the time it takes to make one orbit.
3. Newton use the idea of inertia to explain Kepler's Law. New Life eclipses occur when one planetary body passes through the shadow of another.
4. The full moon phase shows a fully illuminated Moon. The third quarter and first quarter shows a half moon. New moon is not visible.
5. The visible part of the electromagnetic spectrum is visible light. The non visible Parts include radio waves, microwaves, infrared waves, ultraviolet rays, X-rays, and gamma rays.
6. Refracting telescopes use lenses to gather and focus light while reflecting telescopes use curved mirrors to gather and focus light.
7. The angle of the sun's Rays changes throughout the year and leads to the seasonal change on Earth.

	8. The universe is about 14 billion years old. It is very large, and objects within it are very far apart. The universe is made up of billions of galaxies, Each of which is a large collection of stars, dust, and gases. Some Stars, such as our own, include planets and other small objects.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.A.3.2.3	Compare the accuracy of predictions represented in a model to actual observations and behavior
S11.A.3.3.3	Describe advantages and disadvantages of using models to simulate processes and outcomes.
S11.D.3.1.3	Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).
S11.D.3.1.1	Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts.
S11.A.2.2.2	Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meter, probe, interface, imaging technology, telescope) is used to extend human abilities and precision

Important Anchors Addressed in the Unit:	
S11.C.2.1.1	Compare or analyze waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, Xrays, microwaves) as well as their properties, energy levels, and motion.
S11.D.3.1.1	Describe planetary motion and the physical laws that explain planetary motion.

Misconceptions:	**Proper Conceptions:**
1. The earth block the light to the moon causing the moon phases. 2. We can see the whole moon from earth. 3. When we are closer to the sun it is summer and when we are further from the sun it is winter.	1. Half of the moon is always illuminated. 2. We only see one side of the moon because it rotates and revolves at the same time. 3. Seasons are caused by the tilt of the earth not the distance from the Sun.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Introduction to the study of astronomy ● Review the electromagnetic spectrum ● Telescope types and usage ● Rotation vs revolution ● Seasons ● Moon's movement and it's appearance from earth ● Early models of the solar system; current heliocentric model ● Kepler's laws of planetary motion ● Newton's laws of motion	● Describe characteristics of the universe in terms of time, distance, and organization ● Identify the visible and nonvisible parts of the electromagnetic spectrum ● Compare refracting and reflecting telescopes Summarize how earth's rotation and revolution provide a basis for measuring time ● Explain how the tilt of Earth's axis and movement cause seasons ● Explain the moon's movement and how it appears from earth ● Compare the early models of the solar system ● Summarize Kepler's three laws of planetary motion ● Describe how Newton explained Kepler's laws of motion	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between the sun and other heavenly bodies in our solar system.

Academic Vocabulary:

● Astronomy ● Galaxy ● Electromagnetic spectrum ● Geocentric ● Eccentricity ● Phase	● Telescope (reflecting/refracting) ● Rotation ● Revolution ● Heliocentric ● Orbital period ● Eclipse	● Aphelion ● Solstices ● Equinox ● Inertia ● Apogee ● Perigee

Assessments:

- Inquiry activities
- Graphic organizers
- Review & reinforcement worksheets
- Critical Thinking Activities
- Comparing models
- Summary/essay writing
- Test/quizzes

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- geometry and calculating orbital periods
- History of the telescope
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Environmental Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters

Created By: Nicole Gutacker

			Earth & Space Science **Grade 9** **Unit #6**
Course/Subject: Earth and Space Science	**Grade:** 9th	**The Sun**	**Suggested Timeline:** **3-4 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	**Unit 6: The Sun** Unit 7: The Universe Unit 8: The Atmosphere Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	The Sun
Unit Summary	The sun is the energy source that fuels most life on Earth. It is composed mainly of hydrogen and helium. The sun's energy comes from nuclear fusion. The sun has an interior and an atmosphere. Solar activity has an effect on Earth's environment.

Unit Essential Questions:	**Key Understandings:**
1. How does the sun gets it energy? 2. What is the structure of the sun? 3. How does solar activity impact life on Earth?	1. The sun's core converts matter into energy through the process of nuclear fusion. 2. Energy produced by nuclear fusion moves from the sun's core through the hotter radiative zone and then the cooler convective Zone before it enters the sun's atmosphere. 3. The sun's atmosphere is composed of three layers: the photosphere, the hotter chromosphere, and the much hotter and much larger corona. 4. Sunspots are regions of the Photosphere that have stronger magnetic fields than the regions that surround them. 5. Prominences are loops of relatively cool gas that extend above the photosphere. They are usually associated with a chromosphere. Solar flares are explosive releases of energy that are stored in the magnetic field of sunspot. Coronal mass ejections cause disturbances in Earth's magnetosphere called geomagnetic storms. 6. Are colorful sheets of lights that occurs when charged particles from the interaction between the solar winds and Earth's magnetosphere collide with atoms and molecules in the atmosphere.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.A.3.2.3	Compare the accuracy of predictions represented in a model to actual observations and behavior
S11.A.3.3.3	Describe advantages and disadvantages of using models to simulate processes and outcomes.
S11.D.3.1.3	Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).
S11.D.3.1.1	Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts.
S11.A.2.2.2	Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meter, probe, interface, imaging technology, telescope) is used to extend human abilities and precision

Important Anchors Addressed in the Unit:	
S11.D.3.1.2	Describe the structure, formation, and life cycle of stars.
S11.D.3.1	Explain the composition, structure, and origin of the universe.

Misconceptions:	**Proper Conceptions:**
1. The sun is too far aways to have any negative impact on daily life on Earth.	1. The sun's energy could have devastating effects here on Earth.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Composition of the sun ● Nuclear Fusion ● Layers of the sun ● Sunspots, the sunspot cycle, prominences, flares, coronal mass ejections & auroras	● Explain how the sun converts matter into energy in its core ● Compare the radiative and convective zones of the sun ● Describe the 3 layers of the sun's atmosphere ● Explain how solar activity affects Earth	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between the sun and life on Earth.

Academic Vocabulary:		
● Nuclear fusion ● Corona ● Sun Spots ● Aurora	● Radiative zone ● Chromosphere ● Solar Flares ● Prominences	● Convection zone ● Photosphere ● Coronal Mass Ejections

Assessments:

- Inquiry activities
- Graphic organizers
- Review & reinforcement worksheets
- Critical Thinking Activities
- Comparing models
- Summary/essay writing
- Test/quizzes

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- geometry and calculating orbital periods
- History of the telescope
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Environmental Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters

Created By: Nicole Gutacker

			Earth & Space Science **Grade 9** **Unit #7**
Course/Subject: Earth and Space Science	**Grade:** 9th	**The Universe**	**Suggested Timeline:** **3-4 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun **Unit 7: The Universe** Unit 8: The Atmosphere Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	**The Universe & Stars**
Unit Summary	Light is used to determine the chemical composition and temperature of stars. The Doppler Effect is used to determine actual movement of stars through the universe. Stars are classified on the Hertzsprung-Russell Diagram. Stars form and evolve over billions of years. The Big Bang theory is used to explain of the universe came to be

Unit Essential Questions: 1. What characteristics of light help determine the composition and movement of stars and planets in the universe? 2. How are the properties of stars used to classify them on the Hertzsprung - Russell diagram? 3. How does a star progress through its life cycle? 4. How are stars grouped? 5. What evidence exist to support the big bang theory?	**Key Understandings:** 1. To determine its composition and surface temperature, astronomers study the star's spectrum. 2. Stars appear to move in the sky because of the Earth's rotational movement. 3. Astronomers measure the distance to stars using the distance light travels in one year (light year) and the apparent shift in a star's position when viewed from different locations (Parallax). 4. Apparent magnitude is a star's brightness as it appears to us on Earth. Absolute magnitude is its true brightness if all stars were a standard, uniform distance from Earth. 5. A protostar becomes a star when it's hydrogen begins to fuse to form helium. 6. Main sequence stars generate energy through hydrogen fusion. This is the longest phase. 7. There are three types of galaxies spiral, elliptical, and irregular. 8. Evidence for the Big Bang Theory include redshifts, cosmic background radiation. and ripples in space.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.A.3.2.3	Compare the accuracy of predictions represented in a model to actual observations and behavior
S11.A.3.3.3	Describe advantages and disadvantages of using models to simulate processes and outcomes.
S11.D.3.1.3	Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).
S11.D.3.1.1	Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain a system and its parts.
S11.A.2.2.2	Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meter, probe, interface, imaging technology, telescope) is used to extend human abilities and precision

Important Anchors Addressed in the Unit:	
S11.D.3.1.2	Describe the structure, formation, and life cycle of stars.
S11.D.3.1	Explain the composition, structure, and origin of the universe.

Misconceptions:	**Proper Conceptions:**
1. The sun is too far aways to have any negative impact on daily life on Earth.	1. The sun's energy could have devastating effects here on Earth.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Observing bright line spectra to determine composition and temperature of stars ● Apparent vs. absolute star magnitude ● Doppler effect ● Light-years and parallax ● Hertzsprung-Russell diagram and main sequence stars ● Star formation ● The life cycle of a star ● The Big Bang Theory	● Describe how astronomers determine the composition and temperature of the sun ● Explain why stars appear to move in the sky ● Explain the difference between absolute and apparent magnitude ● Describe how a protostar becomes a star ● Explain how a main-sequence star generates energy ● Describe the evolution of a star after its main-sequence stage ● Describe the 3 main types of galaxies ● Summarize the big bang theory ● Interpret and explain evidence to support an expanding universe	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between the stars as they journey through their life cycle.

Academic Vocabulary:		
● Doppler Effect ● Light-year ● Parallax ● Apparent magnitude ● Neutron star/pulsar ● Big Bang Theory	● Galaxy ● Main sequence ● Protostar ● Absolute magnitude ● Cosmology ● Cosmic Background Radiation	● Nebula ● Nova ● Black hole ● Giant ● White dwarf ● Star

Assessments:

- Inquiry activities
- Graphic organizers
- Review & reinforcement worksheets
- Critical Thinking Activities
- Comparing models
- Summary/essay writing
- Test/quizzes

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- measuring distances in space
- History the Universe
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Environmental Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters

Created By: Nicole Gutacker

			Earth & Space Science Grade 9 **Unit #8**
Course/Subject: Earth and Space Science	**Grade:** 9th	**The Atmosphere**	**Suggested Timeline:** **3-4 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun Unit 7: The Universe **Unit 8: The Atmosphere** Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	The Atmosphere
Unit Summary	Earth's atmosphere makes conditions on Earth suitable for living things. Earth's atmosphere is made up primarily of gases, but also liquids and solids. This along with temperature determines air pressure. The layers of the atmosphere are classified according to changes in temperature. The energy from the sun influences atmospheric circulation. Unequal heating of Earth's surface along with Earth's rotation influence wind patterns.

Unit Essential Questions:

1. What is the Earth's atmosphere composed of?
2. What is air pressure and how is it measured?
3. How do the gas laws apply to atmospheric conditions?
4. How are the layers of Earth's atmosphere determined and named?
5. What happens to the sun's energy as it reaches Earth's atmosphere?
6. What are the global winds and how are they determined?

Key Understandings:

1. First atmosphere is a mixture of gases, called air, that surround the Earth. Solid and liquid particles, called particulates, are mixed with the gases that make up air.
2. The atmosphere is divided into four main layers: the troposphere, the stratosphere, the mesosphere, and the thermosphere.
3. Most of the energy that reaches the Earth from the sun is in the form of electromagnetic radiation.
4. The upper atmosphere is heated by absorption of radiation from the Sun. The lower atmosphere is heated by conduction from the Earth's surface and by convection of air.
5. The Coriolis effect is the tendency of a moving object to follow a curved path rather than a straight path because of the rotation of the Earth.
6. Each hemisphere contains three convection cells that circulate air. Net global airflow near Earth's surface is from the poles toward the Equator. The three global wind belts are the trade winds, the westerlies, and the polar easterlies.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.C.1.1.5	Predict the behavior of gases through the application of laws (e.g., Boyle's law, Charles' law, or ideal gas law).
S11.A.1.1.4	Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, ideal gas laws).
SS11.A.3.2.1	Compare the accuracy of predictions represented in a model to actual observations and behavior
SS11.A.3.2.2	Describe advantages and disadvantages of using models to simulate processes and outcomes
SS11.A.3.2.3	Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps).

Important Anchors Addressed in the Unit:	
S11.D.2.1.1	Describe how changes in concentration of minor components (e.g., O2, CO2, dust, pollution) in Earth's atmosphere may be linked to climate change.
S11.D.2.1.2	Compare the transmission, reflection, absorption, and radiation of solar energy to and by Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone laye
S11.D.2.1	Analyze how the transfer of energy and substances between Earth's atmosphere and its surface influences regional or global weather or climate

Misconceptions:	**Proper Conceptions:**
1. The rotation of the Earth causes global winds.	1. Although, the rotation of the Earth has an effect on the how are moves; wind is caused the the uneven heating of Earth's surface.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● The atmosphere is composed of gases liquids and solids ● Atmospheric pressure is a result of gravity holding air molecules near Earth's Surface ● Boyle's law, Charles law and the ideal gas laws are used to predict gas behavior ● Layers in the atmosphere are identified by distinct temperature differences as you increase in altitude ● As the Sun's energy reaches Earth it is either, scattered, reflected, or absorbed ● Heat is transferred through the atmosphere through conduction and convection ● Unequal heating and Earth's rotation create global and local winds	● Explain the composition of Earth's atmosphere ● Explain the factors that influence atmospheric pressure and be able to measure it ● Explain and use the gas laws to predict how atmospheric gases will react ● Identify the layers of the atmosphere based on a temperature and altitude map ● Describe how energy from the sun interacts with Earth and its atmosphere ● Compare and contrast convection and conduction ● Identify the 6 main global winds and their direction explain why they occur	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between the Earth's atmosphere and life on Earth.

Academic Vocabulary:

- Atmosphere
- Ozone
- Atmospheric pressure
- Troposphere
- Stratosphere
- Mesosphere
- Thermosphere
- Albedo
- Greenhouse effect
- Coriolis effect
- Trade winds
- Westerlies
- Polar Easterlies
- Jet Stream
- Reflection
- Refraction
- Conduction
- Convection

Assessments:

- Inquiry activities
- Graphic organizers
- Review & reinforcement worksheets
- Critical Thinking Activities
- Comparing models
- Summary/essay writing
- Test/quizzes

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- graphing
- History meteology
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Environmental Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters

Created By: Nicole Gutacker

			Earth & Space Science **Grade 9** **Unit #9**
Course/Subject: Earth and Space Science	**Grade:** 9th	**Water in the Atmosphere**	**Suggested Timeline:** **3-4 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun Unit 7: The Universe Unit 8: The Atmosphere **Unit 9: Water in the Atmosphere** Unit 10: Air Masses and Fronts Unit 11: Climate

Unit Title	Water in the Atmosphere
Unit Summary	Water in the atmosphere is constantly being transferred through the water cycle. There are various methods for determining the amount of moisture in the atmosphere. Cloud formation is determined by a specific process. The clouds are classified based on altitude and shape. Precipitation type is based on the method of formation.

Unit Essential Questions:	**Key Understandings:**
1. How does energy affect the changing of phases of water? 2. How is atmospheric moisture measured? 3. How are clouds formed? 4. What are the characteristics that classify a cloud type? 5. What are the processes that cause precipitation?	1. Latent heat is released or absorbed when water changes from one state to another. 2. Relative humidity is a ratio of the actual amount of water vapor in the air to the amount of water vapor needed to reach saturation. 3. When air reaches the dew point, the rate of condensation equals the rate of evaporation. 4. Clouds form when water vapor cools and condenses on condensation nuclei. 5. The three major types of clouds are stratus clouds, cumulus clouds, and cirrus clouds. 6. The major forms of precipitation are rain, snow, and hail. 7. Coalescence and supercooling are two processes by which cloud droplets become large enough to fall as precipitation.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.C.1.1.5	Predict the behavior of gases through the application of laws (e.g., Boyle's law, Charles' law, or ideal gas law).
S11.A.1.1.4	Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, ideal gas laws).
SS11.A.3.2.1	Compare the accuracy of predictions represented in a model to actual observations and behavior
SS11.A.3.2.2	Describe advantages and disadvantages of using models to simulate processes and outcomes
SS11.A.3.2.3	Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps).

Important Anchors Addressed in the Unit:	
S11.D.2.1.1	Describe how changes in concentration of minor components (e.g., O2, CO2, dust, pollution) in Earth's atmosphere may be linked to climate change.
S11.D.2.1.2	Compare the transmission, reflection, absorption, and radiation of solar energy to and by Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone laye
S11.D.2.1	Analyze how the transfer of energy and substances between Earth's atmosphere and its surface influences regional or global weather or climate

Misconceptions:	**Proper Conceptions:**
1. 90% relative humidity is the same at all temperatures.	1. The higher the temperature the more water vapor the air can "hold" so there is more water in the air at 90 degree than 70 degrees even if they both have a 90% relative humidity.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● How water enters the atmosphere ● The phases/phase changes of water ● Relative & absolute humidity ● How clouds and precipitation form ● The 3 different types of clouds ● The types of precipitation ● Coalescence versus supercooling ● Measuring precipitation	● Explain how heat energy affects the changing phases of water ● Explain what absolute & relative humidity are, and describe how they are measured ● Describe what happens when the temperature of air decreases to the dew point or below the dew point ● Describe the conditions necessary for clouds to form ● Explain the 4 processes of cooling that lead to cloud formation ● Identify the 3 types of clouds ● Identify & compare the 4 forms of precipitation ● Compare the 2 processes that cause precipitation ● Describe 2 ways that precipitation is measured	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between the water in the atmosphere and life on Earth.

Academic Vocabulary:

- Latent heat
- Sublimation
- Dew point
- Relative humidity
- Coalescence
- Precipitation
- Cloud
- Condensation nuclei
- Deposition
- Fog
- Supercooling
- Adiabatic cooling
- Stratus cloud
- Cirrus cloud
- Nimbus
- Cumulus cloud

Assessments:

- Inquiry activities
- Graphic organizers
- Review & reinforcement worksheets
- Critical Thinking Activities
- Comparing models
- Summary/essay writing
- Test/quizzes

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- graphing
- History meteology
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Environmental Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters

Created By: Nicole Gutacker

			Earth & Space Science **Grade 9** **Unit #10**
Course/Subject: Earth and Space Science	**Grade:** 9th	**Air Masses and Fronts**	**Suggested Timeline:** **3-4 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun Unit 7: The Universe Unit 8: The Atmosphere Unit 9: Water in the Atmosphere **Unit 10: Air Masses and Fronts** Unit 11: Climate

Unit Title	**Air Masses and Fronts**
Unit Summary	There are four main air masses that affect weather patterns in North America. Boundaries between unlike air masses are called fronts. Some frontal boundaries with extreme difference are indicative of severe weather such as tornadoes and hurricanes. There are various weather instruments used to measure weather conditions. This data is then compiled with computers/humans and placed on weather maps using station models, fronts, isotherms or isobars and satellite data to aid in forecasting local and global weather.

Unit Essential Questions:	**Key Understandings:**
1. What is an air mass and how do air masses affect weather in North America? 2. What happens when different air masses collide? 3. How do you classify severe weather? 4. What instruments are used to gather weather data? 5. How do meteorologists accurately predict weather using maps?	1. An air mass forms when air remain stationary or move slowly over a uniform region, taking on the characteristic temperature and humidity of that region. 2. The four main types of air masses are polar, tropical, continental, and maritime. 3. Air masses affect the weather by bringing air that is warm or cold and dry and moist, to a region. 4. Cold front usually produces dorms. Warm fronts usually produce precipitation over a large area. 5. A mid-latitude cyclone forms along of cold or stationary front, in which the rotating wind moves towards a low pressure system. 6. Thunderstorms and tornadoes are caused by the interaction of air masses that have different properties. Hurricanes develop when warm, moist air over the ocean rise rapidly. 7. Meteorologist prepare weather maps that are based on information from weather stations around the world.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.C.1.1.5	Predict the behavior of gases through the application of laws (e.g., Boyle's law, Charles' law, or ideal gas law).
S11.A.1.1.4	Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, ideal gas laws).
SS11.A.3.2.1	Compare the accuracy of predictions represented in a model to actual observations and behavior
SS11.A.3.2.2	Describe advantages and disadvantages of using models to simulate processes and outcomes
SS11.A.3.2.3	Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps).

Important Anchors Addressed in the Unit:	
S11.D.2.1.1	Describe how changes in concentration of minor components (e.g., O2, CO2, dust, pollution) in Earth's atmosphere may be linked to climate change.
S11.D.2.1.2	Compare the transmission, reflection, absorption, and radiation of solar energy to and by Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer
S11.D.2.1	Analyze how the transfer of energy and substances between Earth's atmosphere and its surface influences regional or global weather or climate

Misconceptions:	**Proper Conceptions:**
1. Meteorologist are only correct 50% of the time.	1. There are 100 of factors that need to be considered when making a weather forecast and one variable change can ruin a forecast. (Butterfly Effect)

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Formation of air masses ● Air masses over North America: Source location, movement, and weather ● Characteristics of warm and cold fronts ● Cyclone formation and movement ● Severe weather ● Weather instrument review and application ● Reading and understanding weather symbols ● Forecasting global and local weather	● Explain how the 4 main air masses form ● Describe how air masses affect the weather in North America ● Compare the characteristic weather patterns of cold fronts and warm fronts ● Describe how a midlatitude cyclone forms ● Describe the development of hurricanes, thunderstorms & tornadoes ● Explain how instruments are used to forecast weather ● Explain how weather stations communicate surface weather data ● Explain how computer models help meteorologists forecast weather ● Describe 2 ways that precipitation is measured	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between severe weather and life on Earth.

Academic Vocabulary:

- Air Mass
- Midlatitude cyclone
- Hurricane
- Station model
- Wind vane
- Cold front
- Thunderstorm
- Tornado
- Hygrometer
- Thermometer
- Warm front
- Stationary front
- Occluded front
- Barometer
- Anemometer

Assessments:

- Inquiry activities
- Graphic organizers
- Review & reinforcement worksheets
- Critical Thinking Activities
- Comparing models
- Summary/essay writing
- Test/quizzes

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- graphing
- History meteology
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Environmental Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters

Created By: Nicole Gutacker

			Earth & Space Science **Grade 9** **Unit #11**
Course/Subject: Earth and Space Science	**Grade:** 9th	**Climate**	**Suggested Timeline:** **3-4 weeks**

Course Summary	The Earth Science curriculum builds on the natural curiosity of students. By connecting them to the beauty of geological history, the amazing landforms around the globe, the nature of storms, and the newest discoveries about our universe, it gives students an opportunity to relate to their everyday world.	
Course Units	Unit 1: Intro to Earth Science/Scientific Process Unit 2: Matter Unit 3: Minerals/Rocks Unit 4: Plate Tectonics/Deformation of the Crust Unit 5: EMS/Telescopes, Planetary Motion and the Moon	Unit 6: The Sun Unit 7: The Universe Unit 8: The Atmosphere Unit 9: Water in the Atmosphere Unit 10: Air Masses and Fronts **Unit 11: Climate**

Unit Title	**Climate**
Unit Summary	Many factors shape climate, and latitude plays are role in controlling climate. Climate changes for various reasons. Scientist study past climate to better understand the effects climate change may have on life on Earth.

Unit Essential Questions: 1. What is climate and how is it changing? 2. What are the impacts of climate change on life on Earth?	**Key Understandings:** 1. The climate of a region is described by the Region's temperature and precipitation. 2. Latitude determines the angle at which the sun's Rays hit the Earth. At higher latitudes, the angle is smaller so the area receives less solar energy. At lower latitudes, the angle is larger so the area receives more solar energy. 3. Natural processes and human activity may be causing changes in Earth's climate, including global warming. 4. One potential effect of climate change is a rise in sea levels, which could lead to flooding around Coastal areas.

Focus Anchors Addressed in the Unit:	
Anchor Number	*Anchor Description*
S11.C.1.1.5	Predict the behavior of gases through the application of laws (e.g., Boyle's law, Charles' law, or ideal gas law).
S11.A.1.1.4	Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, ideal gas laws).
SS11.A.3.2.1	Compare the accuracy of predictions represented in a model to actual observations and behavior
SS11.A.3.2.2	Describe advantages and disadvantages of using models to simulate processes and outcomes
SS11.A.3.2.3	Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of objects within the solar system, life spans, size of atomic particles, topographic maps).

Important Anchors Addressed in the Unit:	
S11.D.2.1.1	Describe how changes in concentration of minor components (e.g., O2, CO2, dust, pollution) in Earth's atmosphere may be linked to climate change.
S11.D.2.1.2	Compare the transmission, reflection, absorption, and radiation of solar energy to and by Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer
S11.D.2.1	Analyze how the transfer of energy and substances between Earth's atmosphere and its surface influences regional or global weather or climate

Misconceptions:	**Proper Conceptions:**
1. Climate change is rapid.	1. Climate change happens over a long period of time and has many factors.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Latitude effects on received sunlight, temperature and precipitation ● Heat absorption and release ● Topography and climate ● Climate patterns and change ● Potential causes of climate change: human activity, volcanoes, plate tectonics, orbital changes ● Global warming & sea-level changes	● Explain how latitude determines the amount of solar energy received on Earth, thus affecting temperature and precipitation ● Describe how the different rates at which land and water are heated affect climate ● Explain the effects of topography on climate ● Describe four factors that may cause climate change ● Identify potential impacts of climate change ● Describe 2 ways that precipitation is measured	● <u>Encouraging Inquiry and Curiosity:</u> ○ Modeling, developing and encouraging students to ask and answer questions about the interactions between climate change and life on Earth.

Academic Vocabulary:

- Climate
- Monsoon
- Microclimate
- Global warming
- Specific Heat
- Tropical climate
- Middle-latitude climate
- El Nino
- Polar Climate
- Climatologist

Assessments:

- Inquiry activities
- Graphic organizers
- Review & reinforcement worksheets
- Critical Thinking Activities
- Comparing models
- Summary/essay writing
- Test/quizzes

Differentiation:

- Graphic Organizers
- Skeleton Notes
- Online Tools
- Vocabulary Aids

Interdisciplinary Connections:

- Math- graphing
- History meteology
- English - Collins Writing

Additional Resources:

- Earth Science textbooks
- Environmental Science textbooks
- Lab manuals
- Measuring devices/tools
- Smartboard
- Physical Science textbook
- Internet
- Lab equipment & supplies
- Reference books
- Charts/posters

Created By: Nicole Gutacker