Overview of Year

___11 ____ Grade ____Earth Science_____ Curriculum

Your curriculum overview may have more than 6 units. Please adjust the template accordingly.

SEPT	OCT	NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE
Unit 1 Astronomy		Unit 2 Climate		Unit 3 Weather		Unit 4 Leveling Forces		Unit 5 Uplifting Forces	

Unit 1	Understanding	Essential Question
Astronomy	Most objects in the solar system are in regular and predictable motion. • These motions explain such phenomena as the day, the year, seasons, phases of the moon, eclipses, and tides. Gravity influences the motions of celestial objects. The force of gravity between two objects in the universe depends on their masses and the distance between them. Nine planets move around the Sun in nearly circular orbits. • The orbit of each planet is an ellipse with the Sun located at one of the foci. • Earth is orbited by one moon and many artificial satellites. Earth's coordinate system of latitude and longitude, with the equator and prime meridian as reference lines, is based upon Earth's rotation and our observation of the Sun and stars. Earth rotates on an imaginary axis at a rate of 15 degrees per hour. To people on Earth, this turning of the planet makes it seem as though the Sun, the moon, and the stars are moving around Earth once a day. Rotation provides a basis for our system of local time; meridians of longitude are the basis for time zones. The Foucault pendulum and the Coriolis effect provide evidence of Earth's rotation. Earth's changing position with regard to the Sun and the moon has noticeable effects. • Earth revolves around the Sun with its rotational axis tilted at 23.5 degrees to a line perpendicular to the plane of its orbit, with the North Pole aligned with Polaris. During Earth's one-year period of revolution, the tilt of its axis results in changes in the angle of incidence of the Sun's rays at a given latitude; these changes cause variation in the heating of the surface. This produces seasonal variation in weather. Seasonal changes in the apparent positions of constellations provide evidence of Earth's revolution. The Sun's apparent path through the sky varies with latitude and season. Approximately 70 percent of Earth's surface is covered by a relatively thin layer of water, which responds to the gravitational attraction of the moon and the Sun with a daily cycle of high and low tides. The universe is vast and estimated to be over ten billion years old. The current theory is that the universe was created from an explosion called the Big Bang. Evidence for this theory includes: • cosmic background radiation	What is out "there" and how do we know? 1) Geologic Time: What is geologic time and how will it help us gain perspective on how to study our essential question? 2) Celestial Bodies and the formation of the universe: What is out there (space) and how do we know? 3) How do the stars we see in our night sky form? How are they similar and different from the Sun? 4) Rotation: How does the "spin" of the Earth cause Rochester to change from night and day? How do we know? 5) Phases of the moon: Why does the moon look so different all the time? 6) Revolution/Seasons/gravity: How does the motion of the Earth around the sun cause Rochester, NY to change throughout the year? 7) How does the revolution of the moon around the Earth cause Lake Ontario to change throughout the day? 8) How does the revolution of the Earth around the sun, and its tilt, cause the Sun's path to change over time in Rochester, NY? 9) Pulling it all together: Is it ethical to develop technology to change the orbits of near Earth asteroids?

	• a red-shift (the Doppler effect) in the light from very distant galaxies. Stars form when gravity causes clouds of molecules to contract until nuclear fusion of light elements into heavier ones occurs. Fusion releases great amounts of energy over millions of years. • The stars differ from each other in size, temperature, and age. • Our Sun is a medium-sized star within a spiral galaxy of stars known as the Milky Way. Our galaxy contains billions of stars, and the universe contains billions of such galaxies. Our solar system formed about five billion years ago from a giant cloud of gas and debris. Gravity caused Earth and the other planets to become layered according to density differences in their materials. • The characteristics of the planets of the solar system are affected by each planet's location in relationship to the Sun. • The terrestrial planets are small, rocky, and dense. The Jovian planets are large, gaseous, and of low density. 1.2d Asteroids, comets, and meteors are components of our solar system. Impact events have been correlated with mass extinction and global climatic change. Impact craters can be identified in Earth's crust.	
Performance Task: Students will participate in a debate, or generate an argument that is recorded as a podcast, script or radio broadcast regarding the dangers of moving near Earth asteroids into orbit with Earth.		

Unit 2	**Understanding**	**Essential Question**
Climate	Earth has continuously been recycling water since the outgassing of water early in its history. This constant recirculation of water at and near Earth's surface is described by the hydrologic (water) cycle. Water is returned from the atmosphere to Earth's surface by precipitation. Water returns to the atmosphere by evaporation or transpiration from plants. A portion of the precipitation becomes runoff over the land or infiltrates into the ground to become stored in the soil or groundwater below the water table. Soil capillarity influences these processes. The amount of precipitation that seeps into the ground or runs off is influenced by climate, slope of the land, soil, rock type, vegetation, land use, and degree of saturation. Porosity, permeability, and water retention affect runoff and infiltration. Weather variables are interrelated. For example: temperature and humidity affect air pressure and probability of precipitation air pressure gradient controls wind velocity Seasonal changes can be explained using concepts of density and heat energy. These changes include the shifting of global temperature zones, the shifting of planetary wind and ocean current patterns, the occurrence of monsoons, hurricanes, flooding, and severe weather. Climate variations, structure, and characteristics of bedrock influence the development of landscape features including mountains, plateaus, plains, valleys, ridges, escarpments, and stream drainage patterns. Insolation (solar radiation) heats Earth's surface and atmosphere unequally due to variations in: • the intensity caused by differences in atmospheric transparency and angle of incidence which vary with time of day, latitude, and season • characteristics of the materials absorbing the energy such as color, texture, transparency, state of matter, and specific heat	How do meteorologist study the climate of Rochester? How has it changed in the past and how are our actions changing our climate? 1. How does insolation drive differences in average weather? How does this energy get transferred throughout the Earth system? 2. How does the revolution of Rochester around the Sun cause Rochester, NY to change over the year? 3. How do oceans thousands of miles away causes Rochester's climate to change over time? How can we use cyclical patterns to predict Rochester's future climate? 4. How have plate tectonics caused Rochester's climate to change over time? 5. How are our actions causing Rochester's climate to change? What can we do about it?

	• duration, which varies with seasons and latitude. The transfer of heat energy within the atmosphere, the hydrosphere, and Earth's surface occurs as the result of radiation, convection, and conduction. • Heating of Earth's surface and atmosphere by the Sun drives convection within the atmosphere and oceans, producing winds and ocean currents. A location's climate is influenced by latitude, proximity to large bodies of water, ocean currents, prevailing winds, vegetative cover, elevation, and mountain ranges. Temperature and precipitation patterns are altered by: • natural events such as El Niño and volcanic eruptions • human influences including deforestation, urbanization, and the production of green- house gases such as carbon dioxide and methane.	
Performance Task:		

Unit 3	**Understanding**	**Essential Question**
Weather	Earth has continuously been recycling water since the outgassing of water early in its history. This constant recirculation of water at and near Earth's surface is described by the hydrologic (water) cycle. • Water is returned from the atmosphere to Earth's surface by precipitation. Water returns to the atmosphere by evaporation or transpiration from plants. A portion of the precipitation becomes runoff over the land or infiltrates into the ground to become stored in the soil or groundwater below the water table. Soil capillarity influences these processes. • The amount of precipitation that seeps into the ground or runs off is influenced by climate, slope of the land, soil, rock type, vegetation, land use, and degree of saturation. • Porosity, permeability, and water retention affect runoff and infiltration. Weather variables are interrelated. For example: • temperature and humidity affect air pressure and probability of precipitation • air pressure gradient controls wind velocity Air temperature, dew point, cloud formation, and precipitation are affected by the expansion and contraction of air due to vertical atmospheric movement. Weather variables can be represented in a variety of formats including radar and satellite images, weather maps (including station models, isobars, and fronts), atmospheric cross-sections, and computer models. Atmospheric moisture, temperature and pressure distributions; jet streams, wind; air masses and frontal boundaries; and the movement of cyclonic systems and associated tornadoes, thunderstorms, and hurricanes occur in observable patterns. Loss of property, personal injury, and loss of life can be reduced by effective emergency preparedness. Seasonal changes can be explained using concepts of density and heat energy. These changes include the shifting of global temperature zones, the shifting of planetary wind and ocean current patterns, the occurrence of monsoons, hurricanes, flooding, and severe weather.	What is weather and what causes it? 1. Does air have mass? How do you know? 2. How does water cycle throughout the Earth system? 3. What causes wind? 4. How can I use observations of the sky predict air pressure? 5. What causes the clouds and how can they give me clues to future weather? 6. How does weather change over time? 7. How does a meteorologist predict the weather? What tools do they use to predict the weather?
Performance Task: *Create a **weather forecast*** that demonstrates the skills of a meteorologist and knowledge of weather and the factors that cause weather.		

Water cycle model that is revisited and reflected on throughout the unit.

"Rate" local meteorologist project where students watch and rate meteorologists based on accuracy and descriptions of weather variables that cause weather.

Unit 4	Understanding	Essential Question
Leveling Forces	**U1**. Earth may be considered a huge machine driven by two engines, one internal and one external. These heat engines convert heat energy into mechanical energy**.** **U2**. Precipitation resulting from the external heat engine's weather systems supplies moisture to Earth's surface that contributes to the weathering of rocks. **U3**. Running water erodes mountains that were originally uplifted by Earth's internal heat engine and transports sediments to other locations, where they are deposited and may undergo the processes that transform them into sedimentary rocks. **U4**. Rocks and minerals help us understand Earth's historical development and its dynamics. They are important to us because of their availability and properties. The use and distribution of mineral resources and fossil fuels have important economic and environmental impacts. As limited resources, they must be used wisely.	1. How does variation in density create change on Earth's surface? 2. How do humans impact Earth's processes and vice versa?
Performance Task: Apply their understanding of surface processes through a poster presentation and written report to the "US Olympic Committee" explaining suitability of 2 chosen U.S. cities as sites for the Summer Olympic Games.		

Unit 5	Understanding	Essential Question
Uplifting Forces	**U1**. Earth may be considered a huge machine driven by two engines, one internal and one external. These heat engines convert heat energy into mechanical energy. **U2**. Global climate is determined by the interaction of solar energy with Earth's surface and atmosphere. This energy transfer is influenced by dynamic processes such as cloud cover and Earth rotation, and the positions of mountain ranges and oceans.	1. What makes a theory viable? 2. How does variation in density create change on Earth's surface?

	U3. Earth's internal heat engine is powered by heat from the decay of radioactive materials and residual heat from Earth's formation. **U4**. Differences in density resulting from heat flow within Earth's interior caused the changes explained by the theory of plate tectonics: movement of the lithospheric plates; earthquakes; volcanoes; and the deformation and metamorphism of rocks during the formation of young mountains. **U5**. Observation and classification have helped us understand the great variety and complexity of Earth materials. Minerals are the naturally occurring inorganic solid elements, compounds, and mixtures from which rocks are made. **U6**. We classify minerals on the basis of their chemical composition and observable properties. Rocks are generally classified by their origin (igneous, metamorphic, and sedimentary), texture, and mineral content. **U7.** Rocks and minerals help us understand Earth's historical development and its dynamics. They are important to us because of their availability and properties. The use and distribution of mineral resources and fossil fuels have important economic and environmental impacts. As limited resources, they must be used wisely.	
Performance Task: Apply their understanding of the concepts of plate tectonics by developing a press release explaining catastrophic events that could have happened at designated locations during specific geologic periods empowering students to transfer that understanding of the "why" behind geologic phenomena that occur today.		