

**Pequea Valley School District  
Middle School Science**

**Unit: Nature of Science**

**Course: Earth & Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result  
What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)**

**How can we apply science process skills to be successful scientists and explore the world around us?**

**Keystone Eligible Content/PA Core Standard**

**S8.A.1.1.2 Explain how certain questions can be answered through scientific inquiry and/or technological design.**

**S8.A.1.1.3 Use evidence, such as observations or experimental results, to support inferences about a relationship.**

**S8.A.1.1.4 Use evidence, observations, or a variety of scales (e.g., mass, distance, volume, temperature) to describe relationships.**

**S8.A.1.1.4 Develop descriptions, explanations, predictions, and models using evidence.**

**S8.A.2.1.2 Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.**

**S8.A.2.1.3 Design a controlled experiment by specifying how the independent variables will be manipulated, how the dependent variable will be measured, and which variables will be held constant.**

**S8.A.2.1.4 I Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions**

**S8.A.2.1.5 Use evidence from investigations to clearly communicate and support conclusions.**

**S8.A.2.2.1 Describe the appropriate use of instruments and scales to accurately and safely measure time, mass, distance, volume, or temperature under a variety of conditions.**

**S8.A.2.2.2 Apply appropriate measurement systems (e.g., time, mass, distance, volume, temperature) to record and interpret observations under varying conditions.**

**S8.A.3.2.1 .Describe how scientists use models to explore relationships in natural systems (e.g., an ecosystem, river system, the solar system)**

**S8.A.1.2.4 Explain society's standard of living in terms of technological advancements and how these advancements impact on agriculture (e.g., transportation, processing, production, storage)**

**S8.A.2.1.6 Identify a design flaw in a simple technological system and devise possible working solutions.**

**S8. A.2.2.3 Describe ways technology (e.g. microscope telescope, micrometer, hydraulics, barometer) extends and enhances human abilities for specific purposes.**

**S8.A.3.2.2 Describe how engineers use models to develop new and improved technologies to solve problems.**

**S8 A. 3.2.3 Given a model showing simple cause-and-effect relationships in a natural system, predict results that can be used to test the assumptions in the model (e.g. photosynthesis, water cycle, diffusion, infiltration)**

**S8. A. 3.3.1 Identify and describe patterns as repeated processes or recurring elements in human-made systems (e.g. trusses, hub-and spoke system in communications and transportation systems, feedback controls in regulated systems)**

**Pacing: Approximate number of class sessions per unit  
4 weeks (and spread throughout the semester)**

**Tier 3 Vocabulary (Content specific vocabulary)**

**Observation (Quantitative vs. Qualitative)**

**Classify**

**Hypothesis**

**Measure (tools and units)**

**Interpret**

**Graph**

**Variable (Independent, Dependent, Constant)**

**Control**

**Patterns**

**Inference**

**Predict**

**Testable Question**

**Data**

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”.*

**-Know how to collect information about an object or situation.**

**-Know how to design an experiment, using variables, testable question and hypothesis.**

**-Know how to analyze data (look for patterns, draw conclusions, organize data and communicate it to others.**

**-Know different types of measurements, tools and technological equipment used to collect data and information.**

**-Know how to recognize patterns in science and nature.**

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding.*

**-Students need to understand how to conduct experimentation in an effort to answer questions about the world around them.**

**-Students need to understand how to determine the correct means of collecting data or observations in different situations.**

**-Students need to understand the importance of recognizing patterns in science and nature.**

**Learning Outcome** - What do students need to be able to **accomplish** by the unit’s end? *List skills and competencies, NOT learning activities.*

**Students will be able to plan, conduct and analyze an experiment of their own design.**

**Students will be able to determine how to appropriately collect data using correct tools and units.**

**Students will be able to recognize patterns in the world around them.**

Literature: ScienceSaurus

Software/Resources: eScience, Explorelearning

**Pequea Valley School District  
Middle School Science**

**Unit: Atmosphere**

**Course: Earth/Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result  
What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)** How is energy transferred throughout our atmosphere and how does this influence our atmosphere?

**Keystone Eligible Content/PA Core Standard** S8.C.2.1.2, S8.C.2.2.1, S8.D.2.1.1, S8.D.2.1.2, S8.A.2.1.1, S8.A.2.1.5, S8.A.2.2.2

**Pacing: Approximate number of class sessions per unit** 10

**Tier 3 Vocabulary (Content specific vocabulary)** radiation, conduction, convection, density, correlation, atmosphere, altitude, pressure, wind, Coriolis Effect, hurricane, tornado, land breeze, sea breeze

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”.* The Sun is Earth’s primary energy source.

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding.* The Sun heats Earth’s surface, which in turn heats the atmosphere. Changing the temperature of air, changes its density and pressure. This causes air to move. Earth’s rotation then causes the wind to deflect.

**Learning Outcome** - What do students need to be able to **accomplish** by the unit’s end? *List skills and competencies, NOT learning activities.* Identify the three methods of heat transfer. Explain how changing temperature and density influence pressure. Know that air moves from high to low pressure and curves right in the Northern Hemisphere and left in the Southern Hemisphere. Apply this knowledge to explain global and local wind patterns.

Literature:

Software/Resources:



**Pequea Valley School District  
Middle School Science**

**Unit: Earth History**

**Course: Earth/Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result**  
**What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)** How do we know what happened in our planet's past?

**Keystone Eligible Content/PA Core Standard** S8.D.1.1.1 S8.D.1.1.4, S8.A.1.3.2, S8.A.1.1.1, S8.A.2.1.5

**Pacing: Approximate number of class sessions per unit** 10

**Tier 3 Vocabulary (Content specific vocabulary)** mineral, rock cycle, fossil, hardness, luster, cleavage, streak, density, igneous, metamorphic, sedimentary, half-life, isotopes

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”*. Earth's conditions were different in the past and have changed over time.

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding.* By studying rocks and minerals we can learn about past environments. Relative and radiometric dating allows us to determine the ages of rock layers and the fossils within them. Studying fossils allows us to see how life has changed over time.

**Learning Outcome** - What do students need to be able to **accomplish** by the unit's end? *List skills and competencies, NOT learning activities.* Identify rocks and infer about the environment they formed in. Calculate the age of rock layers. List and explain evidence that supports the Theory of Evolution.

Literature:

Software/Resources:

**Pequea Valley School District  
Middle School Science**

**Unit: Earth Motions**

**Course: Earth/Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result**  
**What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)** How do the motions of the Earth influence our planet?

**Keystone Eligible Content/PA Core Standard** S8.D.3.1.1, S8.A.1.1.3, S8.A.1.3.3, S8.A.2.1.4, S8.A.2.1.5, S8.A.3.2.1, S8.A.3.3.2

**Pacing: Approximate number of class sessions per unit** 10

**Tier 3 Vocabulary (Content specific vocabulary)** rotation, revolution, axis, cycle, solstice, equinox, lunar, solar, eclipse, phase

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”.* Objects in the sky appear to move because the Earth moves.

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding.* Day/Night are caused by Earth’s rotation, A year is 365 days because that is how long it takes Earth to revolve around the Sun. A month is how long it takes the Moon to revolve around the Earth.

**Learning Outcome** - What do students need to be able to **accomplish** by the unit’s end? *List skills and competencies, NOT learning activities.* Observe/Use/Build models to explain observable phenomenon such as the cause of day/night, changing constellations, seasons, moon phases, tides, and eclipses.

Literature:

Software/Resources:

**Pequea Valley School District  
Middle School Science**

**Unit: Earth Processes**

**Course: Earth/Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result**  
**What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)** How does our planet change over time?

**Keystone Eligible Content/PA Core Standard** S8.D.1.1.2 S8.D.1.1.3, S8.A.1.3.1, S8.A.2.1.1, S8.A.2.1.5, S8.A.2.2.2

**Pacing: Approximate number of class sessions per unit** 10

**Tier 3 Vocabulary (Content specific vocabulary)** mass, volume, density, weathering, erosion, tectonics, soil, sediment, deposition

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”*. Density is a property of matter. Earth is not static.

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding*. The Earth’s surface changes over time via plate tectonics and erosion.

**Learning Outcome** - What do students need to be able to **accomplish** by the unit’s end? *List skills and competencies, NOT learning activities*. Learners demonstrate their knowledge of density by solving buoyancy problems. Learners identify processes that form various landforms. Learners can list and explain several pieces of evidence that support the Theory of Plate Tectonics.

Literature:

Software/Resources:

**Pequea Valley School District  
Middle School Science**

**Unit: Earth Structure**

**Course: Earth/Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result**  
**What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)** How can we determine the structure/interior of our planet?

**Keystone Eligible Content/PA Core Standard** S8.D.1.1.2, S8.A.1.1.2, S8.A.2.1.5, S8.A.2.2.1

**Pacing: Approximate number of class sessions per unit** 10

**Tier 3 Vocabulary (Content specific vocabulary)** seismic wave, earthquake, crust, mantle, core, focus, epicenter, reflect

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”*. Speed = distance/time, ratios and proportions, Pythagorean Theorem, triangulation

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding.* Seismic waves can be used to determine the Earth’s interior because they change speed and direction when they travel through different materials. They also reflect off these different layers.

**Learning Outcome** - What do students need to be able to **accomplish** by the unit’s end? *List skills and competencies, NOT learning activities.* Learners demonstrate the ability to determine a planet’s structure.

Literature:

Software/Resources:

**Pequea Valley School District  
Middle School Science**

**Unit: Gravity**

**Course: Earth/Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result  
What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)** What variables influence the force of gravity? How do we measure the strength of gravity between two objects? What variables influence the orbit of an object?

**Keystone Eligible Content/PA Core Standard** S8.D.3.1.2, S8.A.1.2.3, S8.A.2.1.1, S8.A.2.1.5, S8.A.2.2.2

**Pacing: Approximate number of class sessions per unit** 10

**Tier 3 Vocabulary (Content specific vocabulary)** gravity, mass, distance, acceleration, orbit, period, velocity, ellipse, force, accuracy, precision, correlation, inertia, acceleration, air resistance, friction

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”.* Gravity is the force that keeps objects attached to Earth’s surface and is also responsible for objects orbiting in space.

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding.* Gravity is determined by the mass of the objects and the distance between them. Ignoring air resistance/friction, all objects accelerate to the ground at the same rate. There is a correlation between the shape of a planet’s orbit, its distance from the Sun, the strength of gravity, and its orbital velocity. A planet’s orbital period is correlated to its distance.

**Learning Outcome** - What do students need to be able to **accomplish** by the unit’s end? *List skills and competencies, NOT learning activities.* Learners will be able to use and apply Kepler’s Law of Planetary Motion and Newton’s Laws of Motion and Gravity to solve various problems.

Literature:

Software/Resources:

**Pequea Valley School District  
Middle School Science**

**Unit: Solar System**

**Course: Earth/Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result**  
**What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)** How are the objects in our Solar System classified?

**Keystone Eligible Content/PA Core Standard** S8.D.3.1.3, S8.A.2.1.4, S8.A.3.2.1

**Pacing: Approximate number of class sessions per unit** 10

**Tier 3 Vocabulary (Content specific vocabulary)** solar system, comet, asteroid, planet, moon, star, meteorite, ratio, proportion, correlation, scatter plot

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”.* The Sun is the center of the Solar System and all of the objects orbit around it.

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding.* Ratios and proportions can be used to create models. Objects in the Solar System are organized into different categories based on their characteristics.

**Learning Outcome** - What do students need to be able to **accomplish** by the unit’s end? *List skills and competencies, NOT learning activities.* Learners use ratios and proportions to create a model of the Solar System using Google Earth. Learners classify objects in the Solar Systems into different categories based on data.

Literature:

Software/Resources:

**Pequea Valley School District  
Middle School Science**

**Unit: Stars**

**Course: Earth/Space Science**

**Grade: 8**

<b>Planning the Focus Based on the Desired Result</b> <b>What do you want all students to know, understand and do by the end of the unit?</b>
<b>Unit Essential Question(s)</b> How do we classify the stars in our Universe? How are the properties of a star correlated?
<b>Keystone Eligible Content/PA Core Standard</b> S8.A.1.1.3, S8.A.2.1.1, S8.A.1.1.4, S8.A.2.1.4, S8.A.2.1.5, S8.A.2.2.1
<b>Pacing: Approximate number of class sessions per unit</b> 10
<b>Tier 3 Vocabulary (Content specific vocabulary)</b> electromagnetic radiation, wavelength, frequency, Doppler Effect, spectra, nebula, giant, dwarf, black hole
<b>Know</b> - What do students need to <b>know</b> in order to be able to do and understand? <i>List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”.</i> Energy comes in different forms, other than visible light.
<b>Understand</b> - What do students need to <b>understand</b> ? What is the <b>big idea</b> ? <i>List broad concepts or “big ideas” in a statement of enduring understanding.</i> Light is only one type of energy in the Universe. Other forms have different wavelengths/frequencies. A star’s properties can be determined from its spectra. There is a correlation between a star’s color and temperature and its size and brightness. All stars begin their lives on a line of best fit on the H-R Diagram known as the main sequence. The outliers on the diagram are different life stages of the stars.
<b>Learning Outcome</b> - What do students need to be able to <b>accomplish</b> by the unit’s end? <i>List skills and competencies, NOT learning activities.</i> Learners will be able to classify stars by their spectra. They will also be able to make inferences about galaxies based on observations of their H-R diagrams.

Literature:

Software/Resources:

**Pequea Valley School District  
Middle School Science**

**Unit: Universe**

**Course: Earth/Space Science**

**Grade: 8**

<b>Planning the Focus Based on the Desired Result</b> <b>What do you want all students to know, understand and do by the end of the unit?</b>
<b>Unit Essential Question(s)</b> How can we determine the history and development of our Universe?
<b>Keystone Eligible Content/PA Core Standard</b> S8.A.1.1.1, S8.A.2.1.1, S8.A.1.1.3, S8.A.1.1.4, S8.A.2.1.5, S8.A.2.2.3, S8.A.3.1.2
<b>Pacing: Approximate number of class sessions per unit</b> 10
<b>Tier 3 Vocabulary (Content specific vocabulary)</b> redshift, radar, parallax, Big Bang Theory, magnitude, speed, light-year
<b>Know</b> - What do students need to <b>know</b> in order to be able to do and understand? <i>List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”.</i> If one knows the speed and distance of an object, they can determine the time. The brightness of an object decreases as distance increases.
<b>Understand</b> - What do students need to <b>understand</b> ? What is the <b>big idea</b> ? <i>List broad concepts or “big ideas” in a statement of enduring understanding.</i> Radar can be used to determine the distance to nearby objects, because of the known speed of light. The angle of parallax shift is correlated to the distance of the object. The distance of a galaxy can be determined by comparing its true brightness with its apparent brightness from Earth. The speed of a galaxy is related to the redshift of its spectra. Therefore, one can determine the time that all of the galaxies come back together (the age of the Universe).
<b>Learning Outcome</b> - What do students need to be able to <b>accomplish</b> by the unit’s end? <i>List skills and competencies, NOT learning activities.</i> Learners will list and explain evidence that supports the Big Bang Theory and also demonstrate how the age of the universe can be calculated.

Literature:

Software/Resources:

**Pequea Valley School District  
Middle School Science**

**Unit: Weather & Climate**

**Course: Earth/Space Science**

**Grade: 8**

**Planning the Focus Based on the Desired Result**  
**What do you want all students to know, understand and do by the end of the unit?**

**Unit Essential Question(s)** Why does weather change over time? Why does Earth have different climate zones and why does Earth's global climate change over time?

**Keystone Eligible Content/PA Core Standard** S8.D.1.3.1, S8.D.1.3.2, S8.D.2.1.3, S8.D.2.1.1, S8.D.2.1.3, S8.A.2.1.5, S8.A.2.2.1, S8.A.3.1.3, S8.A.3.2.3

**Pacing: Approximate number of class sessions per unit** 10

**Tier 3 Vocabulary (Content specific vocabulary)** condensation, evaporation, humidity, psychrometer, hygrometer, front, climate, latitude, elevation, ocean current, lake effect snow

**Know** - What do students need to **know** in order to be able to do and understand? *List concepts, such as facts, formulas, key vocabulary and knowledge “nuggets”*. The two factors that determine the weather/climate of a region are temperature and humidity.

**Understand** - What do students need to **understand**? What is the **big idea**? *List broad concepts or “big ideas” in a statement of enduring understanding.* Air takes on the properties of the surface it formed over. Wind causes this air to move this air to different regions. When two air masses collide, they form a front where bad weather usually occurs. Different areas of the world have similar weather conditions over an extended period of time.

**Learning Outcome** - What do students need to be able to **accomplish** by the unit's end? *List skills and competencies, NOT learning activities.*

Learners will understand how temperature influences humidity. They will also be able to calculate humidity. Learners will be able to compare/contrast warm and cold fronts. They will be able to apply their knowledge of local climate factors to solve a science scenario type problem.

Literature:

Software/Resources: