**Course Title:** Grade 8 - Earth and Space Science
**Board Approval Date:**
**Credit / Hours:** N/A

## Course Description:

This course focuses on mastery of the PA Academic Standards for Science and Technology as well as Environment and Ecology. The focus of this course is on Earth and Space Science. As students progress through this course they will participate in a systematic study of Meteorology, Astronomy, and Geology through classroom instruction and scientific inquiry based laboratory activities.

Upon completion of the course, students will have a clear understanding of the dynamic forces at work in the world around them, enabling them to become better caretakers of our planet, Earth.

## Learning Activities / Modes of Assessment:

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| Large group instruction | Tests and Quizzes |
| Laboratory experiments | Checklists / Teacher Observation |
| Small group work/discussion | Projects with Rubrics |
| Computer simulations | Lab Reports / Write-ups |
| Various websites | Summarizing activities |
| Homework | PSSA practice questions and curricular bellringers |
| Hands on activities | CDT testing |

## Instructional Resources:

*Weather and Climate* (Prentice Hall, 2007) (including online access)
*Astronomy* (Prentice Hall, 2007) (including online access)
*Inside Earth* (Prentice Hall, 2007) (including online access)
*Earth's Changing Surface* (Prentice Hall, 2007) (including online access)
iPads
Vernier Labquests and a variety of probeware
Discovery Education video services
Various instructional videos, educational websites, and iPad applications

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| BrainPop | edPuzzle | Quizlet |
| GoFormative | ThingLink | Socrative |
| Study Island | IXL | eBackpack |
| PicCollage | Padlet | VoiceThread |

Course Pacing Guide

Course: Grade 8 - Earth and Space Science

| **Course Unit (Topic)** | **Length of Instruction (Days/Periods)** |
|---|---|
| 1. The Atmospheric Process and Weather | 80 days |
| 2. Water | 6 days |
| 3. Climate | 10 days |
| 4. Earth, Moon, and Sun | 25 days |
| 5. The Solar System | 25 days |
| 6. Stars, Galaxies, and the Universe | 20 days |
| Total Days | 166 days |

Topic: 1 - The Atmospheric Process and Weather
Subject(s): Science

Days:80
Grade(s): 8

| Know: | Understand: | Do: |
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| **Concepts:**<br><br>1. The Atmosphere<br>2. Energy in the Atmosphere<br>3. Water in the Atmosphere<br>4. Air Masses, Fronts, and Pressure Systems<br>5. Predicting the Weather<br><br>**Vocabulary:**<br><br>• Atmosphere, water vapor, ozone, density, temperature, barometer, pressure, air pressure, altitude, mercury barometer, aneroid barometer, troposphere, stratosphere, mesosphere, thermosphere, ionosphere, exosphere, Northern Lights<br><br>• Electromagnetic waves, radiation, infrared radiation, ultraviolet radiation, scattering, greenhouse effect, temperature, thermal energy, thermometer, heat, conduction, convection, convection currents, wind, anemometer, wind-chill factor, local wind, sea breeze, land breeze, global winds, Coriolis Effect, latitude, jet stream<br><br>• Water cycle, evaporation, humidity, relative humidity, psychrometer, condensation, dew point, cirrus, cumulus, stratus, | Changes in the atmosphere and hydrosphere cause different weather patterns to emerge. That changing weather impacts everyday life; sometimes weather patterns can be predicted, other times not.<br><br>**Anchors:** | **Eligible Content:** |
| | **S8.A.1 1** Explain, interpret, and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs).<br>***Reference: 3.2.7.A, 3.2.7.B*** | **S8.A.1.1.1** Distinguish between a scientific theory and an opinion, explaining how a theory is supported with evidence, or how new data/information may change existing theories and practices.<br><br>**S8.A.1.1.2** Explain how certain questions can be answered through scientific inquiry and/or technological design.<br><br>**S8.A.1.1.3** Use evidence, such as observations or experimental results, to support inferences about a relationship.<br><br>**S8.A.1.1.4** Develop descriptions, explanations, predictions, and models using evidence. |
| | **S8.A.1.2** Identify and explain the impacts of applying scientific, environmental, or technological knowledge to address solutions to practical problems.<br>***Reference: 3.2.7.C, 3.8.7.A, 3.8.7.B, 4.3.7.A*** | **S8.A.1.2.1** Describe the positive and negative, intended and unintended, effects of specific scientific results or technological developments (e.g., air/space travel, genetic engineering, nuclear fission/fusion, artificial intelligence, lasers, organ transplants).<br><br>**S8.A.1.2.2** Identify environmental issues and explain their potential long-term health effects (e.g., pollution, pest controls, vaccinations).<br><br>**S8.A.1.2.3** Describe fundamental scientific or technological concepts that could solve practical |

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| nimbus, precipitation, drought, cloud seeding, rain gauge, Fahrenheit, Celsius, Doldrums, Horse Latitudes, Tradewinds, Prevailing Winds<br><br>• Air mass, tropical, polar, maritime, continental, front, cold front, warm front, stationary front, occluded front, cyclone, anticyclone<br><br>• Storm, thunderstorm, lightning, tornado, tornado alley, hurricane, evacuate, winter storm, lake effect snow, storm surge, flash flood, eye, meteorologist, weather, isobar, isotherm, weather balloon, weather satellite, weather station, Doppler radar | | problems (e.g., Newton's laws of motion, Mendelian genetics).<br><br>**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.1.3** Identify and analyze evidence that certain variables may have caused measurable changes in natural or human-made systems. ***Reference: 3.1.7.E, 4.7.7.C, 4.8.7.C*** | **S8.A.1.3.1** Use ratio to describe change (e.g., percents, parts per million, grams per cubic centimeter, mechanical advantage).<br><br>**S8.A.1.3.2** Use evidence, observations, or explanations to make inferences about change in systems over time (e.g., carrying capacity, succession, population dynamics, loss of mass in chemical reactions, indicator fossils in geologic time scale) and the variables affecting these changes.<br><br>**S8.A.1.3.3** Examine systems changing over time, identifying the possible variables causing this change, and drawing inferences about how these variables affect this change.<br><br>**S8.A.1.3.4** Given a scenario, explain how a dynamically changing environment provides for the sustainability of living systems. |
| | **S8.A.2.1** Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems. ***Reference: 3.2.7.B, 3.2.7.D, 3.1.7.C, 3.1.7.D*** | **S8.A.2.1.1** Use evidence, observations, or a variety of scales (e.g., mass, distance, volume, temperature) to describe relationships.<br><br>**S8.A.2.1.2** Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.<br><br>**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.<br><br>**S8.A.2.1.4** Interpret data/observations; develop relationships among variables based on data/observations to design models as solutions.<br><br>**S8.A.2.1.5** Use evidence from investigations to clearly communicate and support conclusions.<br><br>**S8.A.2.1.6** Identify a design flaw in a simple technological system and devise possible working solutions. |

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| | **S8.A.2.2** Apply appropriate instruments for a specific purpose and describe the information the instrument can provide. ***Reference: 3.3.7.A, 3.7.7.B, 3.1.7.D*** | **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.<br><br>**S8.A.2.2.2** Apply appropriate measurement systems (e.g., time, mass, distance, volume, temperature) to record and interpret observations under varying conditions.<br><br>**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.3.1** Explain the parts of a simple system, their roles, and their relationships to the system as a whole. ***Reference: 3.1.7.A, 3.4.7.B, 4.3.7.C, 4.2.7.D, 4.6.7.A*** | **S8.A.3.1.1** Describe a system (e.g., watershed, circulatory system, heating system, agricultural system) as a group of related parts with specific roles that work together to achieve an observed result.<br><br>**S8.A.3.1.2** Explain the concept of order in a system [e.g., (first to last: manufacturing steps, trophic levels); (simple to complex: cell, tissue, organ, organ system)].<br><br>**S8.A.3.1.3** Distinguish among system inputs, system processes, system outputs, and feedback (e.g., physical, ecological, biological, informational).<br><br>**S8.A.3.1.4** Distinguish between open loop (e.g., energy flow, food web) and closed loop (e.g., materials in the nitrogen and carbon cycles, closed-switch) systems.<br><br>**S8.A.3.1.5** Explain how components of natural and human-made systems play different roles in a working system. |
| | **S8.A.3.2** Apply knowledge of models to make predictions, draw inferences, or explain technological concepts. ***Reference: 3.1.7.B, 3.2.7.B, 4.1.7.B*** | **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).<br><br>**S8.A.3.2.2** Describe how engineers use models to develop new and improved technologies to solve problems.<br>**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). |

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| | **S8.A.3.3** Describe repeated processes or recurring elements in natural, scientific, and technological patterns. ***Reference: 3.1.7.C, 3.2.7.B*** | **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).<br><br>**S8.A.3.3.2** Describe repeating structure patterns in nature (e.g., veins in a leaf, tree rings, crystals, water waves) or periodic patterns (e.g., daily, monthly, annually). |
| | **S8.C.1.1** Explain concepts about the structure and properties (physical and chemical) of matter. ***Reference: 3.4.7.A*** | **S8.C.1.1.2** Use characteristic physical or chemical properties to distinguish one substance from another (e.g., density, thermal expansion/contraction, freezing/melting points, streak test). |
| | **S8.C.2.1** Describe energy sources, transfer of energy, or conversion of energy. ***Reference: 3.4.7.B, 4.2.7.B*** | **S8.C.2.1.2** Explain how energy is transferred from one place to another through convection, conduction, or radiation. |
| | **S8.C.2.2** Compare the environmental impact of different energy sources chosen to support human endeavors. ***Reference: 3.4.7.B, 4.2.7.B*** | **S8.C.2.2.1** Describe the Sun as the major source of energy that impacts the environment. |
| | **S8.D.1.3** Describe characteristic features of Earth's water systems or their impact on resources. ***Reference: 3.5.7.D, 4.3.7.B, 4.1.7.A, 4.1.7.B, 4.1.7.C*** | **S8.D.1.3.1** Describe the water cycle and the physical processes on which it depends (i.e., evaporation, condensation, precipitation, transpiration, runoff, infiltration, energy inputs, and phase changes). |
| | **S8.D.2.1** Explain how pressure, temperature, moisture, and wind are used to describe atmospheric conditions that affect regional weather or climate. | **S8.D.2.1.1** Explain the impact of water systems on the local weather or the climate of a region (e.g., lake effect snow, land/ocean breezes). |

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| | ***Reference: 3.5.7.C*** | **S8.D.2.1.2** Identify how global patterns of atmospheric movement influence regional weather and climate.<br><br>**S8.D.2.1.3** Identify how cloud types, wind directions, and barometric pressure changes are associated with weather patterns in different regions of the country. |
| | **S.7.C.1.1** Describe the structure of matter and its chemical and physical properties. ***Reference: 3.2.7.A*** | **S.7.C.1.1.1** Use characteristic physical or chemical properties of matter to distinguish one substance from another (e.g., density, freezing/melting points, solubility, ability to rust).<br><br>**S.7.C.1.1.4** Describe the relationship between mass and volume as density. |
| | **S.7.D.2.1** Explain the basic elements of meteorology. ***Reference: 3.3.7.A*** | **S.7.D.2.1.1** Explain the effect of wind patterns, circulation of oceans currents, atmospheric pressure, and temperature on weather.<br><br>**S 7.D.2.1.2** Describe changes in atmospheric conditions associated with various weather patterns. |
| | **S.6.C.1.1** Explain that matter has observable physical properties. ***Reference: 3.2.6.A*** | **S.6.C.1.1.2** Explain that materials are characterized by having a specific amount of mass in each unit of volume (density). |
| | **S.6.C.2.1** Explain how energy can be transformed from one form to another and describe the results of the transformation. ***Reference: 3.2.6.B*** | **S.6.C.2.1.1** Describe how heat moves in predictable ways from warmer objects to cooler ones until they reach the same temperature.<br><br>**S.6.C.2.1.2** Describe the effect of heat on particle motion during phase changes. |
| | **S.6.D.2.1** Explain basic elements of weather and climate. ***Reference: 3.2.6.B, 3.3.6.B*** | **S.6.D.2.1.1** Describe cloud types and measurable factors (i.e., wind direction, temperature, barometric pressure, moisture, and precipitation) that are associated with various weather patterns.<br>**S.6.D.2.1.2** Interpret weather data to develop a weather forecast.<br><br>**S.6.D.2.1.3** Explain how global patterns (jet stream, water currents) influence weather in measurable terms (e.g., wind direction, temperature, barometric pressure, precipitation). |

## Standards:

**Science as Inquiry:** Understanding of science content is enhanced when concepts are grounded in inquiry experiences. The use of scientific inquiry will help ensure that students develop a deep understanding of science content, processes, knowledge and understanding of scientific ideas, and the work of scientists; therefore, inquiry is embedded as a strand throughout all content areas. Teaching science as inquiry provides teachers with the opportunity to help all students in grades K-12 develop abilities necessary to understand and do scientific inquiry. These are very similar across grade bands and evolve in complexity as the grade level increases.

**Grades 8-10:**

- Compare and contrast scientific theories.
- Know that both direct and indirect observations are used by scientists to study the natural world and universe.
- Identify questions and concepts that guide scientific investigations.
- Formulate and revise explanations and models using logic and evidence.
- Recognize and analyze alternative explanations and models.
- Explain the importance of accuracy and precision in making valid measurements.

With Content Area Standards:

3.1.8.A9. 3.1.8.B6. 3.1.8.C4. 3.2.8.A6. 3.2.8.B7. 3.3.8.A8. 3.3.8.D3.
3.1.B.A9. 3.1.B.B6. 3.1.B.C4. 3.2.B.A6. 3.2.B.B7. 3.3.B.A8. 3.3.B.D3.
3.1.C.A9. 3.1.C.B6. 3.1.C.C4. 3.2.C.A6. 3.2.C.B7. 3.3.C.A8. 3.3.C.D3.
3.1.P.A9. 3.1.P .B6. 3.1.P .C4. 3.2.P.A6. 3.2.P .B7. 3.3.P.A8. 3.3.P .D3.
3.1.12.A9. 3.1.12.B6. 3.1.12.C4. 3.2.12.A6. 3.2.12.B7. 3.3.12.A8. 3.3.12.D3

**3.2.5.A1.** Describe how water can be changed from one state to another by adding or taking away heat.

**3.2.6.A1.** Differentiate between volume and mass. Investigate that equal volumes of different substances usually have different masses.

**3.2.7.A1.** Explain how materials are characterized by having a specific amount of mass in each unit of volume (**density**).

**3.2.8.A1.** Differentiate between mass and weight.

**3.2.5.B2.** Examine how energy can be transferred from one form to another.

**3.2.6.B2.** Describe energy as a property of objects associated with heat, light, electricity, magnetism, mechanical motion, and sound.

**3.2.6.B3.** Give examples of how heat moves in predictable ways, normally flowing from warmer objects to cooler ones until they reach the same temperature.
Explain the effect of heat on particle motion by describing what happens to particles during a phase change.

**3.2.7.B3.** Differentiate among **convection**, **conduction,** and **radiation**.

**3.2.8.B3.** Explain how changes in temperature are accompanied by changes in kinetic energy.

**3.2.7.B5.** Demonstrate that visible light is a mixture of many different colors.
Explain the construct of the electromagnetic spectrum.
Describe how sound and light energy are transmitted by waves.

**3.3.5.A4.** Explain the basic components of the water cycle.

**3.3.6.A4.** Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere.

**3.3.8.A4.** Explain how the oceans form one interconnected circulation system powered by wind, tides, the Earth's rotation, and water density differences.

**3.3.5.A5.** Differentiate between weather and climate.
Explain how the cycling of water, both in and out of the atmosphere, has an effect on climate.

**3.3.6.A5.** Describe the composition and layers of the **atmosphere.**
Describe how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation

**3.3.7.A5.** Describe basic elements of **meteorology**.
Explain the relationship between the energy provided by the sun and the temperature differences among water, land and **atmosphere.**

**3.3.8.A5.** Explain how the curvature of the earth contributes to climate.
Compare and contrast water vapor, clouds, and humidity.