Treasure Coast Science Scope and Sequence 2012-2013

Course: Earth and Space Science **Course Code: 2001310** **Quarter:2A**

Topic(s) of Study Energy and the Atmosphere

Bodies of Knowledge: Earth and Space, Nature of Science

Standard(s): Earth Systems and Patterns

Essential Questions: How would the transfer of heat within our Earth's systems be altered if one of the spheres were to be destroyed? How has the medical field been modified by the use of various waves? How do scientists design an investigation to answer a scientific question and communicate their findings?

Concept Map(s): Click here
Resources: Click here
Syllabus: Click here
CCSS Literacy Standards: Click here

NGSSS	OUTLINE OF CONTENT (CONCEPT/SKILLS)	TARGETS
SC.912.E.7.1 Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon. SC.912.E.7.3 Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere. Cognitive complexity: High SC.912.P.10.4 Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter Cognitive Complexity: High SC.912.P.10.18 Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications. Cognitive Complexity: High	I Understanding Systems A. Earth as a system 1. Open, closed and isolated systems 2. Energy/Matter II Characteristics of the atmosphere A. Layers of the atmosphere B. Physical and chemical characteristics/ properties C. Changes in the atmospheric gas composition with altitude D. Nitrogen cycle, carbon/oxygen, and water cycle; emphasizing the atmosphere role. E. Formation of Ozone F. Depletion of Ozone by (CFC's) chloroflurocarbons III Solar Radiation A. Transfer of energy	• Identify and describe the characteristics of systems(I) • Apply the conservation of matter and energy to systems(I) • Compare and contrast the layers of the atmosphere using the physical and chemical properties of each layer(II) • Explain why atmospheric composition changes in various altitudes(II) • Describe and label the major components in the atmosphere(II) • Explain how the major components in the atmosphere are the result of ongoing geochemical Earth cycles(I, II) • Identify and summarize the three methods of energy transfer(III) • Compare the specific heat of various substances(IV) • Describe what happens to solar radiation as it travels through the atmosphere to the surface of the Earth, including radiation scattering, solar reflection, radiation absorption and the Greenhouse Effect.(IV) • Calculate the earth's energy budget(IV)

SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: Cognitive Complexity: High

1. pose questions about the natural world,
2. conduct systematic observations,
3. examine books and other sources of information to see what is already known,
4. review what is known in light of empirical evidence,
5. plan investigations,
6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),
7. pose answers, explanations, or descriptions of events,
8. generate explanations that explicate or describe natural phenomena (inferences),
9. use appropriate evidence and reasoning to justify these explanations to others,
10. communicate results of scientific investigations, and

through radiation, conduction, convection.

B. Electromagnetic spectrum
C. The effect of the atmosphere of filtering gamma radiation and X rays

IV Energy Transfer

A. Earth's energy budget
   1. External sources of energy
   2. Internal sources of energy
B. 1st Law of Thermodynamics
C. 2nd Law of Thermodynamics

- Apply the First Law of Thermodynamics to the total amount of Earth's energy(IV)
- Hypothesize the effects of the Second Law of Thermodynamics on the energy of an open, closed and isolated system.(IV)

Objectives below are from Quarter 1A and should be embedded in this topic of study.

- Define a scientific problem or question based on the specific body of knowledge correlated to the Earth/Space Science course
- Use appropriate reference materials to support scientific investigations of various types, such as systematic observation or experiments
- Explain that science is based on evidence based facts
- Determine tools and methods that should be used to collect valid data

- Describe the role consensus plays in the historical development of a theory in Earth/Space Science. (I,)
- Give examples of how advances in technology have affected scientific theories and laws.

11. evaluate the merits of the explanations produced by others. SC.912.N.3.1 Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. Cognitive Complexity: High SC.912.N.3.2 Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science. Cognitive Complexity: Moderate SC.912.N.3.3 Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships. Cognitive Complexity: Moderate SC.912.N.3.4 Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions. Cognitive Complexity: Moderate SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. Cognitive Complexity: Moderate MA.912.S.1.2 Determine		

appropriate and consistent standards of measurement for the data to be collected in a survey or experiment. Cognitive Complexity: Moderate MA.912.S.3.2 Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries from the following: • bar graphs • line graphs • stem and leaf plots • circle graphs • histograms • box and whisker plots • scatter plots • cumulative frequency (ogive) graphs Cognitive Complexity: High		

Treasure Coast Science Scope and Sequence 2012-2013

Course: Earth and Space Science **Course Code: 2001310** **Quarter: 2B**

Topic(s) of Study Water in our Atmosphere

Bodies of Knowledge: Earth and Space, Nature of Science

Standard(s): Earth Systems and Patterns

Essential Questions: What possible ramifications would result from Global warming when considering each of the earth's systems? How has technology changed the way we predict weather? How do scientists design an investigation to answer a scientific question and communicate their findings?

Concept Map(s): Click here
Resources: Click here
Syllabus: Click here
CCSS Literacy Standards: Click here

NGSSS	OUTLINE OF CONTENT (CONCEPT/SKILLS)	TARGETS
SC.912.P.10.4 Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter. Cognitive Complexity: High SC.912.E.7.1 Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon. Cognitive Complexity: High SC.912.E.7.3 Differentiate and describe the various interactions among Earth systems, including: atmosphere, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere. Cognitive Complexity: High SC.912.E.7.4 Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans. Cognitive Complexity: Moderate	I Energy Relationships A. Energy dynamics of states of matter B. Latent Heat II Phase Changes of Water A. Evaporation B. Condensation C. Sublimation D. Transpiration III The Water Cycle A. Movement of water on Earth B. Components C. Ecological Importance D. Phase Changes IV Humidity A. Causes B. Measuring humidity C. Relative humidity versus absolute humidity D. Effects on humans V Clouds A. Factors and conditions needed for formation	• Relate the recycling of matter and the interactions between earth's systems to the flow of energy(I, III) • Diagram and explain the steps of the water cycle.(II, III) • Identify and explain the causes of phase changes within the water cycle(II, III) • Compare specific heat to the heat of vaporization of various liquids (II) • Explain how some substances such as dry ice can skip phases(II) • Hypothesize the potential effects of the water cycle in Florida as a result of global warming(III) • Distinguish between relative and absolute humidity(IV) • Apply the correct technique in using instruments to measure humidity(IV) • Summarize the conditions and outline the steps that form and dissipate clouds and storms Relate cloud morphology to weather patterns. (III, IV, V) ***Objectives below are from Quarter 1A and should be embedded in this topic of study.*** • Define a scientific problem or question based on the specific body

SC.912.E.7.5 Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions. Cognitive Complexity: High SC.912.E.7.6 Relate the formation of severe weather to the various physical factors. Cognitive Complexity: Moderate SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: Cognitive Complexity: High 12. pose questions about the natural world, 13. conduct systematic observations, 14. examine books and other sources of information to see what is already known, 15. review what is known in light of empirical evidence, 16. plan investigations, 17. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), 18. pose answers, explanations, or	B. Types C. Cloud types associated with various weather and storm patterns. D. Relationship between clouds, elevation, temperature, land and water masses.	of knowledge correlated to the Earth/Space Science course. • Explain that science is based on evidence based facts • Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries from the following: bar graphs, line graphs, scatter plots, cumulative frequency graphs • Describe the effects of technology on environmental quality. (I) • Explain why models are used in science to observe processes that happen too slowly, too quickly, or are too small or vast for direct observation • Describe the limitations and misconceptions perceived by models

descriptions of events, 19. generate explanations that explicate or describe natural phenomena (inferences), 20. use appropriate evidence and reasoning to justify these explanations to others, 21. communicate results of scientific investigations, and 22. evaluate the merits of the explanations produced by others. SC.912.N.1.3 Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. Cognitive Complexity: Low SC.912.N.1.6 Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied Cognitive Complexity: Moderate SC.912.N.2.4 Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger,		

leading to its durability. Cognitive Complexity: High SC.912.N.2.5 Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. Cognitive Complexity: High SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science. Cognitive Complexity: Moderate SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. Cognitive Complexity: Moderate MA.912.S.1.2 Determine appropriate and consistent standards of measurement for the data to be collected in a survey or experiment. Cognitive Complexity: Moderate MA.912.S.3.2 Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries from the following:		

• bar graphs • line graphs • stem and leaf plots • circle graphs • histograms • box and whisker plots • scatter plots • cumulative frequency (ogive) graphs Cognitive Complexity: High		

Treasure Coast Science Scope and Sequence 2012-2013

Course: Earth and Space Science **Course Code: 2001310** **Quarter: 2C**

Topic(s) of Study Weather

Bodies of Knowledge: Earth and Space, Nature of Science

Standard(s): Earth Systems and Patterns

Essential Questions: How do both internal (Earth) and external (astronomical) factors work together to produce global climate change? How do scientists design an investigation to answer a scientific question and communicate their findings?

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NGSSS	OUTLINE OF CONTENT (CONCEPT/SKILLS)	TARGETS
SC.912.E.7.1 Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon. SC.912.E.7.3 Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere. Cognitive complexity: High SC.912.E.7.5 Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions. Cognitive Complexity: High SC.912.E.7.6 Relate the formation of severe weather to the various physical factors. Cognitive Complexity: Moderate SC.912.E.7.7 Identify, analyze, and relate the internal (Earth system) and external	I Air Masses A. Movement of air B. Formation of air masses C. Movement of air masses II Weather fronts A. Types of fronts B. Associated weather with types of fronts III Storms and Severe Weather A. Lightning B. Thunderstorms C. Cyclones and anti-cyclones D. Hurricanes E. Tornadoes IV Collecting weather data V Forecasting the weather A. Monitoring stations B. Weather maps	• Describe how air masses form(I) • Differentiate between the types of fronts(II) • Relate the interaction between different fronts with the formation of weather systems(II, III) • Describe the formation of high and low pressure systems and their circulation(II, III) • Analyze the role of the Second Law of Thermodynamics in the development of weather systems(II, III) • Differentiate between weather and climate(II) • Apply the concepts of energy transfer to each stage of a storm cycle(I, II, III) • Analyze the conditions and factors that lead to various storm systems(I, III) • Assess how earth's tilt influences the Coriolis effect(I) • Compare and contrast the techniques and tools used to gather and relay weather data(IV) • Understand the role of the National Oceanic and Atmospheric Administration's (NOAA) role in weather prediction and

(astronomical) conditions that contribute to global climate change. Cognitive Complexity: High SC.912.E.7.8 Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively. Cognitive Complexity: High SC.912.E.7.9 Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water. Cognitive Complexity: High SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: Cognitive Complexity: High 23. pose questions about the natural world, 24. conduct systematic observations, 25. examine books and other sources of information to see what is already known, 26. review what is known in light of empirical evidence, 27. plan investigations, 28. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical		forecasting(IV, V) • Interpret weather maps and station symbols(V) ***Objectives below are from Quarter 1A and should be embedded in this topic of study.*** • Define a scientific problem or question based on the specific body of knowledge correlated to the Earth/Space Science course. • Recognize systematic inference as one form of scientific investigation. • Use appropriate reference materials to support scientific investigations of various types, such as systematic observation or experiments. • Describe the creative means scientists must use to design an investigation • Determine tools and methods that should be used to collect valid data • Determine appropriate and consistent standards of measurement for the data to be collected in a survey or experiment • Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries from the following: bar graphs, line graphs, scatter plots, cumulative frequency graphs. • Justify conclusions based upon all the available evidence, not on expressed opinions.

representations of data, including data tables and graphs), 29. pose answers, explanations, or descriptions of events, 30. generate explanations that explicate or describe natural phenomena (inferences), 31. use appropriate evidence and reasoning to justify these explanations to others, 32. communicate results of scientific investigations, and 33. evaluate the merits of the explanations produced by others. SC.912.N.1.4 Identify sources of information and assess their reliability according to the strict standards of scientific investigation. Cognitive Complexity: High SC.912.N.1.7 Recognize the role of creativity in constructing scientific questions, methods and explanations. Cognitive Complexity: Low SC.912.N.1.7 Recognize the role of creativity in constructing scientific questions, methods and explanations. Cognitive Complexity: Low SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science. Cognitive Complexity: Moderate		