COMPONENT	OBJECTIVES	COMPETENCY
I Nature of Science	1. Describe that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories. **(SC.H.1.4.1)** 2. Explain that from time to time, major shifts occur in the scientific view of how the world works, but that more often, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. **(SC.H.1.4.2)** 3. Justify that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding of theories, new and old, never ends and leads to an increasingly better understanding of how things work in the world, but not to absolute truth. **(SC.H.1.4.3)** 4. Explain how scientists in any one research group tend to see things alike and that therefore scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis. **(SC.H.1.4.4)** 5. Explain using examples that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors. **(SC.H.1.4.5)** 6. Explain that in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings. **(SC.H.1.4.6)**	A. Apply science investigation skills to design and carry out appropriate types of experiments and to analyze and interpret the data collected to form and report conclusions on earth space science topics using established laboratory and safety procedures and equipment.

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	6. Relate the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings. **(SC.H.1.4.7)** 7. Explain that scientists control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural occurrences to discern patterns. **(SC.H.2.4.2)**	
II Earth and Space	1. Describe and delineate the relationships between events on Earth, and the movements of the Earth, its moon, the other planets and the Sun **(SC.E.1.4.1)** 2. Compare and contrast the characteristics of other planets and satellites to those of the Earth. **(SC.E.1.4.2)** 3. List and explain the reasons that Earth may be the only planet in our Solar System that appears to be capable of supporting life as we know it. Discuss new information that seems to indicate there is a possibility that other bodies in the Solar System could support life. **(SC.E.1.4.3)**	A. Describe the interaction and organization in the Solar System and the universe and how this affects life on Earth.
	1. Describe and relate that the structure of the universe is the result of interactions involving fundamental particles (matter) and basic forces (energy) and that the evidence supports that the universe contains all the matter and energy that ever existed. **(SC.B.2.4.1)** 2. Describe the effect of gravitation in the universe by explaining and calculating that acceleration due to gravitational force is proportional to mass and inversely proportional to the square of the distance between the objects. **(SC.C.2.4.1)**	B. Identify and explain the discovery and functioning of major processes in the evolution of the universe, such as the origin of the universe, stellar evolution, and the components and formation of solar systems and the universe as a whole.

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	3. Summarize that the stages in the development of three categories of stars are based on mass: stars that have the approximate mass of our Sun become white dwarves, stars that are two- to three-solar masses develop into neutron stars, and stars that are four or more solar masses develop into black holes. **(SC.E.2.4.1)** 4. List and explain the physical characteristics and development (evolution) of stars, with respect to stellar equilibrium. **(SC.E.2.4.4)** 5. List and describe the theories concerning the development of the solar system (e.g., planets, satellites comets, asteroids, Oort cloud) 6. Identify the organization of celestial bodies found within (e.g., nebulas, star clusters) and outside our galaxy (e.g., types of galaxies, galactic clusters, super clusters, dark matter). **(SC.E.2.4.2)** 7. Describe and explain astronomical distance and time (light year, astronomical unit) **(SC.E.2.4.3)** 8. Describe and explain various scientific theories on how the universe was formed. **(SC.E.2.4.5)** 9. Relate the various ways in which scientists collect and generate data about our universe (e.g., X-ray telescopes, computer simulations such as gravitational systems, nuclear reactions, space probes, mathematical models, and supercollider simulations) **(SC.E.2.4.6)** 10. Summarize that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex but that scientists operate on the belief that the rules can be discovered by careful, systemic study. **(SC.H.2.4.1)**	

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III Processes that shape the Earth	1. Describe and relate that connections (bonds) form between substances when outer –shell electrons are either transferred or shared between their atoms, changing the properties of substances. **(SC.A.1.4.5)** 2. Generalize that the vast diversity of the properties of materials is primarily due to variations in the forces that hold molecules together (e.g., hardness, malleability, fracture). **(SC.A.1.4.2)** 3. Identify and describe the characteristics and formation of igneous, sedimentary, and metamorphic rocks, and different minerals. Also identify the locations where they are found. 4. Summarize that changes in Earth's climate, geological activity, and life forms may be traced and compared. **(SC.D.1.4.3)**	A. Identify and classify different rocks and minerals.
	1. Describe and explain that the solid crust of Earth consists of slow-moving, separate plates that float on a denser, molten layer of Earth and that these plates interact with each other, changing the Earth's surface in many ways (e.g., forming mountain ranges and rift valleys, causing earthquake and volcanic activity, and forming undersea mountains that can become ocean islands). **(SC.D.1.4.2)** 2. List and describe the layers that make up the structure of the Earth and discuss the scientific evidence that supports their existence.	B. Describe plate tectonics (crustal movements and their effects), the formation of land masses, and basic mountain types.
	1. Relate how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth). **(SC.B.1.4.1)**	C. Describe and interpret types of erosion with emphasis on soil types, glaciation, ocean currents, resulting land forms, and weather patterns.

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	2. Describe how climatic patterns on Earth result from an interplay of many factors (Earth's topography, its rotation on its axis, solar radiation, the transfer of heat energy where the atmosphere interfaces with lands and oceans, and wind and ocean currents). **(SC.D.1.4.1)** 3. Summarize that changes in Earth's climate, geological activity, and life forms may be traced and compared. **(SC.D.1.4.3)** 4. Describe the effects of different cycles on the biotic and abiotic characteristics of the earth (e.g., hydrologic cycle, life cycles of rivers, lakes, and glaciers). 5. Describe Earth's oceans with respect to sizes and composition, ocean topography, sediments, ocean floor movements, currents, waves, tides, ocean life and environments, resources, and pollution.	
	1. Describe that layers of energy-rich organic materials have been gradually turned into great coal beds and oil pools (fossil fuels) by the pressure of the overlying earth and that humans burn fossil fuels to release the stored energy as heat and carbon dioxide. (SC.G.2.4.1) 2. Conclude that changes in a component of an ecosystem will have unpredictable effects on the entire system but that the components of the system tend to react in a way that will restore the ecosystem to a state of equilibrium that is equal to the new conditions that the changed components create. (SC.G.2.4.2)	D. Assess renewable and nonrenewable earth resources.

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	1. Describe how climatic patterns and zones on Earth result from an interplay of many factors (Earth's topography, its rotation on its axis, solar radiation, the transfer of heat energy where the atmosphere interfaces with lands and oceans, and wind and ocean currents). **(SC.D.1.4.1)** 2. Summarize that changes in Earth's climate, geological activity, and life forms may be traced and compared. **(SC.D.1.4.3)** 3. Knows the ways in which humans today are placing their environmental support systems at risk (e.g., rapid human population growth, environmental degradation, and resource depletion). **(SC.G.2.4.6)** 4. Describe the composition and layers of the atmosphere and explain how weather patterns form and occur with respect to high and low pressure air masses (cyclones), solar radiation absorption and reflection, jet streams, winds, conduction and convection, the Coriolis effect, water in the atmosphere, and weather fronts.	E. Describe and explain how climatic patterns on Earth result from an interplay of many factors.
	1. Explain the interconnectedness of the systems on Earth and the quality of life. **(SC.D.2.4.1)** 2. Describe how the world ecosystems are shaped by physical factors that limit their productivity. **(SC.G.2.4.4)** 3. Appraise why performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure. **(SC.H.3.4.1)** 4. Relate how technological problems often create a demand of new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science. **(SC.H.3.4.2)**	F. Describe how the earth/space sciences interact with technology and society.

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	5. Interpret how scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events. **(SC.H.3.4.3)** 6. Explain and relate that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery. **(SC.H.3.4.4)** 7. Demonstrate that the value of a technology may differ for different people and at different times. **(SC.H.3.4.5)** 8. Conclude that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account. **(SC.H.3.4.6)**	