LAB-AIDS Correlations for

New York State Science Learning Standards

HIGH SCHOOL EARTH AND SPACE SCIENCES

Mark Koker, Ph D, Director of Curriculum & Professional Development, Lab-Aids

Daniel Seaver, High School Product Manager, Lab-Aids

This document is intended to show how *EDC Earth Science,* published by Lab-Aids, aligns with the *New York State Science Learning Standards*[1].

ABOUT OUR PROGRAMS

LAB-AIDS Core Science Programs are developed to support current knowledge on the teaching and learning of science. All materials support an inquiry-driven pedagogy, with support for literacy skill development and with assessment programs that clearly show what students know and can do from using the programs. All programs have extensive support for technology and feature comprehensive teacher support. For more information please visit www.labaids.com and navigate to the program of interest.

ABOUT THE NEXT GENERATION SCIENCE STANDARDS

The National Academy of Sciences, Achieve, the American Association for the Advancement of Science, and the National Science Teachers Association have collaborated over several years to develop the Next Generation Science Standards (NGSS). The first step of the process was led by The National Academies of Science, a non-governmental organization commissioned in 1863 to advise the nation on scientific and engineering issues. On July 19, 2011, the National Research Council (NRC), the functional staffing arm of the National Academy of Sciences, released *the Framework for K-12 Science Education*[2].

The *Framework* was a critical first step because it is grounded in the most current research on science and science learning and it identifies the science all K–12 students should know. The second step in the process was the development of standards grounded in the *NRC Framework*. A group of 26 lead states and writers, in a process managed by Achieve, has been working since the release of the Framework to develop K-12 *Next Generation Science Standards* (NGSS). The final release of the *Standards* was in April 2013.

The NGSS provide an important opportunity to improve not only science education but also student achievement. The Next Generation Science Standards are student performance expectations – not

1 *www.nysed.gov/common/nysed/files/programs/curriculum-instruction/ess.pdf*

2 http://www.nextgenscience.org/framework-k-12-science-education

curriculum. Even though within each performance expectation Science and Engineering Practices (SEP) are partnered with a particular Disciplinary Core Idea (DCI) and Crosscutting Concept (CC) in the NGSS, these intersections do not predetermine how the three are linked in curriculum, units, or lessons. Performance expectations simply clarify the expectations of what students will know and be able to do be the end of the grade or grade band. As is generally known, the *Standards* represent content from several domains: (1) science and engineering practices; (2) cross-cutting concepts; (3) the disciplines of life, earth, and physical science. The Standards themselves are written as performance indicators. Various other appendices describe other important elements of the Standards, such as DCI progressions, STS, nature of science, and more.

ABOUT EDC EARTH SCIENCE

EDC Earth Science is a full year, activity-driven high school earth science course developed by the Oceans of Data Institute[3] at the Education Development Center (EDC), with support from the National Science Foundation, and is fully aligned to the *Next Generation Science Framework*. *EDC Earth Science* is designed around the belief that students are capable of rigorous and in-depth explorations in science when given adequate support, structure, and motivation for learning.

EDC Earth Science features the following design components:

- In-depth treatment of content based on recommendations in national standards and representative state frameworks;
- Developmentally appropriate lessons featuring Earth Science concepts that build on previous learning and prepare students for more advanced courses;
- The use of historical, newsworthy, and fictionalized stories to draw students into the Earth Science content, to motivate them to acquire the knowledge for solving problems, and to serve as a framework around which students build conceptual understanding;
- Differentiated instructional strategies and activities that help students construct meaning from their experiences and that serve as bridges between concrete and abstract thinking; and,
- Support for developing literacy skills and the use of formative assessment techniques.

Each chapter of *EDC Earth Science* is a cluster of activities that addresses a specific set of concepts and skills. The amount of class time for each chapter will vary. A chapter may range from one to four weeks of classroom sessions. Not shown in the following table are two project-oriented shorter chapters that open and close the course, which taken together require 2-4 weeks for completion. This provides up to 32 weeks of actual instructional time, plus an additional 4 weeks for assessment and related activities. For more information, visit https://store.lab-aids.com/high-school-curriculum/edc-earth-science.

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[3] http://oceansofdata.org/

Unit Title	Core Science Content	Suggested teaching time
1 Hydrosphere: Water in Earth's Systems	Water cycle; surface water, groundwater, assessing and protecting water supplies, Global patterns of ocean circulation; how wind and density differences drive ocean currents; global conveyor belt; El Niño	3-4 weeks
2 Atmosphere and Climate	Climate and weather; influence of latitude, atmospheric circulation, proximity to ocean, elevation, land features, and prevailing winds on regional climate, Energy balance, albedo effect, greenhouse effect, carbon cycle, positive and negative feedback loops; Paleoclimatology, climate proxies, climate change in Earth's past, Milankovitch cycles, tectonic processes that influence climate, human impact on climate	5-8 weeks
3 Earth's Place in the Universe	Life and death of stars, solar nebular condensation hypothesis, Kepler's Laws, Earth's interior structure and composition, internal sources of heat energy, seismic waves, introduction to plate tectonic theory, driving forces of plate movement	3-4 weeks
4 Plate Tectonics	Transform-fault boundaries, earthquakes, physical and computer models Subduction zones, volcanoes, formation of igneous rocks, field-measurement technologies for volcano monitoring Seafloor spreading, paleo-magnetism, plate tectonics summary, landforms associated with plate boundaries	5-7 weeks
5 The Rock Cycle	Erosion and deposition, deltaic processes, formation of sedimentary rock, The nature of rocks and minerals, rock cycle	3-6 weeks
6 Earth's Resources	The geologic processes by which mineral ores are formed; mineral extraction and processing Fossil fuel formation, petroleum resources and exploration technologies	3-6 weeks

EARTH AND SPACE SCIENCES

Topic	Performance Expectation	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	EDC Activity
HS. Space Systems	HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.	Developing and Using Models	ESS1.A: The Universe and Its Stars PS3.D: Energy in Chemical Process and Everyday Life	Scale, Proportions and Quantity	Chapter 8 READING: Life Cycle of Stars (supports)
HS. Space Systems	HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.	Constructing Explanations and Designing Solutions	ESS1.A: The Universe and Its Stars PS4.B: Electromagnetic Radiation	Connections to Engineering, Technology, and Applications of Science: Interdependence of Science, Engineering and Technology Energy and Matter Nature of Science: Scientific Knowledge Assumes an Order and Consistency in Natural Systems	Chapter 8 ACTIVITY 5: Spectroscopy (supports)
HS. Space Systems	HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.	Obtaining, Evaluating and Communicating Information	ESS1.A: The Universe and Its Stars	Energy and Matter	Chapter 8 READING: Life Cycle of Stars Chapter 8 READING Solar Nebula

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					Condensation Theory (supports)
HS. Space Systems	HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.	Using Mathematics and Computational Thinking	ESS1.B: Earth and The Solar System	Connections to Engineering, Technology, and Applications of Science: Interdependence of Science, Engineering and Technology Scale, Proportion, and Quantity	Chapter 8 ACTIVITY 4: Explaining Patterns of Motion with Kepler's Laws of Motion
HS. History of Earth	HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.	Engaging in Argument from Evidence	ESS1.C: The History of Planet Earth ESS2.B: Plate Tectonics and Large-Scale System Interactions PS1.C: Nuclear Processes	Patterns	Chapter 11 READING: Could Mt Rainier Erupt? Chapter 11 READING: How Do Convergent Boundaries Shape Earth's Surface Chapter 14 READING: Elements of Earth's Crust
HS. History of Earth	HS-ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of	Constructing Explanations and Designing Solutions Nature of Science:	ESS1.C: The History of Planet Earth	Stability and Change	Chapter 8 WHAT'S THE STORY: Meteorites: "Scientific Gold" Chapter 8 ACTIVITY 1:

Topic	Performance Expectation	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	EDC Activity
	Earth's formation and early history.	Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena			The Dating Game Chapter 8 READING: Solar Nebula Condensation Theory
HS. Space Systems	HS-ESS1-7: Construct an explanation using evidence to support the claim that the phases of the moon, eclipses, tides and seasons change cyclically	Constructing Explanations and Designing Solutions	ESS1.B: Earth and The Solar System	Patterns	Not well supported
HS. History of Earth	HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.	Developing and Using Models	ESS2.A: Earth Materials and Systems ESS2.B: Plate Tectonics and Large-Scale System Interactions	Stability and Change	Chapter 11 READING: How do Convergent Boundaries Shape Earth's Surface Features? Chapter 12 ACTIVITY 1: Using Sound Waves to Help Map the Ocean Floor Chapter 12 ACTIVITY 2: Studying Maps of Earth's Oceans Chapter 12 ACTIVITY 4: How Are Ocean Basins Formed by Seafloor

Topic	Performance Expectation	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	EDC Activity
					Spreading? Chapter 13 READING: How Do Rivers Build Land?
HS. Earth's Systems	HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.	Analyzing and Interpreting Data	ESS2.A: Earth Materials and Systems	Stability and Change Connections to Engineering, Technology, and Applications of Science: Interdependence of Science, Engineering, and Technology	Chapter 5 READING: The Greenhouse Effect, the Albedo Effect, the Carbon Cycle and Feedback Loops Chapter 6 ACTIVITY 4: What's Happening Now and What's Projected for the Future? Chapter 6 READING: Sorting Out Natural and Human-Induced Climate Change
HS. Earth's Systems	HS-ESS2-3: Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.	Developing and Using Models Connections to Nature of Science: Scientific Knowledge is	ESS2.A: Earth Materials and Systems ESS2.B: Plate Tectonics and Large-Scale	Energy and Matter Engineering, Technology, and Applications of Science: Influence of Science, Engineering,	Chapter 9 READING: A Dense Interior Chapter 9 ACTIVITY 1: Modeling Earth's Interior Structure

Topic	Performance Expectation	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	EDC Activity
		Based on Empirical Evidence	System Interactions PS4.A: Wave Properties	and Technology on Society and the Natural World	Chapter 9 READING: Energy in Earths Interior
HS. Earth's Systems	HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.	Planning and Carrying Out Investigations	ESS2.C: The Roles of Water in Earth's Surface Processes	Structure and Function	Chapter 2 ACTIVITY 1: Reservoir Roulette: A Journey Through the Water Cycle Chapter 2 READING: The Unique Qualities of Water Chapter 13 ACTIVITY 1: Modeling River Deposits Chapter 13 ACTIVITY 2: Modeling a River Delta Chapter 13 READING: How Do Rivers Build Land?
HS. Earth's Systems	HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere,	Developing and Using Models	ESS2.D: Weather and climate	Energy and Matter	Chapter 5 ACTIVITY 3: Moving Carbon Around Chapter 5 ACTIVITY 4:

Topic	Performance Expectation	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	EDC Activity
	geosphere, and biosphere. (Physical and chemical aspects of the geochemical cycling of carbon.)				Calling All Carbons Chapter 5 READING: The Greenhouse Effect, the Albedo Effect, the Carbon Cycle and Feedback Loops
HS. Earth's Systems	HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.)	Engaging in Argument from Evidence	ESS2.D: Weather and climate ESS2.E: Biogeology	Stability and Change	Chapter 14 ACTIVITY 4: Timeline of Major Events in Earth's History (supports)
HS. Weather and Climate	HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.	Developing and Using Models Connections to Nature of Science: Scientific Knowledge is Based on Empirical Evidence	ESS2.A: Earth Materials and Systems ESS2.D: Weather and Climate ESS1.B: Earth and The Solar System	Patterns	Chapter 5 READING: The Greenhouse Effect, the Albedo effect, the Carbon Cycle and Feedback Loops Chapter 6 ACTIVITY 3: Investigating How Orbital Changes Have Affected Past Climate Chapter 6 READING:

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					The Carbon Cycle, Cretaceous Breadfruit Trees, and the Long Slide to the Ice Age Chapter 6 READING: Sorting Out Natural and Human-Induced Climate Change
HS. Weather and Climate	HS-ESS2-8: Evaluate data and communicate information to explain how the movement and interactions of air masses result in changes in weather conditions.	Analyzing and Interpreting Data Obtaining, Evaluating, and Communicating Information	ESS2.D: Weather and Climate	Patterns Cause and Effect	Chapter 4 READING: Sharing the Warmth Chapter 4 ACTIVITY 5: Interactions Between Ocean and Atmosphere Chapter 4 READING: Winds and Mountains
HS. Weather and Climate	HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.	Analyzing and Interpreting Data Connections to Nature of Science: Scientific Investigations Use a Variety of Methods Connections to	ESS3.D: Global Climate Change	Stability and Change	Chapter 5 READING: The Greenhouse Effect, the Albedo Effect, the Carbon Cycle, and Feedback Loops Chapter 6 ACTIVITY 4: What's Happening Now and What's Projected for the

Topic	Performance Expectation	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	EDC Activity
		Nature of Science: Scientific Knowledge is Based on Empirical Evidence			Future? Chapter 6 READING: Sorting Out Natural and Human-Induced Climate Change
HS. Human Sustainability	HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	Constructing Explanations and Designing Solutions	ESS3.A: Natural Resources ESS3.B: Natural Hazards	Cause and Effect Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World	Chapter 2 ACTIVITY 2: Where's the Drinking Water? Chapter 2 READING: Capturing the Good Water Chapter 10 ACTIVITY 3: What is Happening Along the San Andreas Fault? Chapter 11 READING: Could Mt. Rainier Erupt? Chapter 11 ACTIVITY 3: What Might an Eruption of Rainier Be Like? Chapter 13 READING:

Topic	Performance Expectation	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	EDC Activity
					Have People Played A Role in the Subsidence of New Orleans?
HS. Human Sustainability	HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost benefit ratios.	Engaging in Argument from Evidence	ESS3.A: Natural Resources ETS1.B: Developing Possible Solutions	Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World Connections to Nature of Science: Science Addresses Questions About the Natural and Material World	Chapter 15 ACTIVITY 1: Where Are the Mineral Ores? Chapter 15 READING: The Recipe for Oil (supports)
HS. Human Sustainability	HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.	Using Mathematics and Computational Thinking	ESS3.C: Human Impacts on Earth's Systems	Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World	Not well developed

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				Connections to Nature of Science: Science is a Human Endeavor	
HS. Human Sustainability	HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	Constructing Explanations and Designing Solutions	ESS3.C: Human Impacts on Earths Systems	Stability and Change Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World	Chapter 13 READING: Have People Played a Role in the Subsidence of New Orleans? (supports)
HS. Human Sustainability	HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	Using Mathematics and Computational Thinking	ESS3.D: Global Climate Change ESS2.D: Weather and climate	Systems and System Models	Computational representation support not well developed except for climate change in Chapter 5 and 6 (forcing feedbacks and its effect on global climate change)
HS. Engineering Design	HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	Asking Questions and Defining Problems	ETS1.A: Defining and Delimiting Engineering Problems	Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on	Chapter 2 (water use), Chapter 6 (climate change, Chapter 13 (development along river delta regions), and Chapter 15 and

Topic	Performance Expectation	Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	EDC Activity
				Society and the Natural World	16 (mineral and fossil fuel resource use)
HS. Engineering Design	HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	Constructing Explanations and Designing Solutions	ETS1.C: Optimizing the Design Solution		Not well supported
HS. Engineering Design	HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	Constructing Explanations and Designing Solutions	ETS1.B: Developing Possible Solutions	Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World	Chapter 2 (water use), Chapter 6 (climate change), Chapter 13 (development along river delta regions), Chapter 15 and 16 (mineral and fossil fuel resource use)
HS. Engineering Design	HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	Using Mathematics and Computational Thinking	ETS1.B: Developing Possible Solutions	Systems and System Models	Computer simulation not well supported