*Geoblox Book Correlations to NGSS High School Disciplinary Core Ideas**

DCI	DCI Title	Disciplinary Core Ideas	Geoblox Books
PS1.B	Chemical Reactions	● In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (HS-PS1-6)	● Physical Geology
PS1.C	Nuclear Processes	● Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HSPS1- 8)	● Historical Geology ● Astronomy
PS2.B	Types of Interactions	● Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PS2-4),(HS-PS2-5)	● Astronomy
PS4.A	Wave Properties	● The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (HS-PS4-1)	● Oceanography
LS1.A	Structure and Function	● Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)	● Botany
LS1.C	Organization for Matter and Energy Flow in Organisms	● The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)	● Botany
LS2.B	Cycles of Matter and Energy Transfer in Ecosystems	● Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5)	● Botany ● Plate Tectonics ● Environmental Degradation ● Petroleum Game

LS2.C	Ecosystem Dynamics, Functioning, and Resilience	● A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6) ● Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)	● Environmental Degradation ● Katrina
LS4.D	Biodiversity and Humans	● Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (secondary to HS-LS2-7) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)	● Environmental Degradation ● Katrina
LS4.C	Adaptation	● Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4) ● Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3) ● Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-5),(HS-LS4-6) ● Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)	● Historical Geology

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ESS1.A	The Universe and Its Stars	● The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2), (HS-ESS1-3) ● The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. (HSESS1- 2) ● Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2), (HS-ESS1-3)	● Astronomy
ESS1.C	The History of Planet Earth	● Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. (HS-ESS1-5)	● Plate Tectonics
ESS1.C	The History of Planet Earth	● Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (HS-ESS1-6)	● Astronomy ● Historical Geology
ESS2.B	Plate Tectonics and Large-Scale System Interactions	● Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (ESS2.B Grade 8 GBE)	● Plate Tectonics
PS1.C	Nuclear Processes	● Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (secondary to HS-ESS1-5),(secondary to HS-ESS1-6)	● Historical Geology

PS3.D	Energy in Chemical Processes and Everyday Life	● Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (secondary to HS-ESS1-1)	● Astronomy
ESS2.A	Earth Materials and Systems	● Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HSESS2-1),(HS-ESS2-2)	● Plate Tectonics ● Physical Geology ● Environmental Degradation ● Katrina
ESS2.A	Earth Materials and Systems	● Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (HS-ESS2-3)	● Plate Tectonics ● Physical Geology ● Historical Geology ● Volcano
ESS2.A	Earth Materials and Systems	● The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)	● Historical Geology ● Oceanography ● Volcano ● Plate Tectonics ● Physical Geology ● Environmental Degradation ● Katrina ● Grand Canyon ● Guadalupe Mountains ● Groundwater
ESS2.B	Plate Tectonics and Large-Scale System Interactions	● The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3) ● Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. (ESS2.B Grade 8 GBE) (HS-ESS2-1)	● Plate Tectonics

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ESS2.C	The Roles of Water in Earth's Surface Processes	● The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5)	● Oceanography ● Groundwater
ESS2.D	Weather and Climate	● The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS2-2),(HS-ESS2-4) ● Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6),(HS-ESS2-7)	● Environmental Degradation
ESS2.D	Weather and Climate	● Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2- 6), (HS-ESS2-4)	● Environmental Degradation
ESS2.E	Biogeology	● The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (HS-ESS2-7)	● Environmental Degradation ● Katrina
PS4.A	Wave Properties	● Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (secondary to HS-ESS2-3)	● Physical Geology
ESS2.D	Weather and Climate	● Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (secondary to HSESS3- 6)	● Environmental Degradation
ESS3.A	Natural Resources	● Resource availability has guided the development of human society. (HS-ESS3-1) ● All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)	● Environmental Degradation ● Katrina ● Petroleum Game
ESS3.B		● Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)	● Physical Geology ● Environmental Degradation ● Katrina ● Oceanography ● Volcano ● Plate Tectonics

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ESS3.C	Human Impacts on Earth Systems	● The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3) ● Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4)	● Environmental Degradation ● Katrina ● Petroleum Game
ESS3.D	Global Climate Change	● Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3-5)	● Environmental Degradation ● Katrina ● Petroleum Game
ETS1.B	Developing Possible Solutions	● When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (secondary to HS-ESS3-2),(secondary HS-ESS3-4)	● Environmental Degradation ● Katrina ● Petroleum Game
ETS1.A	Defining and Delimiting Engineering Problems	● Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1) ● Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1)	● Environmental Degradation ● Katrina ● Petroleum Game
ETS1.B	Developing Possible Solutions	● When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3) ● Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (HS-ETS1-4)	● Environmental Degradation ● Katrina ● Petroleum Game
ETS1.C	Optimizing the Design Solution	● Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HSETS1- 2)	● Environmental Degradation ● Katrina ● Petroleum Game