



EARTH AND SPACE **SCIENCE**

Course Overview



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Course Description

EduSystem's 7th-9th Science courses were developed and updated based on the curricular designs, content standards and grade-level expectations of the Department of Education of Puerto Rico (*Puerto Rico Core Standards*), and the Curriculum Framework. Furthermore, the content has been enriched by the study of curricular programs designed by other educational institutions and private schools.

The courses introduce their content in a dynamic, innovative, and recreational way. Additionally, they allow the students to build on their own knowledge through the cognitive development of scientific concepts, principles, and laws. They also encourage the study of this discipline by presenting scientific research, skills, and science processes within accessible content.

Basic Concepts and Conceptual Support Elements

EduSystem's 7th-9th Science courses are supported in their design and conceptualization by several basic principles.

1. Emphasis on the need to:
 - Stimulate in the student the use of logical and analytical thinking for reasoning, interpreting, and solving problems, as well as reflection and decision-making throughout the process.
 - Learn Science while "doing Science" by carrying out various activities, experimentation, and scientific research.
 - Promote curriculum integration and the application of scientific concepts in real-life situations.
 - Structure the teaching process systematically (in sequence and from the concrete to the abstract).
 - Stimulate the development of multiple talents and the opportunity to express them in different ways.
 - Promote the development of science concepts, principles, laws, processes, and skills in an articulated way.
- Provide strategies to address the individual differences of the students that make up the

school population.

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2. The development of the activities integrates a constructivist focus which provides and promotes an environment for the students to play a bigger role in the construction of their knowledge and the development of their skills.

General Objectives

- Promote learning through concrete experiences.
- Encourage the use of information technology as a learning scenario.
- Raise awareness in the students regarding the protection and conservation of the environment.
- Encourage reflection and self-assessment during the learning process.
- Promote experiences that develop the values of science and our surrounding environment.
- Integrate scientific disciplines (Chemistry, Physics, Biology, among others) with other fields.
- Encourage participation in scientific research and in the development of science concepts, skills, and processes.
- Integrate science standards and expectations.
- Facilitate situations, activities, and exercises to actively build knowledge and apply it to different situations.
- Work with concrete and abstract concepts.
- Contribute to the development of language as a means of individual and collective communication and incorporate scientific vocabulary.
- Enrich the lessons with texts, exercises, and activities that are appropriate for the level.
- Highlight the scientific environment according to the level.

Course Structure

Earth and Space Science is composed of six units plus an introductory unit. Within each unit, you will find the lessons that make up the unit. Each lesson consists of a presentation divided into sections that develop the topic of study. Each lesson includes work documents, and as a general rule, contains videos or web links.

We invite you to familiarize yourself with the sections of the presentations and the documents generally found in the lessons of the EduSystem Earth and Space Science course.

Units are made up of the following sections:

Lesson 0

This lesson consists of unit documents, a series of diagnostic, formative, and cumulative assessment documents that will be used before, during, and after the study of each unit. Other documents found on L00 are the following:

- **Activity** Varied and fun activities are carried out to verify what has been learned.
- **Ecological Commitment** Topics related to the ecological point of view and how the student can contribute to the conservation of the environment are introduced.
- **Assessment Exercises** Activities that verify the knowledge acquired in each unit.
- **Laboratory** Research activities are carried out by applying the scientific method. Subjects studied in class are applied during laboratory practice.

Lessons

Each unit consists of several lessons divided according to the topics to be studied. Likewise, each lesson consists of a presentation and the following documents:

- **Evaluate My Progress** Reflective exercise regarding the subject studied in the lesson.
- **Descriptive Log** The lesson plan. This includes specific lesson objectives, standards, and expectations, teaching strategies and resources, keywords, web links, references, among others.
- **Let's Do Science!** A research activity is developed in which the students can learn science by "doing science", through the execution of several assorted activities and scientific research.

- **Did You Know...?** Very interesting topics and scientific curiosities that will stimulate student's imagination are presented.
- **Supplementary Projects** A variety of activities, exercises, games, and manipulatives related to the topics presented in the lesson.
- **Vocabulary** New terms are defined.
- **Knowledge Check** Various activities that check the knowledge acquired in each subject.

Unit Breakdown

Below you will find the units divided by their lessons with detailed objectives and concepts for each of them.

Unit 1. Our Planet and the Environment

At the end of this unit, the student will have completed the objectives found in the following lessons.

Lesson 1. Matter and Energy Sources

Code: C465G0SU01L01

Objective

- Recognize the importance of the study of the Earth Sciences and the use of the scientific method to solve problems.
- Describe the characteristics of physical and chemical changes in matter.
- Identify the primary sources of energy.

Key Terms

activation energy, atom, changes of state, chemical changes, coal, compound, earth sciences, electrons, genetic material, hypothesis, isotopes, kerosene, Law of Conservation of Matter, manipulated variable, matter, mutations., neutrons, ocean basins, physical changes, protons, responding variable, scientific method, shell, theory, valence

Lesson 2. The maps

Code: C465G0SU01L02

Objective

- Recognize the importance of maps in the study of Earth Science.
- Distinguish between the different types of maps.

Key Terms

equinox, fossils, hydrographic basin, legend, river system, scale, summer solstice, supply, topography, tributary, winter solstice

Lesson 3. Composition of the Earth

Code: C465G0SU01L03

Objective

- Mention different hypothesis on the origin of the Earth.
- Distinguish between the different terrestrial biomes and the factors that determine their characteristics.
- Identify the six regions of Earth in which animal diversity is distributed.

Key Terms

chemical evolution, collision, ecological niche, ecological succession, ecosystem, ecosystems, heterotrophic, homeostasis, ornithological fauna, phytoremediation, taiga, temperate deciduous forest, tundra biome

Lesson 4. The Earth and its natural satellite

Code: C465G0SU01L04

Objective

- Explain the possible origin of the Solar System.
- Describe the structure and composition of Earth's atmosphere.
- Define the movements of the Earth and how they affect us.
- Describe the movements and phases of the Moon.

Key Terms

apogee, atmosphere, biosphere, centrifugal force, eclipse, ellipse, elliptical orbit, equinox, far side, hydrosphere, inertia, lithosphere, mass, orbit, perigee, peripheral, phases, precession, protoplanets, rotation, trace, translation

Unit 2. Geological Processes

At the end of this unit, the student will have completed the objectives found in the following lessons.

Lesson 1. Geological activity

Code: C465G0SU02L01

Objective

- Use the geologic timescale to compare the ages and events of Earth's history.
- Explain and identify the evidence that supports the theory of continental drift.
- Identify the main factors of seismic and volcanic activity.
- Analyze the relationship between geological activity and the characteristics of the Earth's surface.

Key Terms

basalt rocks, Cretaceous, crust, earthquakes, echo sounding, epicenter, fault zone, fixed points, focus, geological activity, granite, inner core, Jurassic, karst zone, magma, mantle, Mesozoic Era, Mid-Atlantic Ridge, mogotes, oceanography, outer core, paleomagnetism, Paleozoic Era, platform, silica, subduction zone, Theory of Continental Drift or Plate Tectonics, trench, viscosity, volcano

Lesson 2. How are rocks formed?

Code: C465G0SU02L02

Objective

- Relate the study of rocks with the history and formation of planet Earth.
- Describe the origin, formation, and classification of igneous, sedimentary, and metamorphic rocks.
- Recognize the processes of the rock cycle.
- Describe the origin, formation, and classification of igneous, sedimentary, and metamorphic rocks.
- Distinguish between clastic and non-clastic rocks.
- Identify the main components of soil.

Key Terms

clasts, evaporites, exfoliation, humus, lithify, metamorphic rocks, percolate, porphyritic, sedimentary rocks, sieves, soil, subsoil, topsoil

Lesson 3. Minerals

Code: C465G0SU02L03

Objective

- Define a mineral.
- Define and describe the characteristics and properties of minerals.
- Explain the formation and origin of minerals.
- Classify minerals based on their properties.

Key Terms

abrasion, apatite, baryte, calcite, calcite, carbonates, cleavage, corundum, corundum, diamond, element, fluorite, Friedrich Mohs, gypsum, halites, hardness, hornblende, mica, mineral, mineral, native elements, olivine, oxides, potassium feldspar, pyroxene, quartz, silicate mineral, sulfates, sulfites, talc, topaz

Lesson 4. The geological age

Code: C465G0SU02L04

Objective

- Explain the formation of a fossil.
- Describe the origin of the first living being on Earth.
- Describe how fossils are the key to understanding the events of the past.
- Use the geological time scale to compare eras and periods.
- Describe the geological history of the Earth in terms of life development.

Key Terms

anoxic era, Archean, atmosphere, autotroph, bacteria, Basin, Buffon, Cambrian, Carboniferous, catastrophism, Cenozoic, Charles Darwin, Cretaceous, Cryptic, Cuvier, cyanobacteria, Devonian, engulfed, Eoarchean, Eocene, eon, epoch, era, evolution, fossil, fossil, Hadean, Haldane, Holocene, hominids, Hutton, Imbrian, invaginations, Jurassic, Lamarck, lipids, Lyell, Mesoarchean, Mesoproterozoic, Mesozoic, Miller, Miocene, Mississippian, monomers, Nectarian, Neoproterozoic, Neogene, Neoproterozoic, Oligocene, Oparin, Ordovician, origin, Paleoproterozoic, Paleocene, Paleogene, Paleoproterozoic, Paleozoic, Pangaea, Pennsylvanian, period, Permian, Phareozoic, photosynthetic cell, Pleistocene, Pliocene, Precambrian, prokaryotic cell, Proterozoic, Quaternary, Robert Hooke, Silurian, stromatolite, supereon, symbionts, Triassic, uniformitarianism

Unit 3. The Atmosphere

At the end of this unit, the student will have completed the objectives found in the following lessons.

Lesson 1. The Atmosphere

Code: C465G0SU03L01

Objective

- Describe the composition and characteristics of the atmosphere.
- Compare and contrast the five layers of the atmosphere.
- Explain the formation and importance of clouds.
- Associate the atmosphere, climate patterns, and human activity.

Key Terms

atmosphere, biota, cosmic rays, denitrification, macronutrients, nodules, ozone layer, percolate, reservoirs, trace, air bubbles, air convergence, altostratus, atmospheric pressure, cirrus, cirrostratus, clouds, condensation level, convection heat, cumulus, infrared energy, nimbostratus, stable atmosphere, surface, topography, unstable atmosphere, isobars, jet streams, magnitude, pressure-gradient force, albedo, convection, diffused light, energy radiation, global warming, greenhouse effect, greenhouse gases, infrared radiation, solar radiation

Lesson 2. Weather conditions

Code: C465G0SU03L02

Objective

- Relate the seasons of the year and the climate.
- Compare and contrast the climate zones and their climate differences.
- Describe the five climate types.
- Mention the factors that affect weather conditions.
- Explain how hurricanes and other climate phenomena are formed.

Key Terms

aerosols, changes in pressure, climate control, convergence, dry climate, elliptical pattern, emissions, equinox, eye of the hurricane, fauna, feedback, flora, leap year, meteorologist, Milankovitch theory, oblique, polar climates, rainforest, saturation, solstice, tornadoes, weather barriers, weather conditions, wet climate

Lesson 3. Air Pollutants

Code: C465G0SU03L03

Objective

- List and describe the types of atmospheric pollutants.
- Distinguish between natural and artificial sources of pollution.
- Explain the factors that affect air pollution.
- Describe acid rain and its consequences on the environment.

Key Terms

acid fog, acid rain, acid sedimentation, arsenic, asbestos, atmospheric stability, carbon oxides, carcinogens, changes in temperature, congenital, dilution, dry sedimentation, gases, height, humid sedimentation, inversion effect, inversion layer, liquid sedimentation, mixed depth, mixed layer, particle, silt, wind speed

Unit 4. The Waters

At the end of this unit, the student will have completed the objectives found in the following lessons.

Lesson 1. New Oceans

Code: C465G0SU04L01

Objective

- Define oceanography and recognize its importance.
- Distinguish between the ocean and the sea.
- Mention the physical and chemical properties of the ocean.
- Describe the formation and topography of the ocean.
- Explain the El Niño phenomenon and its effects.

Key Terms

abyss, abyssal plain, basins, border, continental shelf, continental slope, dredgers, El Niño, groundwaters, hydrosphere, La Niña, marine biome, mid-ocean ridges, minerals, ocean, ocean ridges, ocean trenches, oceanography, pressure, radiolarians, salinity, sea, Southern Oscillation, trade winds, transparency, trawling, water cycle, winter monsoon

Lesson 2. Marine Ecosystems

Code: C465G0SU04L02

Objective

- Learn and understand the marine ecosystem as an integrated functional body.
- Identify different species that live in a determined area of the biosphere and the environment with which they interact.
- Recognize the different types of life that exist in oceans.
- Learn what submarine currents are and their importance in ecosystems.
- Learn about bioluminescence and fluorescence and how to distinguish between them.
- Understand coastal zones and all their components.
- Recognize that mangrove forests shelter a large variety of organisms that include bacteria and fungus, which intervene in the basic processes of decomposition.
- Understand the importance of preserving the ecosystem.
- Understand the importance of bioconservation to preserve the life of all species.

Key Terms

adventitious roots, agriculture, benthic zone, benthos, bioconservation, bioluminescence, chemosynthesis, corals, displacement, equatorial current, erosion, erosion, euryhaline, grains, heterotrophic, mangrove forest, mangrove tree, marine ecosystem, microbenthos, nekton, neuston, ocean currents, oil, pelagic zone,

phanerogam, photoprotein, photosynthetic, phytoplankton, plankton, pneumatophores, pollution, radioactive contamination, reefs, resurgent waters, rocky shores, runoff, salt flats, sands, sessiles, stenohaline, surface currents, symbiotic, waste., weathering, zooplankton

Lesson 3. New Aquatic Environment

Code: C465G0SU04L03

Objective

- Describe the characteristics of the aquatic environment.
- Mention the difference between surface water and groundwater.
- Build aquatic food chains.
- Recognize the factors of pollution and the importance of conservation.
- Learn the process of water desalination.
- Recognize the factors of pollution and the importance of conservation.

Key Terms

aquifers, artesian aquifer, biochemical oxygen demand, consumers, crustaceans, decomposers, desalination, diffused sources, dilution, distillation, dome, electro dialysis, epilimnion, euphotic zone, eutrophication, groundwater, heterotrophs, hydrogeology, hydrology, hypolimnion, influent stream, ion exchange, ions, oligotrophs, point sources, pollutant., producers, reverse osmosis, rotifers, sanitary waters, sinkholes, surface water, sustainability, sustainable water use, thermocline, water quality standards

Unit 5. Our Resources

At the end of this unit, the student will have completed the objectives found in the following lessons.

Lesson 1. Renewable Resources

Code: C465G0SU05L01

Objective

- Define the concept of natural renewable resources.
- Identify Puerto Rico's natural renewable resources.
- List the air pollutants that affect the environment the most.
- Recognize the importance of maintaining air and water quality in optimal conditions.
- Learn the agricultural practices that could negatively impact the environment.
- Recognize the importance of species bioconservation.

Key Terms

air quality, aquifers, area sources, artificial lakes, atmospheric pollution, biochemical cycles, bioconservation, biological control, biosphere, carrying capacity, conservation, conservation farming, contaminants, dispersed sources, DNA, ecological revolution, Ecology, ecology, ecosystems, ecosystems, environmental risk, erosion, eutrophication, fertility, fugitive sources, Gaia hypothesis, genetic risk, global, grazing, groundwater, habitat, hydrographic basins, hydrological cycle, inorganic compounds, marginal lands, mobile sources, moral rights, natural disasters, natural resources, nutrients, physical erosion, planning, plowing, plowing practices, pollution, population risk, primary limits, primary pollutants, rare species, renewable resources, reservoirs, risk of extinction, runoff, secondary limits, secondary pollutants, sedimentation, sediments, soil vulnerability, species, stationary sources, supplies, sustainability, sustainability, sustainable life, vulnerable species, water pollutants, water quality, water table

Lesson 2. Non-renewable Resources

Code: C465G0SU05L02

Objective

- Distinguish between renewable and nonrenewable natural resources.
- Recognize the importance of minerals and their impact on the environment.
- Describe the importance of mineral resources and their impact on the environment.
- Recognize the environmental impact of fossil fuels.
- Consider recycling as an environmental conservation alternative.

Key Terms

biogeochemical cycles, bioleaching, biological processes, biooxidation, biosorption, biosphere, biotechnology, collapse of the ground, consumption patterns, cycle of mineral resource, direct impact, disposition basin, ecological cycle, environmental degradation, evaporites, filtration, fossil environment, fractional distillation, geological heritage, igneous formation, indirect impact, landfills, mineral deposits, mineral resources, natural deposits, oil slicks, open-pit mines, percolation, percolation, raw material, recycling, refinery, reservoir rocks, runoff, runoff water, secondary recovery, sedimentary processes, solid residue, standards of living, surface mines, sustainable source, tectonic plates, traces of elements, underground mines, well, well drilling

Lesson 3. The Human Population

Code: C465G0SU05L03

Objective

- Recognize the impact of overpopulation and its implications for future generations.
- Define demographic terms related to populations.
- Explain the Malthusian theory.
- Mention the factors that affect the size of populations.

Key Terms

anti-Malthusian, availability per capita, birth controls, birth rate, carrying capacity, chlorofluorocarbon, death rate, demographic transition, demography, duplication time, fertility rate, genetic material, growth rate, hunger, innovative technologies, land area, limiting factors, logistic growth curve, malnutrition, Malthusian, metropolis, migration, ozone layer, population, population density, population growth, Thomas Robert Malthus

Unit 6. The Universe

At the end of this unit, the student will have completed the objectives found in the following lessons.

Lesson 1. The Universe

Code: C465G0SU06L01

Objective

- Identify the theories on the origin of the Universe.
- Analyze the movement of the planets and the physical laws that govern them.
- Describe how a star is formed.
- Compare the life cycles of stars based on their size.
- Evaluate the use of telescopes and radio telescopes and their importance in space discovery.

Key Terms

Albert Einstein, Big Bang, Big Crunch, concave plane, constellations, convex plane, elliptical orbits, energy, force of gravity, galaxies, Galileo Galilei, general theory of relativity, Greeks, Heliocentric Theory, Isaac Newton, Johannes Kepler, Kepler's laws, Laplace's protosolar nebula, Law of Universal Gravitation, legends, light-year, luminosity, Milky Way, natural laws, nebulae, Nicolaus Copernicus, nuclear fusion, observatories, optical telescope, orbits, Orion, oscillating Universe, radio astronomers, radio astronomy, radio receiver, radio telescope, radio waves, receiver, reflectors, refracting telescope, space telescopes, stars, stationary Universe, telescope, Tycho Brahe, universal gravitation

Lesson 2. Our Solar System

Code: C465G0SU06L02

Objective

- Describe how the Solar System is organized.
- Mention the characteristics that distinguish our Solar System.
- Describe the function and importance of the Sun in the Solar System.
- Describe the characteristics and composition of the inner planets.
- Describe the characteristics and composition of the outer planets and the dwarf planets.

Key Terms

ammonia, Aristotle, atmosphere, Babcock, chromosphere, cloud layer, Clyde Tombaugh, core, core, crown, crust, density, Earth's crust, elliptical, erosive agents, foggy planet, frozen methane, fusion, Galileo, helium, helium, hydrogen, hydrogen, ice volcanoes, infrared rays, inner layer, inner planets, iron, Ishtar Terra, Johan Galle, liquid iron, magnetic field, magnetic field, mantle, mountain range, natural satellites,

nickel, nitrogen, orbital modules, outer planets, oxygen, plain, primary sunspot, rings, secondary sunspot, space probe, sulfur compounds, sunspots, tectonic plates, William Herschel

Lesson 3. Travel to Space

Code: C465G0SU06L03

Objective

- Detail the history of space travel.
- Distinguish between the different types of space.
- Identify the function of different satellites.
- Distinguish between satellites and space probes.
- Recognize the importance of space travel and the current knowledge of the Universe.

Key Terms

Apollo missions, astronauts, atmospheric pressure, booster, cargo hold, Cassini–Huygens, climates, crew, crew cabin, equatorial orbit, fuel, gas storms, Hubble telescope, iodine, launch, light-years, liquid hydrogen, liquid oxygen, NASA, Neil Armstrong, orbit, oxygen, polar orbit, probes, rocket boosters, satellites, satellites, space missions, space probes, Space Race, space shuttles, stationary satellites, sterilized equipment, supernova