

Earth Science

State Goals	Learning Standards	Benchmarks	Unit Name	Course Topic Description
11 Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.	11.A Know and apply the concepts, principles and processes of scientific inquiry.	11.A.4a Formulate hypotheses referencing prior research and knowledge.		
		11.A.4b Conduct controlled experiments or simulations to test hypotheses.		
		11.A.4c Collect, organize and analyze data accurately and precisely.	Minerals, Rocks, and the Rock Cycle	Minerals Lab Rocks Lab
		11.A.4d Apply statistical methods to the data to reach and support conclusions.		
		11.A.4e Formulate alternative hypotheses to explain unexpected results.		
		11.A.4f Using available technology, report, display and defend to an audience conclusions drawn from investigations.		
	11.B Know and apply the concepts, principles and processes of technological design.	11.B.4a Identify a technological design problem inherent in a commonly used product.		
		11.B.4b Propose and compare different solution designs to the design problem based upon given constraints including available tools, materials and time.		
		11.B.4c Develop working visualizations of the proposed solution designs (e.g., blueprints, schematics, flowcharts, cad-cam, animations).		
		11.B.4d Determine the criteria upon which the designs will be judged, identify advantages and disadvantages of the designs and select the most promising design.		
		11.B.4e Develop and test a prototype or simulation of the solution design using available materials, instruments and technology.		
		11.B.4f Evaluate the test results based on established criteria, note sources of error and recommend improvements.		

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		11.B.4g Using available technology, report to an audience the relative success of the design based on the test results and criteria.		
12 Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.	12.A Know and apply concepts that explain how living things function, adapt and change.	12.A.4a Explain how genetic combinations produce visible effects and variations among physical features and cellular functions of organisms.		
		12.A.4b Describe the structures and organization of cells and tissues that underlie basic life functions including nutrition, respiration, cellular transport, biosynthesis and reproduction.		
		12.A.4c Describe processes by which organisms change over time using evidence from comparative anatomy and physiology, embryology, the fossil record, genetics and biochemistry.		
	12.B Know and apply concepts that describe how living things interact with each other and with their environment.	12.B.4a Compare physical, ecological and behavioral factors that influence interactions and interdependence of organisms.		
		12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).		
	12.C Know and apply concepts that describe properties of matter and energy and the interactions between them.	12.C.4a Use kinetic theory, wave theory, quantum theory and the laws of thermodynamics to explain energy transformations.		
		12.C.4b Analyze and explain the atomic and nuclear structure of matter.	Minerals, Rocks, and the Rock Cycle	Basic Chemistry and the Atomic Structure of Matter
	12.D Know and apply concepts that describe force and motion and the principles that explain them.	12.D.4a Explain and predict motions in inertial and accelerated frames of reference.		
		12.D.4b Describe the effects of electromagnetic and nuclear forces including atomic and molecular bonding, capacitance and nuclear reactions.		
	12.E Know and apply concepts that describe the features and	12.E.4a Explain how external and internal energy sources drive Earth processes (e.g., solar energy drives weather patterns; internal heat drives plate tectonics).	Atmosphere and Climate	Heat and the Atmosphere
World of Weather			Moisture, Weather, and Forecasting	

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	processes of the Earth and its resources.		Plate Tectonics, Volcanoes, and Earthquakes	In Search of a Theory
			Planet Earth	Earth as a Complex System
		12.E.4b Describe how rock sequences and fossil remains are used to interpret the age and changes in the Earth.	Geologic Time	Relative Time Scales Geologic Time Scales
	12.F Know and apply concepts that explain the composition and structure of the universe and Earth's place in it.	12.F.4a Explain theories, past and present, for changes observed in the universe.	Astronomy	The Universe
		12.F.4b Describe and compare the chemical and physical characteristics of galaxies and objects within galaxies (e.g., pulsars, nebulae, black holes, dark matter, stars).	Astronomy	The Birth of a Star The Solar System The Universe
13 Understand the relationships among science, technology and society in historical and contemporary contexts.	13.A Know and apply the accepted practices of science.	13.A.4a Estimate and suggest ways to reduce the degree of risk involved in science activities.		
		13.A.4b Assess the validity of scientific data by analyzing the results, sample set, sample size, similar previous experimentation, possible misrepresentation of data presented and potential sources of error.		
		13.A.4c Describe how scientific knowledge, explanations and technological designs may change with new information over time (e.g., the understanding of DNA, the design of computers).	Planet Earth	Think Like a Scientist
		13.A.4d Explain how peer review helps to assure the accurate use of data and improves the scientific process.	Planet Earth	Think Like a Scientist
	13.B Know and apply concepts that describe the interaction between science, technology and society.	13.B.4a Compare and contrast scientific inquiry and technological design as pure and applied sciences.		
		13.B.4b Analyze a particular occupation to identify decisions that may be influenced by a knowledge of science.	Planet Earth	Branches of Earth Science Geologists Oceanography Meteorologists Astronomy



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				Earth Science Career Paths
		13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends.		
		13.B.4d Analyze local examples of resource use, technology use or conservation programs; document findings; and make recommendations for improvements.		
		13.B.4e Evaluate claims derived from purported scientific studies used in advertising and marketing strategies.		