



# EARTH SCIENCE

*Geology, the Environment,  
and the Universe*

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STANDARDS	PAGE REFERENCES
<b>S11.A.1 Reasoning and Analysis</b>	
<b>S11.A.1.1 Analyze and explain the nature of science in the search for understanding the natural world and its connection to technological systems.</b> <b>Reference: 3.1.10.A, 3.2.10.A, 3.1.10.E</b>	
<b>S11.A.1.1.1</b> Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the law of gravity, how light travels, formation of moons, stages of ecological succession).	<b>Student Edition:</b> 19, 756-757, 775-779, 838, 847-851 <b>Teacher Wraparound Edition:</b> CB 624D, 774D; CFU 19; D 632, 848; IM 4D; R 779
<b>S11.A.1.1.2</b> Analyze and explain how to verify the accuracy of scientific facts, principles, theories, and laws.	<b>Student Edition:</b> 19, 443-447, 448-454, 455-459, 460-463, 589-591 <i>Science in the News</i> 596 <b>Teacher Wraparound Edition:</b> A 447, 588; ACT 589; P 631; R 447
<b>S11.A.1.1.3</b> Evaluate the appropriateness of research questions (e.g., testable vs. not-testable).	<b>Student Edition:</b> 11-13

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<p><b>S11.A.1.1.4</b> Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton’s laws of universal gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur’s germ theory, relativity, heliocentric theory, gas laws, processing and feedback systems).</p>	<p><b>Student Edition:</b> 67-69, 314-316, 502-504, 557-561, 562-565 <i>MiniLab</i> 558 <b>Teacher Wraparound Edition:</b> CB 4C, 101, 147; CFU 504; E 156; ITI 104; TPK 755; UAA 315</p>
<p><b>S11.A.1.1.5</b> Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).</p>	<p><b>Student Edition:</b> 18, 53-59, 84-91 <i>Design Your Own Lab</i> 92-93 <i>Discovery Lab</i> 153 <i>Mapping GeoLab</i> 258-259 <i>MiniLab</i> 290, 474, 845 <b>Teacher Wraparound Edition:</b> A 291; CB 98C; P 189; RE 762</p>
<p><b>S11.A.1.2 Identify and analyze the scientific or technological challenges of societal issues; propose possible solutions and discuss implications.</b> <b>Reference: 3.2.10.A, 4.3.10.B</b></p>	
<p><b>S11.A.1.2.1</b> Apply and explain scientific concepts to societal issues using case studies (e.g., sea level change, spread of HIV, deforestation, environmental health, energy).</p>	<p><b>Student Edition:</b> <i>Science in the News</i> 142, 294, 518 <i>Science &amp; the Environment</i> 176, 234, 620, 706 <i>Science &amp; Technology</i> 324 <i>Science &amp; Math</i> 380 <i>National Geographic Expeditions</i> 870-873, 898-901 <b>Teacher Wraparound Edition:</b> E 712</p>
<p><b>S11.A.1.2.2</b> Use case studies (e.g., Wright brothers’ flying machine, Tacoma Narrows Bridge, Henry Petroski’s Design Paradigms) to propose possible solutions and analyze economic and environmental implications of solutions for real-world problems.</p>	<p><b>Student Edition:</b> <i>Science in the News</i> 142, 294 <i>Science &amp; the Environment</i> 176, 234, 736 <i>Science &amp; Technology</i> 324 <i>National Geographic Expeditions</i> 870-873 <b>Teacher Wraparound Edition:</b> AC 193; PO 873; TS 176, 294</p>

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<p><b>S11.A.1.3 Describe and interpret patterns of change in natural and human-made systems.</b>  <b>Reference: 3.1.10.C, 3.1.10.E, 4.8.10.A</b></p>	
<p><b>S11.A.1.3.1</b>            Use appropriate quantitative data to describe or interpret change in systems (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).</p>	<p><b>Student Edition:</b>            711-715  <i>Problem-Solving Lab</i> 18, 843  <i>GeoLab</i> 140-141, 232-233, 516-517  <i>MiniLab</i> 761</p>
<p><b>S11.A.1.3.2</b>            Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis).</p>	<p><b>Student Edition:</b>            80, 138-139, 305-311, 455-459  <i>GeoLab</i> 174-175  <i>Discovery Lab</i> 181  <i>Mapping GeoLab</i> 464-465  <b>Teacher Wraparound Edition:</b>            A 9; AC 713, 720; CB 182</p>
<p><b>S11.A.1.3.3</b>            Describe how changes in physical and biological indicators (e.g., soil, plants, or animals) of water systems reflect changes in these systems (e.g., changes in bloodworm populations reflect changes in pollution levels in streams).</p>	<p><b>Student Edition:</b>            157-158, 228-231, 254-257, 669-675, 730-733  <i>Science &amp; the Environment</i> 234  <b>Teacher Wraparound Edition:</b>            CB 210D; CL 157; EC 158; ITI 395; P 727; TS 234</p>
<p><b>S11.A.1.3.4</b>            Compare the rate of use of natural resources and their impact on sustainability.</p>	<p><b>Student Edition:</b>            111-112, 655-658, 659-663, 698-703  <i>Science &amp; the Environment</i> 260  <i>Discovery Lab</i> 655  <i>Earth Science Online</i> 687  <b>Teacher Wraparound Edition:</b>            CB 76C, 260; EC 656; R 715</p>
<p><b>S11.A.2 Processes, Procedures and Tools of Scientific Investigations</b></p>	
<p><b>S11.A.2.1 Apply knowledge of scientific investigation or technological design to develop or critique aspects of the experimental or design process.</b>  <b>Reference: 3.2.10.B, 3.2.10.B</b></p>	
<p><b>S11.A.2.1.1</b>            Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.</p>	<p><b>Student Edition:</b>            11-13  <i>Design Your Own GeoLab</i> 92-93, 378-379  <b>Teacher Wraparound Edition:</b>            A 19; DI 13; P 13</p>

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<p><b>S11.A.2.1.2</b> Critique the elements of the design process (e.g., identify the problem, understand criteria, create solutions, select solution, test/evaluate and communicate results) applicable to a specific technological design.</p>	<p><b>Student Edition:</b> <i>Design Your Own GeoLab</i> 676-677, 704-705, 798-799 <b>Teacher Wraparound Edition:</b> ACT 722; CFU 675; CL 684; M 692, 695; P 685</p>
<p><b>S11.A.2.1.3</b> Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.</p>	<p><b>Student Edition:</b> 11-13 <i>GeoLab</i> 70-71, 114-115, 174-175, 232-233, 292-293, 826-827 <i>Design Your Own GeoLab</i> 92-93, 378-379 <i>Internet GeoLab</i> 352-353, 642-643 <b>Teacher Wraparound Edition:</b> A 12, 141</p>
<p><b>S11.A.2.1.4</b> Critique the results and conclusions of scientific inquiry for consistency and logic.</p>	<p><b>Student Edition:</b> 11-13 <i>Design Your Own GeoLab</i> 92-93, 378-379, 798-799 <i>GeoLab</i> 174-175 <b>Teacher Wraparound Edition:</b> A 489; CL 157; P 685</p>
<p><b>S11.A.2.1.5</b> Communicate results of investigations using multiple representations.</p>	<p><b>Student Edition:</b> 17-19 <i>Design Your Own GeoLab</i> 92-93, 378-379 <i>GeoLab</i> 114-115, 140-141, 232-233, 292-293 <i>Internet GeoLab</i> 352-353, 488-489, 642-643 <b>Teacher Wraparound Edition:</b> A 41; CD 4D; CL 157; P 91</p>
<p><b>S11.A.2.2 Evaluate appropriate technologies for a specific purpose, or describe the information the instrument can provide.</b> <b>Reference: 3.7.10.B, 3.8.10.B</b></p>	
<p><b>S11.A.2.2.1</b> Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality).</p>	<p><b>Student Edition:</b> <i>Mapping GeoLab</i> 42-43, 430-431, 540-541 <i>Design Your Own GeoLab</i> 92-93, 378-379, 798-799 <i>Problem-Solving Lab</i> 110 <i>GeoLab</i> 114-115, 174-175, 232-233, 406-407 <i>Science &amp; Math</i> 770 <b>Teacher Wraparound Edition:</b> A 21, 110; CB 15; DE 15</p>

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<p><b>S11.A.2.2.2</b> Explain how technology is used to extend human abilities and precision (e.g., GPS, spectroscope, scanning electron microscope, pH meters, probes, interfaces, imaging technologies, telescope).</p>	<p><b>Student Edition:</b> 37-41, 312-316, 448-454, 747-752 <i>Science &amp; Technology</i> 22, 72, 354, 466 <i>Science in the News</i> 800, 828 <b>Teacher Wraparound Edition:</b> CB 26D; CL 38; EC 39; TS 22</p>
<p><b>S11.A.3 Systems, Models and Patterns</b></p>	
<p><b>S11.A.3.1 Analyze the parts of a simple system, their roles, and their relationships to the system as a whole.</b> <b>Reference: 3.1.10.A, 3.1.10.E, 4.3.10.C</b></p>	
<p><b>S11.A.3.1.1</b> Apply systems analysis, showing relationships (e.g., flowcharts, decision trees, dichotomous keys, mind map), input and output, and measurements to explain a system and its parts.</p>	<p><b>Student Edition:</b> <i>Section Review</i> 69, 291, 316, 333, 429, 539, 723 <i>Skill Handbook</i> 934-935 <b>Teacher Wraparound Edition:</b> A 9, 203, 604; CFU 139; R 291</p>
<p><b>S11.A.3.1.2</b> Analyze and predict the effect of making a change in one part of a system on the system as a whole.</p>	<p><b>Student Edition:</b> 220-221, 228-231, 369-374, 375-377, 716-723 <i>MiniLab</i> 290, 348 <b>Teacher Wraparound Edition:</b> AC 720; CL 184</p>
<p><b>S11.A.3.1.3</b> Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).</p>	<p><b>Student Edition:</b> <i>Problem-Solving Lab</i> 699 <i>Earth Science Lab</i> 700 <i>Using Math</i> 748 <b>Teacher Wraparound Edition:</b> ACT 748; CB 384D; DE 694; DI 749; P 700</p>
<p><b>S11.A.3.1.4</b> Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g., heating systems, motor, food production) and identify the resources necessary for operation of the system.</p>	<p><b>Student Edition:</b> 698-703 <i>Design Your Own GeoLab</i> 676-677, 704-705 <i>Earth Science Online</i> 694 <i>Problem-Solving Lab</i> 810 <b>Teacher Wraparound Edition:</b> M 692, 695</p>

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<p><b>S11.A.3.2 Compare observations of the real world to observations of a constructed model.</b>  <b>Reference: 3.1.10.B, 3.2.10.B, 4.1.10.B, 4.6.10.A</b></p>	
<p><b>S11.A.3.2.1</b>  Compare the accuracy of predictions represented in a model to actual observations and behavior.</p>	<p><b>Student Edition:</b>  <i>MiniLab</i> 79, 254, 348, 394, 456, 817  <i>Discovery Lab</i> 121  <i>GeoLab</i> 174-175  <i>Mapping GeoLab</i> 430-431, 594-595  <b>Teacher Wraparound Edition:</b>  A 59; D 65</p>
<p><b>S11.A.3.2.2</b>  Describe advantages and disadvantages of using models to simulate processes and outcomes.</p>	<p><b>Student Edition:</b>  18</p>
<p><b>S11.A.3.2.3</b>  Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).</p>	<p><b>Student Edition:</b>  18, 54-56  <i>MiniLab</i> 718, 845</p>
<p><b>S11.A.3.3 Compare and analyze repeated processes or recurring elements in patterns.</b>  <b>Reference: 3.1.10.C, 3.2.10.B</b></p>	
<p><b>S11.A.3.3.1</b>  Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.</p>	<p><b>Student Edition:</b>  399-405, 557-561, 562-565, 758-767  <i>MiniLab</i> 55, 558  <i>GeoLab</i> 826-827  <i>Appendix G</i> 917  <b>Teacher Wraparound Edition:</b>  CB 52C-D, 56; DI 763; E 762; TS 432</p>
<p><b>S11.A.3.3.2</b>  Compare stationary physical patterns (e.g., crystals, layers of rocks, skeletal systems, tree rings, atomic structure) to the object's properties.</p>	<p><b>Student Edition:</b>  60-66, 77-83, 84-91, 392-398, 566-569, 805-812  <i>MiniLab</i> 55, 394, 587  <i>Design Your Own GeoLab</i> 92-93  <i>Problem-Solving Lab</i> 110  <b>Teacher Wraparound Edition:</b>  ACT 85; E 564</p>

STANDARDS	PAGE REFERENCES
<p><b>S11.A.3.3.3</b> Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).</p>	<p><b>Student Edition:</b> 67-69, 305-311, 399-405, 758-767 <i>Science &amp; Math</i> 44, 206 <i>Problem-Solving Lab</i> 401 <i>GeoLab</i> 406-407 <i>Discovery Lab</i> 443 <b>Teacher Wraparound Edition:</b> AC 101; CB 68, 164; DI 67; M 452; R 69</p>
<p><b>S11.D.1 Earth Features and Processes that Change Earth and Its Resources</b></p>	
<p><b>S11.D.1.1 Explain and analyze the forces in the lithosphere that continually shape Earth.</b> <b>Reference: 3.5.10.A, 4.4.10.B, 4.1.10.B</b></p>	
<p><b>S11.D.1.1.1</b> Classify and describe major types of rocks (igneous – granite, basalt, obsidian, pumice; sedimentary – limestone, sandstone, shale, coal; and metamorphic – slate, quartzite, marble, gneiss) and minerals (quartz, calcite, dolomite, clay, feldspar, mica, halite, pyrite) by their origin and formation.</p>	<p><b>Student Edition:</b> 99-106, 107-113, 121-127, 128-132, 133-139 <i>MiniLab</i> 108 <i>Problem-Solving Lab</i> 138 <i>GeoLab</i> 140-141 <i>GeoDigest</i> 147-149 <b>Teacher Wraparound Edition:</b> A 173; CB 98C-D; CL 131; D 137; R 113</p>
<p><b>S11.D.1.1.2</b> Explain the processes that take place at plate boundaries and how these processes continue to shape Earth (e.g., volcanic activity, earthquakes, mountain building, mid-ocean ridges, deep-sea trenches, new land being formed).</p>	<p><b>Student Edition:</b> 443-447, 448-454, 455-459, 460-463, 476-479, 480-487, 505-510, 528-534, 535-539 <b>Teacher Wraparound Edition:</b> AC 457; CB 442C-D; ITI 453, 455, 533</p>
<p><b>S11.D.1.1.3</b> Analyze features created by the interaction of processes that change Earth’s surface (e.g., wind and moving water help break down rock into soil; plate movement, earthquakes, and volcanic activity help cause mountains and valleys to form; flowing water and deposition of material help form deltas).</p>	<p><b>Student Edition:</b> 153-161, 162-166, 181-190, 191-197, 198-203, 211-221 <i>Earth Science Online</i> 157 <i>GeoDigest</i> 264-267 <b>Teacher Wraparound Edition:</b> A 201; CB 152C-D, 180C-D; DI 155</p>
<p><b>S11.D.1.2 Analyze how human-made systems impact the management and distribution of natural resources.</b> <b>Reference: 4.2.10.C, 3.5.10.B, 3.6.10.A</b></p>	
<p><b>S11.D.1.2.1</b> Evaluate factors affecting availability, location, extraction, and use of natural resources.</p>	<p><b>Student Edition:</b> 89-91, 111-113, 655-658, 659-663, 669-675, 683-689, 690-697, 698-703, 711-715 <b>Teacher Wraparound Edition:</b> A 132; CB 76C; P 657; R 689</p>

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<p><b>S11.D.1.2.2</b> Explain the impact of obtaining and using natural resources for the production of energy and materials (e.g., resource renewal, amount of pollution, deforestation).</p>	<p><b>Student Edition:</b> 664-668, 716-723, 724-729, 730-733 <i>MiniLab</i> 718 <b>Teacher Wraparound Edition:</b> A 91, 723, 729; AC 686; CB 717; CL 695; DI 732; E 90, 720</p>
<p><b>S11.D.1.3 Explain the significance and contribution of water as a resource to living things and the shaping of the land.</b> <b>Reference: 3.5.10.D, 4.1.10.B, 4.3.10.B</b></p>	
<p><b>S11.D.1.3.1</b> Explain the multiple functions of different water systems in relation to landforms (e.g., buffer zones, nurseries, food production areas, habitat, water quality control, biological indicators).</p>	<p><b>Student Edition:</b> 228-231, 669-675 <i>Science &amp; the Environment</i> 234, 432 <b>Teacher Wraparound Edition:</b> A 230; CB 210D, 234, 412D</p>
<p><b>S11.D.1.3.2</b> Explain relationships among physical characteristics, vegetation, topography, and flow as it relates to water systems.</p>	<p><b>Student Edition:</b> 211-221, 222-227 <i>Problem-Solving Lab</i> 217 <i>GeoLab</i> 232-233 <b>Teacher Wraparound Edition:</b> A 217, 218; CB 210C, 212, 223; DE 213; M 215, 225; P 218</p>
<p><b>S11.D.1.3.3</b> Explain factors (e.g., nutrient loading, turbidity, rate of flow, rate of deposition, biological diversity) that affect water quality and flow through a water system.</p>	<p><b>Student Edition:</b> 211-221, 239-243, 244-248, 249-257 <i>Discovery Lab</i> 211 <b>Teacher Wraparound Edition:</b> A 219; CB 255; CFU 221; CO 215; D 216; EC 216</p>
<p><b>S11.D.2 Weather, Climate, and Atmospheric Processes</b></p>	
<p><b>S11.D.2.1 Analyze how the transfer of energy and substances between Earth's atmosphere and its surface influences regional or global weather or climate.</b> <b>Reference: 3.5.10.C</b></p>	
<p><b>S11.D.2.1.1</b> Describe how changes in concentration of minor components (e.g., O<sub>2</sub>, CO<sub>2</sub>, ozone, dust, pollution) in Earth's atmosphere are linked to climate change.</p>	<p><b>Student Edition:</b> 374, 375-377, 725-729 <i>Science &amp; Math</i> 380 <i>Earth Science Online</i> 725 <b>Teacher Wraparound Edition:</b> A 374, 376, 377, 729; CB 358D; IM 725; ITI 725, 375; P 725</p>

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<p><b>S11.D.2.1.2</b> Compare the transmission, reflection, absorption, and radiation of solar energy to and by the Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer; increased global cloud cover)</p>	<p><b>Student Edition:</b> 275-277, 374, 375-377 <i>Science in the News</i> 294 <i>MiniLab</i> 376 <i>Science &amp; the Environment</i> 490 <b>Teacher Wraparound Edition:</b> AC 273, 374; CB 490; CFU 377; DI 376; EC 273; M 276; P 277</p>
<p><b>S11.D.2.1.3</b> Explain weather patterns and seasonal changes using the concepts of heat and density.</p>	<p><b>Student Edition:</b> 278-284, 299-304, 305-311, 329-333, 341-346, 347-351, 359-363, 759-762 <i>MiniLab</i> 290, 302, 761 <i>GeoLab</i> 292-293 <b>Teacher Wraparound Edition:</b> RE 308, 331; TPK 343</p>
<p><b>S11.D.2.1.4</b> Analyze weather maps and weather data (e.g., air masses, fronts, temperature, air pressure, wind speed, wind direction, precipitation) to predict regional or global weather events.</p>	<p><b>Student Edition:</b> 278-284, 285-291, 299-304, 305-311, 312-316, 317-321 <i>Discovery Lab</i> 299 <i>Earth Science Online</i> 309 <i>Problem-Solving Lab</i> 318 <i>Mapping GeoLab</i> 322-323 <b>Teacher Wraparound Edition:</b> A 309; CL 308; R 284, 311</p>
<p><b>S11.D.3 Composition and Structure of the Universe</b></p>	
<p><b>S11.D.3.1 Explain the composition, structure and origin of the universe.</b> <b>Reference: 3.4.10.D</b></p>	
<p><b>S11.D.3.1.1</b> Describe planetary motion and the physical laws that explain planetary motion.</p>	<p><b>Student Edition:</b> 759, 775-779 <i>MiniLab</i> 777 <b>Teacher Wraparound Edition:</b> CB 776; CFU 779; DE 778; ITI 778; UAA 776</p>
<p><b>S11.D.3.1.2</b> Describe the structure, formation, and life cycle of stars.</p>	<p><b>Student Edition:</b> 805-812, 813-820, 821-825 <b>Teacher Wraparound Edition:</b> A 807, 825; CB 804D, 808, 811, 819; CFU 825; CO 807; DI 822; ITP 814</p>

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<p><b>S11.D.3.1.3</b>            Explain the current scientific theories of the origin of the solar system and universe (big bang theory, solar nebular theory, stellar evolution).</p>	<p><b>Student Edition:</b>            793-797, 821-825, 847-851</p> <p><b>Teacher Wraparound Edition:</b>            A 825; AC 794; CB 774D; CFU 825, 851; D 848;            IM 849; R 851; TPK 793</p>