



# Earth Science

Geology, the Environment, and the Universe

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| <p><b>Scientific Inquiry (Nature of Science Unifying Concept A)</b><br/>                     Scientific inquiry is the process by which humans systematically examine the natural world. Scientific inquiry is a human endeavor and involves observation, reasoning, insight, energy, skill, and creativity. Scientific inquiry is used to formulate and test explanations of nature through observation, experiments, and theoretical or mathematical models. Scientific explanations and evidence are constantly reviewed and examined by others. Questioning, response to criticism and open communication are integral to the process of science.</p> |   |
| <p>By the end of grade band, students know and are able to do everything required in earlier grades and:</p>  |   |
| <p><b>N.12.A Students understand that a variety of communication methods can be used to share scientific information.</b></p>   |   |
| <p>N.12.A.1 Students know that tables, charts, illustrations and graphs can be used in making arguments and claims in oral and written presentations. E/S</p>   | <p><b>Student Edition:</b><br/>                     13<br/> <i>GeoLab</i> 77, 103, 185, 243, 305, 397, 429, 553, 699, 725, 883<br/> <i>Data Analysis Lab</i> 94<br/> <i>Problem-Solving Lab</i> 874<br/> <i>Math Skills</i> 951-953</p> |
| <p>N.12.A.2 Students know that scientists maintain a permanent record of procedures, data, analyses, decisions, and understandings of scientific investigations. I/S</p>  | <p><b>Student Edition:</b><br/>                     10-13, 83 #16<br/> <i>Section Assessment</i> 19<br/> <b>Teacher Wraparound Edition:</b><br/>                     A 5; AC 10; DI 13; ESJ 17; TCS 13</p>                              |

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| N.12.A.3 Students know that repeated experimentation allows for statistical analysis and unbiased conclusions. E/S                | <b>Student Edition:</b><br><i>GeoLab</i> 103, 699<br><b>Teacher Wraparound Edition:</b><br>TCS 15  |
| N.12.A.4 Students know how to safely conduct an original scientific investigation using the appropriate tools and technology. E/L | <b>Student Edition:</b><br>13<br><i>GeoLab</i> 21, 77, 103, 125, 305, 397, 740, 821, 843<br><i>MiniLab</i> 801, 873<br><i>Launch Lab</i> 829<br><i>Reference Handbook</i> 954-955<br><b>Teacher Wraparound Edition:</b><br>IE 77 |
| N.12.A.5 Students know that models and modeling can be used to identify and predict cause-effect relationships. I/S               | <b>Student Edition:</b><br>18-19<br><i>GeoLab</i> 125, 243, 429, 821<br><i>Launch Lab</i> 193, 281, 313, 763<br><i>MiniLab</i> 210, 240, 362, 481, 631, 653  |
| N.12.A.6 Students know organizational schema can be used to represent and describe relationships of sets. E/S                     | <b>Student Edition:</b><br>18<br><i>GeoLab</i> 243, 305, 397, 429, 725<br><i>Data Analysis Lab</i> 208, 423, 501, 688, 722<br><i>Problem-Solving Lab</i> 227, 294, 449, 565  |

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| <p><b>Science, Technology, and Society (Nature of Science Unifying Concept B)</b></p> <p>Technology defines a society or era. It can shape the environment in which people live, and it has increasingly become a larger part of people’s lives. While many of technology’s effects on society are regarded as desirable, other effects are seen as less desirable. Instruction in this area should not be solely in science or technology courses, but should be shared by science, math, technology, social studies and language arts. The development and use of technology affects society and the environment in which we live, and at the same time society influences the development of technology and its impact on culture.</p> |  |
| <p>By the end of grade band, students know and are able to do everything required in earlier grades and:</p>  |  |
| <p><b>N.12.B Students understand the impacts of science and technology in terms of costs and benefits to society.</b></p>   |  |
| <p>N.12.B.1 Students know that science, technology, and society influenced one another in both positive and negative ways. E/S</p>  | <p><b>Student Edition:</b><br/>           9, 27 #15, 41-46, 324-328, 714-719<br/> <i>National Geographic Expeditions</i> 20<br/> <i>Earth Science and Technology</i> 47, 76, 184, 333<br/> <i>Reading for Comprehension</i> 435<br/> <i>Earth Science and the Environment</i> 724<br/> <b>Teacher Wraparound Edition:</b><br/>           CL 42</p> |
| <p>N.12.B.2 Students know consumption patterns, conservation efforts, and cultural or social practices in countries have varying environmental impacts. E/S</p>   | <p><b>Student Edition:</b><br/>           167, 394-395, 678-681, 682-686, 718, 720-723, 734-736, 737-742, 743-747, 748-750<br/> <i>Section Assessment</i> 101<br/> <i>Earth Science and the Environment</i> 304<br/> <b>Teacher Wraparound Edition:</b><br/>           A 742; DIS 718; EC 283</p>  |
| <p>N.12.B.3 Students know the influence of ethics on scientific enterprise. E/S</p>   | <p><b>Student Edition:</b><br/>           17, 83 #16, 221 #17<br/> <i>Section Assessment</i> 10<br/> <b>Teacher Wraparound Edition:</b><br/>           A 5; ESJ 17</p>   |
| <p>N.12.B.4 Students know scientific knowledge builds on previous information. E/S</p>  | <p><b>Student Edition:</b><br/>           19, 468-472, 473-479, 480-485, 486-488, 494 #36, 633-635, 799-803, 878-881<br/> <i>Earth Science and Society</i> 552<br/> <b>Teacher Wraparound Edition:</b><br/>           AC 6, 478, 722; ITF 633; TCS 474</p>   |

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| <p><b>Atmospheric Processes and the Water Cycle (Earth and Space Science Unifying Concept A)</b></p> <p>Earth systems have internal and external sources of energy, both of which create heat. Driven by sunlight and Earth's internal heat, a variety of cycles connect and continually circulate energy and material through the components of the earth systems.</p> |   |
| <p>By the end of grade band, students know and are able to do everything required in earlier grades and:</p>  |   |
| <p><b>E.12.A Students understand heat and energy transfer in and out of the atmosphere and its involvement in weather and climate.</b></p>  |   |
| <p>E.12.A.1 Students know that the sun is the major source of Earth's energy, and provides the energy driving Earth's weather and climate. E/S</p>  | <p><b>Student Edition:</b><br/>314-317, 378, 388, 390, 708, 776-778<br/><i>Concepts in Motion</i> 288, 388<br/><i>Section Assessment</i> 288</p> <p><b>Teacher Wraparound Edition:</b><br/>A 288; ACT 293; TCS 282, 286, 383, 391</p>                                 |
| <p>E.12.A.2 Students know the composition of Earth's atmosphere has changed in the past and is changing today. I/S</p>  | <p><b>Student Edition:</b><br/>282-283, 394-395, 628-631, 687-688, 743-747<br/><i>Earth Science and the Environment</i> 304<br/><i>Reading for Comprehension</i> 311, 403</p> <p><b>Teacher Wraparound Edition:</b><br/>AC 629; EC 395; ITI 743; TCS 284; TPK 628</p> |
| <p>E.12.A.3 Students understand the role of the atmosphere in Earth's greenhouse effect. E/S</p>  | <p><b>Student Edition:</b><br/>393-395, 400 #30, 463 #11-#12<br/><i>Concepts in Motion</i> 393<br/><i>MiniLab</i> 394<br/><i>Section Assessment</i> 395</p> <p><b>Teacher Wraparound Edition:</b><br/>A 394; CFU 395; EC 745; TCS 629, 751</p>                        |
| <p>E.12.A.4 Students know that convection and radiation play important roles in moving heat energy in the Earth system. E/S</p>   | <p><b>Student Edition:</b><br/>286-288, 309 #44, 318-321, 346, 388-389<br/><i>Concepts in Motion</i> 288</p> <p><b>Teacher Wraparound Edition:</b><br/>A 288; ACT 293; CON 346; TCS 286, 314; TPK 318</p>   |

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| E.12.A.5 Students know that Earth's rotation affects winds and ocean currents. I/S  | <b>Student Edition:</b><br>318-321, 373 #10, 425-427<br><i>National Geographic</i> 319<br><i>Concepts in Motion</i> 319<br><i>Section Assessment</i> 323<br><b>Teacher Wraparound Edition:</b><br>A 427; CFU 427; ESJ 426; R 427; TCS 319   |
| <b>Solar System and Universe (Earth and Space Science Unifying Concept B)</b><br>The universe is a dynamic system of matter and energy. The universe is extremely large and massive with its components separated by vast distances. Tools of technology will continue to aid in the investigation of the components, origins, processes and age of the universe. Earth is one part in our solar system, which is within the Milky Way galaxy. The Sun is the energy-producing star for our solar system. Most objects in our solar system are in predictable motion, resulting in phenomena such as day/night, year, phases of the moon, tides, and eclipses.<br>By the end of grade band, students know and are able to do everything required in earlier grades and: |   |
| <b>E.12.B Students know scientific theories of origins and evolution of the universe.</b>   |   |
| E.12.B.1 Students know common characteristics of stars. I/S   | <b>Student Edition:</b><br>837-846<br><i>Concepts in Motion</i> 839, 844<br><i>National Geographic</i> 839<br><i>Table 29.2</i> 844<br><i>Section Assessment</i> 846<br><i>GeoLab</i> 853<br><b>Teacher Wraparound Edition:</b><br>A 846, AC 842; CFU 846; DI 844; DIS 844; R 846; TCS 845; TPK 845 |
| E.12.B.2 Students know that stars are powered by nuclear fusion of lighter elements into heavier elements, which results in the release of large amounts of energy. I/S   | <b>Student Edition:</b><br>834, 847-848<br><i>Section Assessment</i> 836<br><i>Concepts in Motion</i> 849<br><b>Teacher Wraparound Edition:</b><br>AC 849; E 835; ESJ 834; MI 847   |

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| <p>E.12.B.3 Students know ways in which technology has increased understanding of the universe. I/S</p>  | <p><b>Student Edition:</b><br/> 764-769, 879-880<br/> <i>Earth Science and the Environment</i> 124<br/> <i>Figure 27.4</i> 766-767<br/> <i>Concepts in Motion</i> 767<br/> <i>Launch Lab</i> 795<br/> <i>Earth Science and Technology</i> 820, 882<br/> <i>National Geographic Expeditions</i> 934-939<br/> <b>Teacher Wraparound Edition:</b><br/> P 880; TCS 124, 820, 872, 880, 934</p> |
| <p>E.12.B.4 Students know the ongoing processes involved in star formation and destruction. W/L</p>  | <p><b>Student Edition:</b><br/> 847-851<br/> <i>Concepts in Motion</i> 848<br/> <i>Section Assessment</i> 851<br/> <b>Teacher Wraparound Edition:</b><br/> A 851, 881; AC 850; CFU 851; DI 848; DIS 848; IM 848, 850; UST 849</p>  |
| <p>E.12.B.5 Students know that scientific evidence suggests that the universe is expanding. I/S</p>  | <p><b>Student Edition:</b><br/> 873-877, 878-881<br/> <i>MiniLab</i> 873<br/> <i>Problem-Solving Lab</i> 874<br/> <i>Section Assessment</i> 881<br/> <b>Teacher Wraparound Edition:</b><br/> A 873, 877; AC 326; IM 875; R 881</p>   |
| <p>E.8.B.7: Students know regular and predictable motions of Earth around the Sun and the Moon around the Earth explain such phenomena as the day, the year, phases of the Moon, and eclipses. E/S</p> | <p><b>Student Edition:</b><br/> 775-784<br/> <i>MiniLab</i> 776<br/> <i>National Geographic</i> 779<br/> <i>Problem-Solving Lab</i> 782<br/> <i>Concepts in Motion</i> 782<br/> <b>Teacher Wraparound Edition:</b><br/> A 784; ACT 781; CFU 784; D 775, 780; DI 776, 778; DIS 779; ESJ 783; TCS 779</p>  |

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| <p><b>Earth's Composition and Structure (Earth and Space Science Unifying Concept C)</b><br/>           Earth is composed of materials that move through the biogeochemical cycles. Earth's features are shaped by ongoing and dynamic processes. These processes can be constructive or destructive and occur over geologic time scales.</p> |   |
| <p>By the end of grade band, students know and are able to do everything required in earlier grades and:</p>  |   |
| <p><b>E.12.C Students understand evidence for processes that take place on a geologic time scale.</b></p>   |   |
| <p>E.12.C.1 Students know how successive layers of sedimentary rock and the fossils contained within them can be used to confirm the age, history, and changing life forms of the Earth including how this evidence is affected by the folding, breaking, and uplifting of layers. E/S</p>  | <p><b>Student Edition:</b><br/>           470-471, 590-594, 595-600, 606-609<br/> <i>MiniLab</i> 597<br/> <i>Problem-Solving Lab</i> 599<br/> <i>National Geographic Expeditions</i> 922-927<br/> <b>Teacher Wraparound Edition:</b><br/>           A 597, 600; DI 596; E 595; ITU 587; M 598; MI 595; P 468</p>  |
| <p>E.12.C.2 Students understand the concept of plate tectonics including the evidence that supports it (structural, geophysical and paleontological evidence). E/S</p>  | <p><b>Student Edition:</b><br/>           468-472, 473-479, 480-485, 486-488<br/> <i>Launch Lab</i> 467<br/> <i>Concepts in Motion</i> 469<br/> <i>National Geographic</i> 478<br/> <i>Writing in Earth Science</i> 490<br/> <i>GeoLab</i> 490-491<br/> <b>Teacher Wraparound Edition:</b><br/>           A 472; DI 476; ITI 477; M 473; TCS 466, 474</p> |
| <p>E.12.C.3 Students know that elements exist in fixed amounts and move through solid earth, oceans, atmosphere and living things as part of biogeochemical cycles. E/S</p>   | <p><b>Student Edition:</b><br/>           151, 158 #7-#8, 224, 227 #11-#13, 303, 688<br/> <i>Concepts in Motion</i> 224, 415, 689<br/> <i>National Geographic</i> 415, 689<br/> <b>Teacher Wraparound Edition:</b><br/>           A 151; ESJ 150; IM 689; TCS 280</p>   |

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| E.12.C.4 Student know processes of obtaining, using, and recycling of renewable and nonrenewable resources. E/S         | <b>Student Edition:</b><br>99-101, 678-681, 682-686, 687-692, 693-697, 708-713, 714-719, 720-723, 737-742<br><b>Teacher Wraparound Edition:</b><br>A 101; DIS 738; E 99; EC 100; ESJ 680; P 680                     |
| E.12.C.5 Students know that soil, derived from weathered rocks and decomposed organic material, is found in layers. E/S | <b>Student Edition:</b><br>176-183, 188 # 27-28, 189 #41-#43<br><i>Concepts in Motion</i> 181<br><i>Section Assessment</i> 183<br><b>Teacher Wraparound Edition:</b><br>D 181; DI 178, 180; ESJ 176; M 178; TCS 180 |