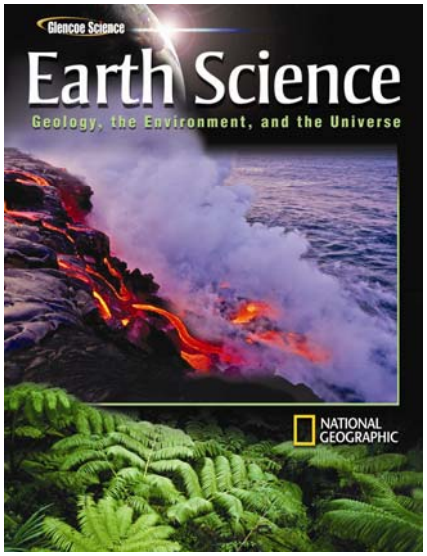
Glencoe

Science
Grade Level Expectations
Grade 9, 10, 11



Earth Science

Geology, the Environment, and the Universe

STANDARDS	PAGE REFERENCES
Strand 5: Processes and Interactions of the Earth's Systems (Geosphere, Atmosphere, and Hydrosphere)	
1. Earth's systems (geosphere, atmosphere, and hydrosphere) have common components and unique structures	
A. The Earth's crust is composed of various materials, including soil, minerals, and rocks, with characteristic properties	
Not assessed at this level	
B. The hydrosphere is composed of water (a material with unique properties) and other materials	
Scope and Sequence – Components and Structure of Earth's Systems a. Recognize the importance of water as a solvent in the environment as it relates to karst topography (cave formation), acid rain, and water pollution	**Student Edition:** 259-262, 265-268, 693-697, 745-746, 748-750 *National Geographic Expeditions* 102 *GeoLab* 270-271 *Reading for Comprehension* 759 **Teacher Wraparound Edition:** AC 229; D 259; ITU 57; M 748; R 750; TCS 102, 259

Codes used for Teacher Wraparound Edition pages are the initial caps of headings on that page.

STANDARDS	PAGE REFERENCES
C. The atmosphere (air) is composed of a mixture of gases, including water vapor, and minute particles	
Scope and Sequence – Components and Structure of Earth's Systems a. Relate the composition of gases and temperature of the layers of the atmosphere (i.e., troposphere, stratosphere, ionosphere) to cloud formation and transmission of radiation (e.g., ultraviolet, infrared)	**Student Edition:** 282-288, 289-296, 297-301 *Launch Lab* 281 *National Geographic* 285 **Teacher Wraparound Edition:** A 288; CON 299; DI 283; DIS 284; M 284; R 290; TCS 282, 286
b. Describe the causes and consequences of observed and predicted changes in the ozone layer	**Student Edition:** 283, 745 *Earth Science & Society* 304 *Reading for Comprehension* 311 **Teacher Wraparound Edition:** AC 287; EC 283; IM 744; TCS 304, 745; TS 304
D. Climate is a description of average weather conditions in a given area over time	
Scope and Sequence – Components and Structure of Earth's Systems a. Provide evidence (e.g., melting glaciers, fossils, desertification) that supports theories of climate change due to natural phenomena and/or human interactions	**Student Edition:** 387-392, 393-395 *Earth Science & Society* 396 *Reading for Comprehension* 403 **Teacher Wraparound Edition:** A 392; CFU 395; D 393; EC 395; ESJ 391; IM 387, 390; ITI 393; P 391; TCS 391, 396
b. Explain how climate and weather patterns in a particular region are affected by factors, such as proximity to large bodies of water or ice/ocean currents, latitude, altitude, prevailing wind currents, and amount of solar radiation	**Student Edition:** 314-317, 318-321, 378-380, 388-389 *MiniLab* 315 **Teacher Wraparound Edition:** AES 379; CON 389; DI 321, 378, 389; E 388; IM 384; ITI 378; ITU 279; TCS 320

STANDARDS	PAGE REFERENCES
2. Earth's systems (geosphere, atmosphere, and hydrosphere) interact with one another as they undergo change by common processes	
A. The Earth's materials and surface features are changed through a variety of external processes	
Scope and Sequence – Interactions among Earth's Systems and Processes of Change a. Explain the external processes (i.e., weathering, erosion, deposition of sediment) that result in the formation and modification of landforms	**Student Edition:** 134-136, 164-170, 171-175, 194-200, 201-206, 207-212 *MiniLab* 210 *National Geographic* 211 *Earth Science & Society* 213 **Teacher Wraparound Edition:** A 212; CON 174; D 165; TCS 165, 171, 173
b. Describe the factors that affect rates of weathering and erosion of landforms (e.g., soil/rock type, amount and force of run-off, slope)	**Student Edition:** 168-170, 179-180, 188 #29-#30, 194-199, 201 *GeoLab* 185 **Teacher Wraparound Edition:** AC 166, 169; CFU 170; CON 168; ESJ 168; ITP 169
B. There are internal processes and sources of energy within the geosphere that cause changes in Earth's crustal plates	
Scope and Sequence – Interactions among Earth's Systems and Processes of Change a. Describe the internal source of energy on Earth that results in uneven heating of the mantle (i.e., decay of radioactive isotopes)	**Student Edition:** 112, 486, 621-622 **Teacher Wraparound Edition:** R 623; TCS 621; TPK 620
b. Illustrate and explain the convection currents that result from the uneven heating inside the mantle and cause movement of crustal plates	**Student Edition:** 486-488, 559 #14, 673 #11-#12 **Teacher Wraparound Edition:** CFU 488; D 487; ESJ 486; MI 486; R 488
c. Describe how the energy of an earthquake travels as seismic waves and provides evidence for the layers of the geosphere	**Student Edition:** 532-533, 534-538, 557 #46 *National Geographic* 537 **Teacher Wraparound Edition:** AC 539; ACT 537; CFU 538; D 532, 535; E 536; R 538; TCS 532, 535, 537, 545

STANDARDS	PAGE REFERENCES
d. Relate the densities of the materials found in continental and oceanic plates to the processes that result in each type of plate boundary (i.e., diverging, converging, transform)	**Student Edition:** 480-485, 488, 562-566, 567-573, 574 **Teacher Wraparound Edition:** CFU 573; CON 570; ITI 569; P 569; TCS 568
e. Describe the effects of the movement of crustal plates (i.e., earthquakes, seafloor spreading, mountain building, volcanic eruptions) at a given location on the planet	**Student Edition:** 480-485, 500-507, 517, 528-533, 542-544, 567-573 *Launch Lab* 467 *Earth Science & the Environment* 489 *GeoLab* 553 **Teacher Wraparound Edition:** CON 502, 570; D 503; IM 530; ITI 501; TS 489
f. Articulate the processes involved in the Theory of Plate Tectonics (i.e., uneven heating of the mantle due to the decay of radioactive isotopes, movement of materials via convection currents, movement of continental and oceanic plates along diverging, converging, or transform plate boundaries) and describe evidence that supports that theory (e.g., correlation of rock sequences, landforms, and fossils; presence of intrusions and faults; evidence of seafloor spreading)	**Student Edition:** 468-472, 473-479, 480-485, 486-488 *National Geographic* 478 *MiniLab* 481 *Problem-Solving Lab* 484 *GeoLab* 490-491 **Teacher Wraparound Edition:** AC 469; CFU 485; M 473; MI 486; TCS 477, 478, 486
C. Continual changes in the Earth's materials and surface that result from internal and external processes is described by the rock cycle	
Not assessed at this level	
D. Changes in the Earth over time can be inferred through rock and fossil evidence	
Scope and Sequence – Interactions among Earth's Systems and Processes of Change a. Use evidence from relative and real dating techniques (e.g., correlation of trace fossils, landforms, and rock sequences; evidence of climate changes; presence of intrusions and faults; magnetic orientation; relative age of drill samples) to infer geologic history	**Student Edition:** 140, 468-472, 590-594, 595-600, 601-605, 606-609 *MiniLab* 597 *Problem-Solving Lab* 599 *Earth Science & Technology* 610 *GeoLab* 611 **Teacher Wraparound Edition:** A 600; AC 469; ACT 608; R 600; TCS 604

STANDARDS	PAGE REFERENCES
E. Changes in the form of water as it moves through Earth's systems are described as the water cycle	
Not assessed at this level	
F. Constantly changing properties of the atmosphere occur in patterns which are described as weather	
Scope and Sequence – Interactions among Earth's Systems and Processes of Change a. Predict the weather at a designated location using weather maps (including map legends) and/or weather data (e.g., temperature, barometric pressure, cloud cover and type, wind speed and direction, precipitation)	**Student Edition:** 324-328, 329-332, 339 #39 *Problem-Solving Lab* 294, 330 *GeoLab* 334-335, 367 **Teacher Wraparound Edition:** A 332; AYS 334; ESJ 331
b. Discover and evaluate patterns and relationships in the causes of weather phenomena and regional climates (e.g., circulation of air and water around the Earth, movement of global winds and water cycles due to solar radiation)	**Student Edition:** 286-288, 289-296, 297-303, 314-317, 318-323, 350-354, 361-365, 378-380 *Launch Lab* 280 *MiniLab* 295 *GeoLab* 397 **Teacher Wraparound Edition:** CL 322; ESJ 314; R 323; TCS 280
G. The geosphere, hydrosphere, and atmosphere are continually interacting through processes that transfer energy and Earth's materials	
Scope and Sequence – Interactions among Earth's Systems and Processes of Change a. Explain how global wind and ocean currents are produced on the Earth's surface (e.g., effects of unequal heating of the Earth's land masses, oceans, and air by the Sun due to latitude and surface material type; effects of gravitational forces acting on layers of air of different densities due to temperature differences; effects of the rotation of the Earth; effects of surface topography)	**Student Edition:** 293, 318-323, 425-427 *National Geographic* 319 **Teacher Wraparound Edition:** A 427; CFU 427; DI 290; ESJ 426; ITI 426; R 427; TCS 319
b. Describe the effects of natural phenomena (e.g., burning organic material, volcanic eruptions, lightning, changes in global wind and ocean currents) on the properties of the atmosphere	**Student Edition:** 282-283, 388-389, 392, 690-692 **Teacher Wraparound Edition:** A 392; CON 389

STANDARDS	PAGE REFERENCES
3. Human activity is dependent upon and affects Earth's resources and systems	
A. Earth's materials are limited natural resources affected by human activity	
Scope and Sequence – Effect of Human Activity on Earth's Resources a. Distinguish between renewable and nonrenewable energy resources	**Student Edition:** 678-681, 708-713, 714-719, 720-723 *Launch Lab* 677 **Teacher Wraparound Edition:** A 681; CFU 681; DI 678; ESJ 680
b. Recognize the finite availability of fresh water for use by living organisms	**Student Edition:** 224, 252, 263-268, 693-697 *Earth Science & Society* 242, 698 *Earth Science & the Environment* 269 *GeoLab* 699 **Teacher Wraparound Edition:** AC 695; TCS 242, 693, 694; TPK 748; TS 242
c. Identify human activities that adversely affect the composition of the atmosphere, hydrosphere, or geosphere	**Student Edition:** 167, 238-241, 265-268, 734-736, 737-742, 743-747, 748-750 *GeoLab* 270-271 *Earth Science & the Environment* 304 *Reading for Comprehension* 311 *Earth Science & Society* 396 *MiniLab* 740 *Earth Science & Technology* 751 **Teacher Wraparound Edition:** AC 265; EC 283
d. Predict the effect of change on the other sphere when given a scenario describing how the composition of the atmosphere, hydrosphere, or geosphere is altered	**Student Edition:** 164-170, 171-175, 176-183, 207-212, 230, 232-237, 259-262, 387-392, 412 *National Geographic Expeditions* 102 *MiniLab* 136 **Teacher Wraparound Edition:** AC 135; EC 167; TCS 20

STANDARDS	PAGE REFERENCES
e. Recognize how the geomorphology of Missouri (i.e., different types of Missouri soil and rock materials such as limestone, granite, clay, loam; land formations such as karst (cave) formations, glaciated plains, river channels) affects the development of land use (e.g., agriculture, recreation, planning and zoning, waste management)	**Student Edition:** 99-101, 199-200, 219 #40, 230-231, 238-241, 247 #38, 545-551, 682-686 *Careers in Earth Science* 72 **Teacher Wraparound Edition:** A 101; AES 230; E 199; ESJ 174; IM 549; TCS 261
f. Recognize the limited availability of major mineral deposits in the United States (e.g., lead, petroleum, coal, copper, zinc, iron, gravel, aluminum) and the factors that affect their availability	**Student Edition:** 99-101, 107 #38-#40, 121-123 *Reading for Comprehension* 109 **Teacher Wraparound Edition:** AC 120; CON 100; DI 89; E 98; ITU 675
g. Recognize the economic, political, social, and ethical constraints associated with obtaining and using natural resources (e.g., mining and use of different types of Missouri mineral resources such as lead mining, gravel dredging, strip mining, coal burning, production of fertilizers and explosives; use of fossil fuels versus renewable resources) (Assess Locally)	**Student Edition:** 99-101, 150, 678-681, 720-723, 737-742 **Teacher Wraparound Edition:** A 101, 742; AC 710; E 99
Strand 6: Composition and Structure of the Universe and the Motion of the Objects Within It	
1. The universe has observable properties and structure	
A. The Earth, Sun, and moon are part of a larger system that includes other planets and smaller celestial bodies	
Scope and Sequence – Objects in the Universe and Their Motion a. Describe and relate the positions and motions of the Sun-Earth solar system, the Milky Way galaxy, and other galaxies within the universe (i.e., it is just one of several solar systems orbiting the center of a rotating spiral galaxy; that spiral galaxy is just one of many galaxies which orbit a common center of gravity; the expanding universe causes the distance between galaxies to increase)	**Student Edition:** 775-784, 796-803, 862-868, 869-877 *Launch Lab* 763, 861 *Problem-Solving Lab* 807 *MiniLab* 873 **Teacher Wraparound Edition:** AC 797; DI 800; ESJ 801; ITI 800, 863; TCS 800

STANDARDS	PAGE REFERENCES
B. The Earth has a composition and location suitable to sustain life	
Scope and Sequence – Objects in the Universe and Their Motion a. Explain how Earth's environmental characteristics and location in the universe (e.g., atmosphere, temperature, orbital path, magnetic field, mass-gravity, location in solar system) provide a life-supporting environment	**Student Edition:** 303, 393, 628-632, 633-637 **Teacher Wraparound Edition:** A 632; TCS 629, 634, 783
b. Compare the environmental characteristics and location in the universe of Earth and other celestial bodies (e.g., planets, moons) to determine ability to support life	**Student Edition:** 804-810 *Earth Science & Technology* 638, 820 **Teacher Wraparound Edition:** CON 807; ESJ 798; TCS 806, 809, 812; TS 638
C. Most of the information we know about the universe comes from the electromagnetic spectrum	
Scope and Sequence – Objects in the Universe and Their Motion a. Identify information that the electromagnetic spectrum provides about the stars and the universe (e.g., chemical composition, temperature, age of stars, location of black holes, motion of celestial bodies)	**Student Edition:** 764-769, 835, 843-846, 873-877, 878-881 *Data Analysis Lab* 835 *GeoLab* 853 *Earth Science & Technology* 882 **Teacher Wraparound Edition:** DI 835; E 765; R 765; TCS 767, 845, 876; TPK 845
b. Evaluate the advantages/disadvantages of using different tools (e.g., spectroscope, different types of telescopes, probes) to gather information about the universe (e.g., background radiation, magnetic fields, discovery of previously unknown celestial bodies)	**Student Edition:** 764-769 *Reading for Comprehension* 793 **Teacher Wraparound Edition:** A 769; AC 768; AES 766; CFU 769; ESJ 766, 767; IM 768; R 769; TCS 766
2. Regular and predictable motions of objects in the universe can be described and explained as the result of gravitational forces	
A. The apparent position of the Sun and other stars, as seen from Earth, change in observable patterns	
Not assessed at this level	
B. The apparent position of the moon, as seen from Earth, and its actual position relative to Earth change in observable patterns	
Not assessed at this level	

STANDARDS	PAGE REFERENCES
C. The regular and predictable motions of a planet and moon relative to the Sun explain natural phenomena, such as day, month, year, shadows, moon phases, eclipses, tides, and seasons	
Scope and Sequence – Objects in the Universe and Their Motion a. Relate units of time (i.e., day, month, year) to the regular and predictable motion of the planets and moons and their positions in the solar system	**Student Edition:** 775-780 **Teacher Wraparound Edition:** AC 782; MI 775
b. Explain seasonal phenomena (i.e., weather, length of day, temperature, intensity of sunlight) as a consequence of a planet's axial tilt as it rotates and a planet's orbital position as it revolves around the Sun	**Student Edition:** 314-315, 378, 388, 401 #37 *MiniLab* 315, 776 **Teacher Wraparound Edition:** A 315; D 775; E 388; ITI 378, 777; M 777
c. Provide evidence that can be observed from Earth that supports the fact Earth rotates on its axis and revolves around the Sun	**Student Edition:** 775 **Teacher Wraparound Edition:** DIS 777
d. Predict the moon rise/set times, phases of the moon, and/or eclipses when given the relative positions of the moon, planet, and Sun	**Student Edition:** 778-784 *National Geographic* 779 *Problem-Solving Lab* 782 **Teacher Wraparound Edition:** A 785; ACT 781; DI 778; DIS 779; ESJ 783; TCS 779
e. Explain how the gravitational forces, due to the relative positions of a planet, moon, and Sun, determine the height and frequency of tides	**Student Edition:** 423-424, 497 #9-#11 *Section Assessment* 427 *Earth Science & the Environment* 428 **Teacher Wraparound Edition:** AC 423; CON 424; ITI 425; TCS 425
D. Gravity is a force of attraction between objects in the solar system that governs their motion	
Scope and Sequence – Objects in the Universe and Their Motion a. Explain orbital motions of moons around planets, and planets around the Sun, as the result of gravitational forces between those objects	**Student Edition:** 796-803, 825 #33-#35 *MiniLab* 801 *Problem-Solving Lab* 807 **Teacher Wraparound Edition:** A 803; CFU 803; DI 800; DIS 798, 799; ESJ 801; IM 770; ITI 800; MI 796; TSC 800

STANDARDS	PAGE REFERENCES
Strand 7: Scientific Inquiry	
1. Science understanding is developed through the use of science process skills, scientific knowledge, scientific investigation, reasoning, and critical thinking	
A. Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation	
Scope and Sequence - All Units a. Formulate testable questions and hypotheses	**Student Edition:** 10 *GeoLab* 77, 103, 125, 153, 305, 397, 429 **Teacher Wraparound Edition:** A 12; AC 10; R 11
b. Analyzing an experiment, identify the components (i.e., independent variable, dependent variables, control of constants, multiple trials) and explain their importance to the design of a valid experiment	**Student Edition:** 10-13 *MiniLab* 12 *Section Assessment* 16 *GeoLab* 103, 125, 397 **Teacher Wraparound Edition:** P 11; TS 428
c. Design and conduct a valid experiment	**Student Edition:** 24 #33 *Inquiry Extension* 21, 77, 243 *GeoLab* 125, 305, 397, 429 *Apply Your Skills* 397 **Teacher Wraparound Edition:** A 172
d. Recognize it is not always possible, for practical or ethical reasons, to control some conditions (e.g., when sampling or testing humans, when observing animal behaviors in nature)	**Student Edition:** 25 #37 *National Geographic Expedition* 20
e. Acknowledge some scientific explanations (e.g., explanations of astronomical or meteorological phenomena) cannot be tested using the standard experimental "scientific method" due to the limits of the laboratory environment, resources, and/or technologies	**Student Edition:** 18-19, 394-395, 473-479, 486-488 *National Geographic Expeditions* 20, 934-939 *Earth Science & Society* 333 *Earth Science & Technology* 751 **Teacher Wraparound Edition:** CON 174; ITU 3

STANDARDS	PAGE REFERENCES
f. Acknowledge there is no fixed procedure called "the scientific method", but that some investigations involve systematic observations, carefully collected and relevant evidence, logical reasoning, and some imagination in developing hypotheses and other explanations	**Student Edition:** 10-13, 595-600, 764-769 *National Geographic* 11 *Section Assessment* 16 *National Geographic Expeditions* 20, 366, 455, 518, 666, 892-897 *Earth Science & the Environment* 124, 269 *Careers in Earth Science* 278 *Earth Science & Technology* 638
g. Evaluate the design of an experiment and make suggestions for reasonable improvements	**Student Edition:** *GeoLab* 103, 397, 725, 821, 853 *Problem-Solving Lab* 122 **Teacher Wraparound Edition:** A 19
B. Scientific inquiry relies upon gathering evidence from qualitative and quantitative observations	
Scope and Sequence - All Units a. Make qualitative and quantitative observations using the appropriate senses, tools and equipment to gather data (e.g., microscopes, thermometers, analog and digital meters, computers, spring scales, balances, metric rulers, graduated cylinders)	**Student Edition:** *GeoLab* 21, 77, 103, 125, 153, 243, 305, 397, 429 *Launch Lab* 59, 163, 281 *MiniLab* 92, 505, 695
b. Measure length to the nearest millimeter, mass to the nearest gram, volume to the nearest milliliter, force (weight) to the nearest Newton, temperature to the nearest degree Celsius, time to the nearest second	**Student Edition:** 13-15 *GeoLab* 21, 125, 153, 243, 305, 397, 429, 821 *Launch Lab* 251 *MiniLab* 695
c. Determine the appropriate tools and techniques to collect, analyze, and interpret data	**Student Edition:** *GeoLab* 21, 77, 103, 125, 153, 243, 305, 397, 429
d. Judge whether measurements and computation of quantities are reasonable	**Student Edition:** *GeoLab* 21, 153, 853 *Problem-Solving Lab* 122, 874 *Share Your Data* 125, 153 **Teacher Wraparound Edition:** T 699

STANDARDS	PAGE REFERENCES
e. Calculate the range, average/mean, percent, and ratios for sets of data	**Student Edition:** 601-603 *Data Analysis Lab* 18, 377, 423 *Problem-Solving Lab* 122, 227, 449, 565 *GeoLab* 243, 305, 699 *Launch Lab* 251 *MiniLab* 416 **Teacher Wraparound Edition:** ACT 253; DIS 199
f. Recognize observation is biased by the experiences and knowledge of the observer (e.g., strong beliefs about what should happen in particular circumstances can prevent the detection of other results)	**Student Edition:** *Analyze Media Sources* 947 *Apply the Skill* 947
C. Evidence is used to formulate explanations	
Scope and Sequence - All Units a. Use quantitative and qualitative data as support for reasonable explanations (conclusions)	**Student Edition:** *MiniLab* 12 *GeoLab* 77, 103, 125, 153, 185, 243, 305, 397, 821, 883
b. Analyze experimental data to determine patterns, relationship, perspectives, and credibility of explanations (e.g., predict/extrapolate data, explain the relationship between the independent and dependent variable)	**Student Edition:** *GeoLab* 77, 103, 125, 153, 185, 243, 305, 397, 429, 519, 553, 667 *MiniLab* 265 *Apply Your Skill* 334 **Teacher Wraparound Edition:** A 12
c. Identify the possible effects of errors in observations, measurements, and calculations on the validity and reliability of data and resultant explanations (conclusions)	**Student Edition:** *Problem-Solving Lab* 122 *GeoLab* 853 **Teacher Wraparound Edition:** D 15; Pro 195; T 21, 429, 821; TCS 15
D. Scientific inquiry includes evaluation of explanations (hypotheses, laws, theories) in light of scientific principles (understandings)	
Scope and Sequence - All Units a. Analyze whether evidence (data) and scientific principles support proposed explanations (hypotheses, laws, theories)	**Student Edition:** 19, 468-472 *Share Your Data* 125 *GeoLab* 153, 397, 490-491 **Teacher Wraparound Edition:** A 472; E 658; P 636

STANDARDS	PAGE REFERENCES
b. Evaluate the reasonableness of an explanation (conclusion)	**Student Edition:** *Share Your Data* 125, 519, 611 *GeoLab* 153, 397
E. The nature of science relies upon communication of results and justification of explanations	
Scope and Sequence - All Units a. Communicate the procedures and results of investigations and explanations through: _ oral presentations _ drawings and maps _ data tables (allowing for the recording and analysis of data relevant to the experiment such as independent and dependent variables, multiple trials, beginning and ending times or temperatures, derived quantities) _ graphs (bar, single, and multiple line) _ equations and writings	**Student Edition:** *Launch Lab* 5 *GeoLab* 21, 103, 125, 153, 185, 243, 305, 397, 429, 519, 553, 611, 667, 725
b. Communicate and defend a scientific argument	**Student Edition:** 188 #31, 219 #39, 247 #37 *Writing in Earth Science* 20, 213 *Inquiry Extension* 77 *Apply Your Skill* 270 **Teacher Wraparound Edition:** A 637; AES 199; CL 718; ESJ 636, 696
c. Explain the importance of the public presentation of scientific work and supporting evidence to the scientific community (e.g., work and evidence must be critiqued, reviewed, and validated by peers; needed for subsequent investigations by peers; results can influence the decisions regarding future scientific work)	**Student Edition:** 17, 83 #16, 221 #17 **Teacher Wraparound Edition:** A 5; ESJ 17
Strand 8: Impact of Science, Technology, and Human Activity	
1. The nature of technology can advance, and is advanced by, science as it seeks to apply scientific knowledge in ways that meet human needs	
A. Designed objects are used to do things better or more easily and to do some things that could not otherwise be done at all	
Not assessed at this level	

STANDARDS	PAGE REFERENCES
B. Advances in technology often result in improved data collection and an increase in scientific information	
Scope and Sequence - All Units a. Recognize the relationships linking technology and science (e.g., how technological problems may create a demand for new science knowledge, how new technologies make it possible for scientists to extend research and advance science)	**Student Edition:** 41-46, 324-328, 329-332, 764-769 *Earth Science & Technology* 47, 184, 610, 638, 751, 882 *Earth Science & the Environment* 124 *Reading for Comprehension* 341 *National Geographic Expeditions* 455, 518 **Teacher Wraparound Edition:** CON 41
C. Technological solutions to problems often have drawbacks as well as benefits	
Scope and Sequence - All Units a. Identify and evaluate the drawbacks (e.g., design constraints, unintended consequences, risks) and benefits of technological solutions to a given problem (e.g., damming a river for flood control, using pesticides to eliminate mosquitoes, genetic engineering of cells, use of satellite communications to gather information)	**Student Edition:** 265-268, 394-395, 737-741, 743-747, 748-750 *Earth Science & the Environment* 304 *GeoLab* 725 **Teacher Wraparound Edition:** AC 740; AES 766; DIS 718, 741; EC 696; ESJ 696; TCS 745, 749
2. Historical and cultural perspectives of scientific explanations help to improve understanding of the nature of science and how science knowledge and technology evolve over time	
A. People of different gender and ethnicity have contributed to scientific discoveries and the invention of technological innovations	
Scope and Sequence - All Units a. Recognize contributions to science are not limited to the work of one particular group, but are made by a diverse group of scientists representing various ethnic and gender groups	**Student Edition:** 381-385 **Teacher Wraparound Edition:** AC 478; ITF 32, 64, 298, 324, 351, 378, 450, 476, 508, 534, 593, 804; TCS 378
b. Recognize gender and ethnicity of scientists often influence the questions asked and/or the methods used in scientific research and may limit or advance science knowledge and/or technology	**Teacher Wraparound Edition:** ITF 324, 351, 476

STANDARDS	PAGE REFERENCES
B. Scientific theories are developed based on the body of knowledge that exists at any particular time and must be rigorously questioned and tested for validity	
Scope and Sequence - All Units a. Identify and describe how explanations (hypotheses, laws, theories) of scientific phenomena have changed over time as a result of new evidence (e.g., model of the solar system, basic structure of matter, structure of an atom, Theory of Plate Tectonics, Big Bang and nebular theory of the universe, explanation of electric current)	**Student Edition:** 468-472, 473-479, 480-485, 486-488, 878-881 *Reading for Comprehension* 559 **Teacher Wraparound Edition:** AC 635; CFU 472; R 881; TCS 468, 474, 621
b. Identify and analyze current theories that are being questioned, and compare them to new theories that have emerged to challenge older ones (e.g., Theory of Evolution, theories of extinction, global warming) (Assess Locally)	**Student Edition:** 394-395 *Reading for Comprehension* 221, 403 *Earth Science & the Environment* 428 *Earth Science & Technology* 751 **Teacher Wraparound Edition:** A 637; TCS 391, 634
3. Science and technology affect, and are affected by, society	
A. People, alone or in groups, are always making discoveries about nature and inventing new ways to solve problems and get work done	
Not assessed at this level	
B. Social, political, economic, ethical, and environmental factors strongly influence, and are influenced by, the direction of progress of science and technology	
Scope and Sequence - All Units a. Analyze the roles of science and society as they interact to determine the direction of scientific and technological progress (e.g., prioritization of and funding for new scientific research and technological development is determined on the basis of individual, political and social values and needs; understanding basic concepts and principles of science and technology influences debate about the economics, policies, politics, and ethics of various scientific and technological challenges)	**Student Edition:** 720-723 *Earth Science & Technology* 47, 184 *Earth Science & Society* 213, 242, 333 *Earth Science & the Environment* 724 *National Geographic Expeditions* 892-897 **Teacher Wraparound Edition:** ITF 388; TCS 76

STANDARDS	PAGE REFERENCES
b. Identify and describe major scientific and technological challenges to society and their ramifications for public policy (e.g., global warming, limitations to fossil fuels, genetic engineering of plants, space and/or medical research)	**Student Edition:** 734-736 *National Geographic Expeditions* 20, 892-897 *Earth Science & Technology* 184 *Earth Science & Society* 242, 333 *Earth Science & the Environment* 304 *Reading for Comprehension* 497 **Teacher Wraparound Edition:** ITF 388
c. Analyze and evaluate the social, political, economic, ethical, and environmental factors affecting progress toward meeting major scientific and technological challenges (e.g., limitations placed on stem-cell research or genetic engineering, introduction of alien species, deforestation, bioterrorism, nuclear energy, genetic counseling, computer technology)	**Student Edition:** 734-736, 737-742, 743-747, 748-750 *Earth Science & Technology* 184 *Earth Science & Society* 213, 242, 698 *National Geographic Expeditions* 892-897 **Teacher Wraparound Edition:** R 395; TS 304
C. Scientific ethics require that scientists must not knowingly subject people or the community to health or property risks without their knowledge and consent	
Scope and Sequence - All Units a. Identify and evaluate the need for informed consent in experimentation	**Student Edition:** 25 #37
b. Identify the ethical issues involved in experimentation (i.e., risks to organisms or environment)	**Student Edition:** 25 #37 *National Geographic Expeditions* 20
c. Identify and evaluate the role of models as an ethical alternative to direct experimentation (e.g., using a model for a stream rather than pouring oil in an existing stream when studying the effects of oil pollution)	**Student Edition:** 18-19 **Teacher Wraparound Edition:** A 394; CL 197; D 393, 548; M 196
D. Scientific information is presented through a number of credible sources, but is at times influenced in such a way to become non-credible	
Scope and Sequence - All Units a. Evaluate a given source for its scientific credibility (e.g., articles in a new periodical quoting an "eyewitness", a scientist speaking within or outside his/her area of expertise)	**Student Edition:** *Analyzing Media Sources* 947 *Apply the Skill* 947 **Teacher Wraparound Edition:** DI 13

STANDARDS	PAGE REFERENCES
b. Explain why accurate record-keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society	**Student Edition:** 17, 83 #16, 221 #17 *Section Assessment* 19 **Teacher Wraparound Edition:** A 5; ESJ 17