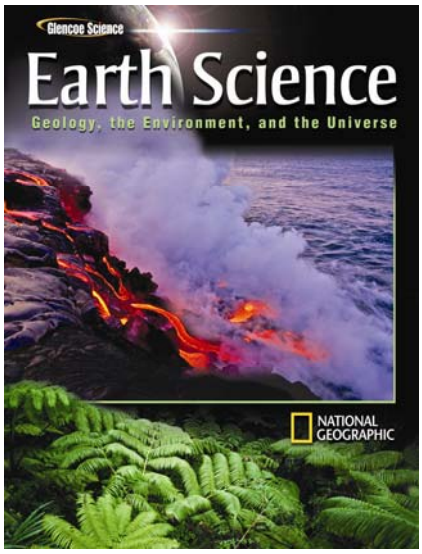
Science Model Content Standards
Grades 9-12

Colorado



Earth Science

Geology, the Environment, and the Universe

STANDARDS	PAGE REFERENCES
GRADES 9–12	
Standard 1: Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.	
1. ask questions and state hypotheses using prior scientific knowledge to help design and guide development and implementation of a scientific investigation	**Student Edition:** 10-13, 24 #22 *National Geographic* 11 *Concepts in Motion* 11 *GeoLab* 77, 103, 125, 243, 305, 397 *Inquiry Extension* 185 **Teacher Wraparound Edition:** A 12, 172, 712; P 11
2. select and use appropriate technologies to gather, process, and analyze data and to report information related to an investigation	**Student Edition:** *GeoLab* 21, 77, 103, 125, 153, 185, 243, 305, 367, 397, 429, 725, 821, 883
3. identify major sources of error or uncertainty within an investigation *(for example: particular measuring devices and experimental procedures)*	**Student Edition:** *GeoLab* 21, 103, 725, 786-787, 821, 853, 883 *Problem-Solving Lab* 122 *Share Your Data* 153 **Teacher Wraparound Edition:** D 15; TCS 15

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

STANDARDS	PAGE REFERENCES
4. recognize and analyze alternative explanations and models	**Student Edition:** 468-472, 473-479, 480-485, 486-488, 633-635, 799-800 *GeoLab* 125, 725, 821 *Share Your Data* 519 *Reading for Comprehension* 673 *Inquiry Extension* 883 **Teacher Wraparound Edition:** CFU 637; E 595; R 803
5. construct and revise scientific explanations and models, using evidence, logic, and experiments that include identifying and controlling variables	**Student Edition:** *MiniLab* 12, 394, 695 *GeoLab* 77, 103, 125, 185, 243, 305, 397, 429, 519, 725, 821, 853
6. communicate and evaluate scientific thinking that leads to particular conclusions	**Student Edition:** 17-19 *GeoLab* 77, 103, 125, 153, 185, 243, 367, 397, 519, 611, 667 *Problem-Solving Lab* 148 *Writing in Earth Science* 305 **Teacher Wraparound Edition:** DI 13
Standard 4: Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. (Focus: Geology, Meteorology, Astronomy, Oceanography)	
1. the Earth's interior has a composition and structure	**Student Edition:** 486-488, 536-538, 641 #15-#16 *National Geographic* 537 *Writing in Earth Science* 538 **Teacher Wraparound Edition:** A 538; TCS 536
2. the theory of plate tectonics helps to explain relationships among earthquakes, volcanoes, midocean ridges, and deep-sea trenches	**Student Edition:** 473-479, 480-485, 500-501, 543-544 *National Geographic* 478 *MiniLab* 481 *Section Assessment* 488 *Earth Science and the Environment* 489 *GeoLab* 553 **Teacher Wraparound Edition:** AC 480; ITI 500, 501; TCS 483, 502; TS 489

STANDARDS	PAGE REFERENCES
3. the feasibility of predicting and controlling natural events can be evaluated *(for example: earthquakes, floods, landslides)*	**Student Edition:** 199-200, 230-231, 539-544, 549-551 *MiniLab* 541 *Earth Science and Society* 552 *National Geographic Expeditions* 916-921 **Teacher Wraparound Edition:** A 200, 541; ACT 550; AES 230; E 918; ESJ 549; ITF 508; TCS 466
4. there are costs, benefits, and consequences of natural resource exploration, development, and consumption (*for example: geosphere, biosphere, hydrosphere, atmosphere and greenhouse gas*)	**Student Edition:** 263-268, 393-395, 686, 718, 720-723 *Earth Science and Society* 242, 396 *Earth Science and the Environment* 269, 304, 724 *GeoLab* 270-271 **Teacher Wraparound Edition:** AC 287; CL 718; EC 283, 696
5. there are consequences for the use of renewable and nonrenewable resources	**Student Edition:** 263-268, 678-681, 695-697, 734-736, 737-742, 743-747, 748-750 *Earth Science and Society* 698 *MiniLab* 740 *National Geographic Expeditions* 892-897, 928-933 **Teacher Wraparound Edition:** A 742; CL 750; ESJ 267, 743
6. evidence is used (*for example: fossils, rock layers, ice cores, radiometric dating)* to investigate how Earth has changed or remained constant over short and long periods of time *(for example: Mount St. Helen's' eruption, Pangaea, and geologic time)*	**Student Edition:** 590-594, 595-600, 601-605, 606-609 *MiniLab* 597 *Concepts in Motion* 598 *Problem-Solving Lab* 599 **Teacher Wraparound Edition:** A 600; DI 596; ESJ 604; IM 590; ITU 587; M 598; TCS 598, 603
7. the atmosphere has a current structure and composition and has evolved over geologic time (*for example: effects of volcanic activity and the change of life forms*)	**Student Edition:** 282-286, 628-631, 687 *Concepts in Motion* 285 *National Geographic* 285 **Teacher Wraparound Edition:** A 288; DIS 282; R 632; TCS 282, 284, 629; TPK 628

STANDARDS	PAGE REFERENCES
8. energy transferred within the atmosphere influences weather *(for example: the role of conduction, radiation, convection, and heat of condensation in clouds, precipitation, winds, storms)*	**Student Edition:** 286-288, 294-295, 297-303, 318-323, 344-347 **Teacher Wraparound Edition:** A 323; CFU 288; CON 294; DIS 284, 298; ESJ 285; RE 345; TCS 286, 297; UAA 299
9. weather is caused by differential heating, the spin of the Earth and changes in humidity (air pressure, wind patterns, coriolis effect)	**Student Edition:** 289-296, 314-317, 318-323 *GeoLab* 305 *Launch Lab* 313 *MiniLab* 315 *Concepts in Motion* 316, 319 *National Geographic* 319 **Teacher Wraparound Edition:** A 296; CFU 317; R 323; TCS 291, 319, 320
10. there are interrelationships between the circulation of oceans and weather and climate	**Student Edition:** 379, 384, 388-389, 412, 425-427 **Teacher Wraparound Edition:** CON 389; DI 290, 389; IM 390; ITI 393; ITU 279
11. there are factors that may influence weather patterns and climate and their effects within ecosystems *(for example: elevation, proximity to oceans, prevailing winds, fossil fuel burning, volcanic eruptions)*	**Student Edition:** 378-380, 387-392, 393-395 *Earth Science and Society* 396 **Teacher Wraparound Edition:** A 392, 395; CFU 380; CON 389; D 393; DI 395; ESJ 391; ITI 378; ITU 279; TS 396
12. water and other Earth systems interact (*for example: the biosphere, lithosphere, and atmosphere*)	**Student Edition:** 8-9, 134-140, 164-169, 172-175, 176-180, 194-200, 259-262 *National Geographic* 139 **Teacher Wraparound Edition:** AC 238, 300; CFU 175; ESJ 171; ITP 9; ITU 3; R 9
13. continental water resources are replenished and purified through the hydrologic cycle	**Student Edition:** 224-231, 238-241, 247#36, 249#13, 252-258, 277 #11-#13, 303 *Concepts in Motion* 224 **Teacher Wraparound Edition:** BI 250; IM 224; MI 253; R 303; TCS 238, 280, 294

STANDARDS	PAGE REFERENCES
14. gravity governs the motions observed in the solar system and beyond	**Student Edition:** 802-803, 867-868 *Concepts in Motion* 803 **Teacher Wraparound Edition:** CFU 803
15. there is electromagnetic radiation produced by the Sun and other stars *(for example: X- ray, ultraviolet, visible light, infrared, radio)*	**Student Edition:** 764-765, 831 **Teacher Wraparound Edition:** ITI 764; MI 764; RE 765; TCS 831, 833, 848
16. stars differ from each other in mass, color, temperature and age	**Student Edition:** 843-846, 847-851 *Section Assessment* 851 **Teacher Wraparound Edition:** A 846; DI 844, 848; DIS 844; ESJ 847; P 844; R 846, 851; TCS 828
17. the scales of size and separation of components of the solar system are complex	**Student Edition:** 804-810, 811-815, 816-819, 825 #33-#35 *Math in Earth Science* 810 *National Geographic* 817 *GeoLab* 821 **Teacher Wraparound Edition:** CFU 815; DI 808; TCS 794, 808
Standard 5 Students understand that the nature of science involves a particular way of building knowledge and making meaning of the natural world.	
1. print and visual media can be evaluated for scientific evidence, bias, or opinion	**Student Edition:** *Problem-Solving Skills* 947 **Teacher Wraparound Edition:** TPK 10
2. the scientific way of knowing uses a critique and consensus process *(for example: peer review, openness to criticism, logical arguments, skepticism)*	**Student Edition:** 17-19, 83 #16 **Teacher Wraparound Edition:** A 5; AC 10; ESJ 17

STANDARDS	PAGE REFERENCES
3. graphs, equations or other models are used to analyze systems involving change and constancy *(for example: comparing the geologic time scale to shorter time frame, exponential growth, a mathematical expression for gas behavior; constructing a closed ecosystem such as an aquarium)*	**Student Edition:** 18-19 *National Geographic Expeditions* 20 *GeoLab* 125, 185, 243, 305, 397, 429, 490-491 *MiniLab* 136, 172, 453, 801 *Data Analysis Lab* 688
4. there are cause-effect relationships within systems *(for example: the effect of temperature on gas volume, effect of carbon dioxide level on the greenhouse effect, effects of changing nutrients at the base of a food pyramid)*	**Student Edition:** 164-170, 249 #15, 292, 393-395 *GeoLab* 153, 305 *Inquiry Extension* 185 *Launch Lab* 281, 499 **Teacher Wraparound Edition:** A 427; CL 197; CON 357; EC 283; ESJ 168; ITP 292
5. scientific knowledge changes and accumulates over time; usually the changes that take place are small modifications of prior knowledge but major shifts in the scientific view of how the world works do occur	**Student Edition:** 19, 468-472, 473-479, 480-485, 486-488, 595, 799-803 *Earth Science and the Environment* 124 *Figure 19.4* 530-531 *Earth Science and Society* 552 *Figure 21.4* 592-593 *Figure 27.4* 766-767 **Teacher Wraparound Edition:** AC 478; ESJ 471; ITF 593
6. interrelationships among science, technology and human activity lead to further discoveries that impact the world in positive and negative ways	**Student Edition:** 9, 41-46, 718, 769 *National Geographic Expeditions* 20, 366, 518 *Earth Science and Technology* 47, 76, 184 *Earth Science and Society* 333 *Reading for Comprehension* 341 *Earth Science and the Environment* 724 *Section Assessment* 769 **Teacher Wraparound Edition:** CON 41
7. there is a difference between a scientific theory and a scientific hypothesis	**Student Edition:** 10, 19, 83 #12 *Writing in Earth Science* 19 **Teacher Wraparound Edition:** AC 18; CFU 19; IM 17