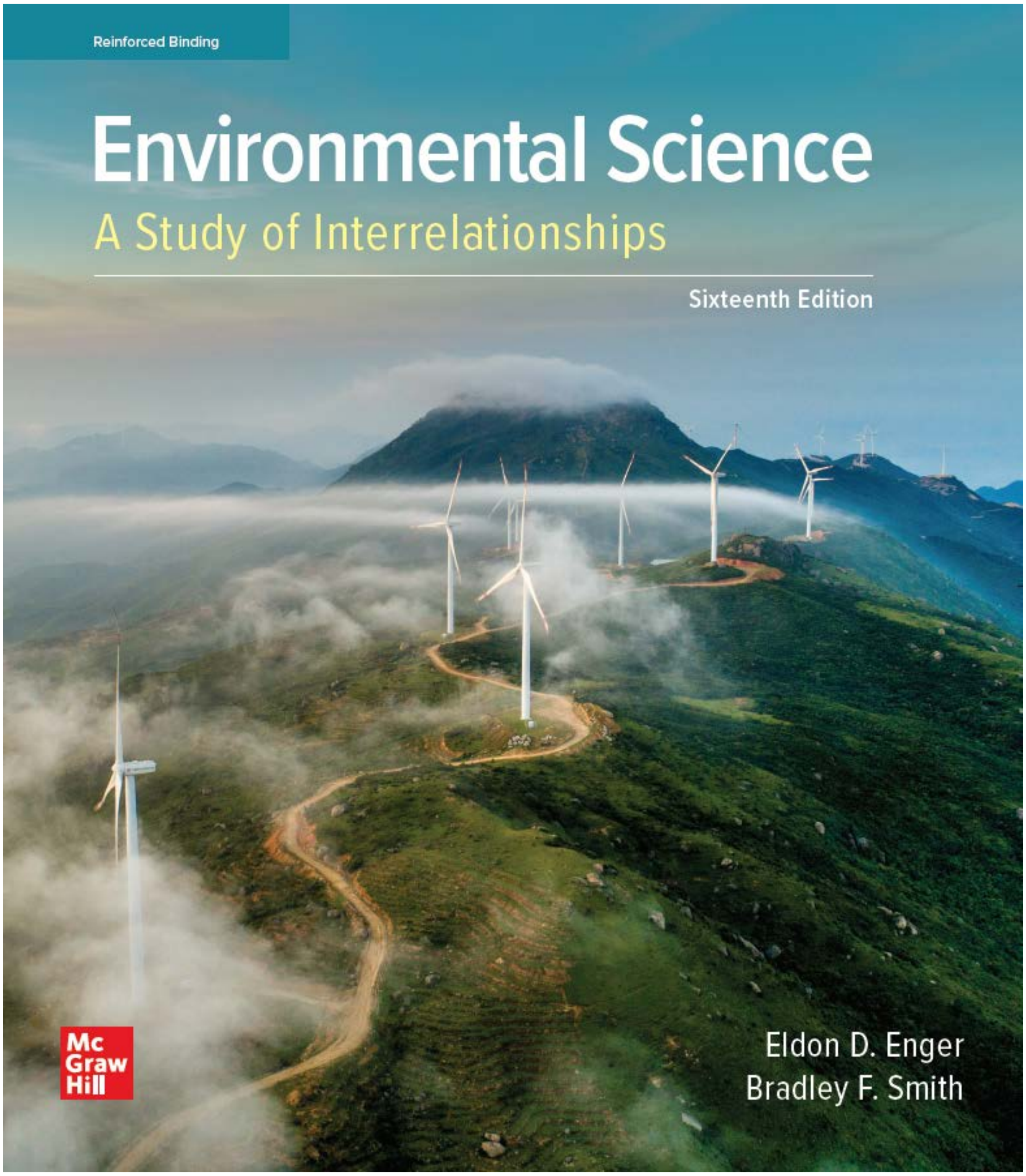
Next Generation Science Standards: Life Science Performance Expectations CORRELATION GUIDE for *Environmental Science: A Study of Interrelationships*



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16th Edition, © 2021
ISBN 978-1-264-33368-4

Correlation of Next Generation Science Standards,
Life Science Performance Expectations to
***Environmental Science: A Study of Interrelationships,* (16e)**
by Eldon D. Enger & Bradley F. Smith

Next Generation Science Standards Life Science Performance Expectations	**Environmental Science: A Study of Interrelationships 16th Edition, ©2021**
HS-LS1 From Molecules to Organisms: Structures and Processes	
HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.	Very limited coverage of DNA. Can be incorporated into discussion of genes and DNA on following pages: 92, 254
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	NA
HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	Investigations not mentioned. Feedback mechanisms mentioned at: 38
HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.	NA
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	Model not mentioned, can be incorporated into the following: 75, 76 80

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HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.	Can be incorporated into discussion of photosynthesis: 75, 77, 102, 107,108 109
HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Model not mentioned; can be incorporated into discussion of respiration. 76, 77, 102, 103, 105,106,107 108
HS-LS2 Ecosystems: Interactions, Energy, and Dynamics	
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	Can be incorporated into the following: 160-161 *Review Questions* 182 (#6)
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	Page references present information on populations and biodiversity. Figures present mathematical concepts but students are not asked to perform math-related activities. 154-172, 176-178, 261-279 *Issues & Analysis* 116 *Review Questions* 182 (#1, #3, #7. #8, #11, #13, #14, #16), 286 (#9
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	105-115 *Going Green* 115 *Critical Thinking questions 118* (#2) *Review Questions* 117 (#20-#24)
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	Page references present information on flow of energy and cycling of matter. Figures present mathematical concepts but students are not asked to perform math-related activities. 103-115, 366-368 *Focus On* 112 *Review Questions* 117 (#18-#24), 396 (#1)
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	108-109, 366, 427-428 *Review Questions* 117 (#20)
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	109, 111, 121-125 *Chapter Opener* 153 *Critical Thinking Questions* 118 (#2) *Focus On* 112, 135 *Issues and Analysis* 116, 149, 180 *Science, Politics, & Policy* 148

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HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*	Can be incorporated into the following: 6, 34, 58-63, 237-246, 279-285 *Critical Thinking Questions* 15 (#5), *Focus On* 6, 279 *Going Green* 5, 54, 129, 389 *Issues & Analysis* 198, 247, 284, 335, 392-393 *Review Questions* 42 (#6) *Science, Politics, & Policy* 79, 88, 235, 438 *What's Your Take?* 82
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.	Not discussed directly but can be incorporated into discussion of natural selection and evolution: 91-94
HS-LS3 Heredity: Inheritance and Variation of Traits	
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	Very limited coverage of DNA. Can be incorporated into discussion of genes and DNA on following pages: 91, 254
HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	Can be incorporated into discussion of role of variation in natural selection: 92 *Review Questions* 117 (#6)
HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	Can be incorporated into discussion of development pesticide resistance: 94, 346-348
HS-LS4 Biological Evolution: Unity and Diversity	
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	Not discussed directly. Can be incorporated into discussion of evolution. 92-93
HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.	93-94 *Review Questions* 117 (#6, #7)
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.	Can be incorporated into discussion of development pesticide resistance: 93-94, 346-348

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HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.	Can be incorporated into discussion of development herbicide resistance: 92-94, 346-347, 348 *Review Questions* 117 (#6, #7)
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	94-96, 250-255, 274-275, 434 *Critical Thinking Questions* 118 (#1), 286 (#1) *Issues & Analysis* 116, 149 *Review Questions* 117 (#8, #9), 286 (#17)
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*	Can be incorporated into analysis of solutions presented in text. 268-272 *Issues & Analysis* 392 *Going Green* 129 *Review Questions* 286 (#14) *Science, Politics, & Policy* 88-89, 148
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	11-18, 44-46, 67-70, 174-175, 427-429, 431-434, 435-440 *Chapter Opener* 120 *Critical Thinking Questions* 19 (#4), 183 (#3, #6, #7). 443 (#2) *Issues & Analysis* 442 *Science, Politics, & Policy* 178
HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	Engineering-focused activities not present in text. However, could be incorporated into discussions of solid waste management, alternative energy resources, etc. *Chapter Opener* 445 *Focus On* 448, 455 *Going Green* 193, 307, 452 *Issues & Analysis* 459-459 *Science, Politics, and Policy* 191, 454 *What's Your Take?* 457
HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.	11-18, 44-46, 67-70 174-175, 427-429, 431-434, 435-441 *Chapter Opener* 120 *Critical Thinking Questions* 19 (#4), 183 (#3, #6, #7). 443 (#2) *Issues & Analysis* 335, 442 *Science, Politics, & Policy* 178

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HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	Computer simulations and modeling are not presented as activities. Can be incorporated into the pages cited in this section of correlation, particularly overpopulation, climate change, and cost-benefit analysis discussions. 13-18, 44-46, 67-70, 174-175, 427-429, 433-435, 437-440 *Chapter Opener* 120 *Critical Thinking Questions* 19 (#4), 183 (#3, #6, #7). 443 (#2) *Issues & Analysis* 442 *Science, Politics, & Policy* 178
1. Asking questions (for science) and defining problems (for engineering)	67-69 *Critical Thinking Questions* 64 (#1, #3), 83 (#1, #2) *What's Your Take* 433
2. Developing and using models	Text does not ask students to develop and use models, but can be incorporated into discussion of climate models and/or demographic models: 158, 161-165, 175-176, 426
3. Planning and carrying out investigations	67-69 *Critical Thinking Questions* 64 (#1, #3), 83 (#1, #2) *What's Your Take* 433
4. Analyzing and interpreting data	154-158, 159-160, 164-165, 166, 169-170, 189-190, 195-197, 427-429, 447-448, 453-457 *Chapter Opener* 185 *Focus On* 436 *Issues & Analysis* 284, 442
5. Using mathematics and computational thinking	Text is very light on computation. Pages cited refer to risk and cost benefit calculations, determination of energy return on investment, and toxicity: 48-49, 55, 56 *Chapter Opener* 228-229 *Focus On* 469
6. Constructing explanations (for science) and designing solutions (for engineering)	*Critical Thinking Questions* 83 (#4, #6), 118 (#3), 226 (#1), 248 (#4), 336 (#5)
7. Engaging in argument from evidence	*Critical Thinking Questions* 19 (#4), 183 (#6) *Issues & Analysis* 17, 180 *What's Your Take?* 16, 41, 59, 82, 115, 181, 224, 233, 333, 352 *Science, Politics, and Policy* 88
8. Obtaining, evaluating, and communicating information	*Critical Thinking Questions* 151 (#4), 226 (#1, #4), 248 (#1), 311 (#1), 361 (#6) *Issues & Analysis* 149, 223, 247, 284, 309, 335, 392-393, 420, 442

Next Generation Science Standards Crosscutting Concepts	Environmental Science: A Study of Interrelationships 16th Edition, ©2021
1. Patterns. Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.	67, 72-73, 94-96, 121-140, 161-163, 164 *Review Questions* 150 (#1-#5)
2. Cause and effect: Mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.	67-68, 276-277, 429-431, 431-434 *Chapter Opener* 66 *Focus On* 436 *Issues & Analysis* 116, 149 *Science, Politics, & Policy* 235
3. Scale, proportion, and quantity. In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.	Can be incorporated into the following: 56-57, 72-78, 80, 86-90, 94, 102-115, 219-220, 346 *Focus On* 469 *Review Questions* 83 (#6-#11), 117 (#14)
4. Systems and system models. Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.	Discussion of systems (biological and industrial) can be incorporated into the following: 4, 80, 216, 239, 424-429, 449-450 *Chapter Opener* 2
5. Energy and matter: Flows, cycles, and conservation. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.	Can be incorporated into the following: 76-78, 80, 86, 102-105, 230-245 *Chapter Opener* 2 *Review Questions* 18 (#5), 83 (#11), 248 (#4)
6. Structure and function. The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.	73-74, 128-129, 137, 142, 236-238
7. Stability and change. For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.	Can be incorporated into the following: 91-96, 121-125, 427-429, 431-434 *Focus On* 436 *Issues of Analysis* 116