**Lab-Aids Correlations for**

**2023 PENNSYLVANIA**
**SCIENCE, TECHNOLOGY & ENGINEERING, ENVIRONMENTAL LITERACY AND SUSTAINABILITY (STEELS) STANDARDS**
**LIFE SCIENCE – GRADES 9-12**

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This document is intended to show how the SEPUP *Science and Global Issues: Biology 3rd edition* materials align with the 2023 STEELS Standards.

ABOUT OUR PROGRAMS

Lab-Aids has based its home offices and operations in Ronkonkoma, NY, since 1963. We publish over 200 kits and core curriculum programs to support science teaching and learning, grades 6-12. All core curricula support an inquiry-driven pedagogy, with support for literacy skill development and with assessment programs that clearly show what students know and are able to do as a result of program use. All programs have extensive support for technology and feature comprehensive teacher support. For more information please visit www.lab-aids.com and navigate to the program of interest.

SEPUP

Materials from the Science Education for Public Understanding Program (SEPUP) are developed at the Lawrence Hall of Science, at the University of California, Berkeley, and distributed nationally by Lab-Aids, Inc. Since 1987, development of SEPUP materials has been supported by grants from the National Science Foundation and other public and private sources. SEPUP programs include student books, equipment kits, teacher materials, and online digital content, and are available as full year courses, or separately, as units, each taking 3-8 weeks to complete, as listed below.

SCIENCE AND GLOBAL ISSUES: BIOLOGY UNITS

| Unit | Number of Activities | Issue Focus |
|---|---|---|
| Sustainability: Changing Human Impact | 4 activities (Introductory sequence) | Asking questions and defining problems<br>Developing and using models<br>Developing possible solutions |
| Ecology: Living on Earth | 17 activities | Interdependent relationships in ecosystems<br>Cycles of matter and energy transfer in ecosystems<br>Ecosystem dynamics, functioning, and resilience<br>Biodiversity and humans<br>Defining and delimiting engineering problems |
| Cells: Improving Global Health | 17 activities | Structure and function<br>Organization for matter and energy flow in organisms<br>Cycles of matter and energy transfer in ecosystems<br>Stability and change (Homeostasis) |

| Unit | Number of Activities | Issue Focus |
|---|---|---|
| Genetics: Feeding the World | 17 activities | Variation of traits<br>Inheritance of traits<br>Growth and development of organisms<br>Structure and function<br>Adaptation |
| Evolution: Managing Change | 15 activities | Natural selection<br>Adaptation<br>Social interactions and group behavior<br>Evidence of common ancestry and diversity<br>Biodiversity and humans<br>Developing possible solutions |

ABOUT THE LAB-AIDS CITATIONS

| Citations included in the correlation document are as follows: | |
|---|---|
| Unit title: | *Ecology*: |
| Activity Number | *6, 7, 9, 10** |
| | * indicates where standard is assessed |

| STEELS 3.1 Life Science: Grades 9–12 | | |
|---|---|---|
| **Strand** | **Standard** | ***Science and Global Issues: Biology* Unit: Activity(ies)** |
| **Structure and Function** | **3.1.9-12.A**<br>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. | *Cells:*<br>6<br><br>*Genetics:*<br>2, 7, 8, 9, 10*, 15 |
| | **3.1.9-12.B**<br>Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. | *Cells:*<br>*2, 3, 4, 5, 6*, 7*, 8* |
| | **3.1.9-12.C**<br>Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. | *Cells:*<br>*1, 2, 3, 4, 5, 7, 8, 9* |
| **Growth and Development of Organisms** | **3.1.9-12.D**<br>Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. | *Genetics:*<br>*3, 8** |
| **Organization for Matter and Energy Flow in Organisms** | **3.1.9-12.E**<br>Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. | *Cells:*<br>*11*, 12, 13, 15* |
| | **3.1.9-12.F**<br>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. | *Cells:*<br>*9, 10, 11, 13, 14, 15, 16** |
| | **3.1.9-12.G**<br>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. | *Cells:*<br>*9, 10, 14, 15*, 16* |
| **Interdependent Relationships in Ecosystems** | **3.1.9-12.H**<br>Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. | *Ecology:*<br>*6, 7, 9, 10** |
| | **3.1.9-12.I**<br>Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. | *Ecology:*<br>*1, 2, 3*, 4* |
| **Cycles of Matter and Energy Transfer in Ecosystems** | **3.1.9-12.J**<br>Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. | *Ecology:*<br>*6, 7, 8**<br><br>*Cells:*<br>*10, 15** |

| STEELS 3.1 Life Science: Grades 9–12 | | |
|---|---|---|
| **Strand** | **Standard** | ***Science and Global Issues: Biology* Unit: Activity(ies)** |
| | **3.1.9-12.K**<br>Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. | *Ecology:*<br>*11, 12** |
| | **3.1.9-12.L**<br>Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. | *Ecology:*<br>*3, 4, 5** |
| **Ecosystem Dynamics, Functioning, and Resilience** | **3.1.9-12.M**<br>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. | *Ecology:*<br>*13, 14*, 15, 16* |
| | **3.1.9-12.N**<br>Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. | *Ecology:*<br>*13, 14, 15, 16, 17**<br><br>*Cells:*<br>*1, 2, 3, 7, 13, 17*<br><br>*Genetics:*<br>*16, 17*<br><br>*Evolution:*<br>*10, 13, 14*, 15** |
| **Social Interactions and Group Behavior** | **3.1.9-12.O**<br>Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. | *Evolution:*<br>*1, 3** |
| **Inheritance of Traits** | **3.1.9-12.P**<br>Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. | *Genetics:*<br>*4, 5, 7, 10, 11*, 12** |
| **Variation of Traits** | **3.1.9-12.Q**<br>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. | *Genetics:*<br>*1, 6, 11, 12, 13** |
| | **3.1.9-12.R**<br>Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. | *Genetics:*<br>*4, 5, 6*, 14** |

| STEELS 3.1 Life Science: Grades 9–12 | | |
|---|---|---|
| **Strand** | **Standard** | ***Science and Global Issues: Biology* Unit: Activity(ies)** |
| **Evidence of Common Ancestry and Diversity** | **3.1.9-12.S**<br>Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. | *Evolution:*<br>*6, 7, 8, 9, 10* |
| **Natural Selection** | **3.1.9-12.T**<br>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. | *Evolution:*<br>*1, 2, 3, 4, 5*, 6, 12* |
| | **3.1.9-12.U**<br>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. | *Genetics:*<br>*14, 15, 16*<br><br>*Evolution:*<br>*1, 2, 3, 4*, 5, 6* |
| **Adaptation** | **3.1.9-12.V**<br>Create or revise a simulation to test a solution to mitigate the adverse impacts of human activity on biodiversity. | *Evolution:*<br>*12, 13, 14** |
| | **3.1.9-12.W**<br>Construct an explanation based on evidence for how natural selection leads to adaptation of populations. | *Evolution:*<br>*1, 2, 3, 4, 5, 6*, 11, 12* |
| | **3.1.9-12.X**<br>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. | *Evolution:*<br>*6, 7, 8*, 9, 10* |
| **Engineering, Technology, and Applications of Science (ETS)** | **3.5.9-12.I (ETS)**<br>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. | *Evolution:*<br>*13, 14** |
| | **3.5.9-12.K (ETS)**<br>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. | *Evolution:*<br>*13, 14** |
| | **3.5.9-12.T (ETS)** | The NGSS typically ties this standard to earth science. See |

| STEELS 3.1 Life Science: Grades 9–12 | | |
|---|---|---|
| **Strand** | **Standard** | ***Science and Global Issues: Biology* Unit: Activity(ies)** |
| | Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. | the *EDC: Earth Science* program from Lab-Aids. |
| | **3.5.9-12.Y (ETS)**<br>Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. | The NGSS typically ties this standard to physical science. See the *Natural Approach to Chemistry* program from Lab-Aids. |