LAB-AIDS CORRELATIONS TO SGI BIOLOGY

ARIZONA ACADEMIC STANDARDS[1]

HIGH SCHOOL BIOLOGY AND LIFE SCIENCE

Science and Global Issues: Biology (SGI Biology) was developed by the SEPUP group, at the Lawrence Hall of Science, University of California Berkeley, under the direction of Dr. Barbara Nagle, SEPUP Director. Development of *SGI Biology* is supported by grants from the National Science Foundation. *SGI Biology* is published by, and available exclusively from, LAB-AIDS, Ronkonkoma NY, 800.381.8003.

This document was prepared by Mark Koker, Ph D, Director of Curriculum and Training at LAB-AIDS. This is not an exhaustive document. It is designed to provide a general overview of the alignment of *SGI Biology* to the Arizona science program standards, grades 9-12, for review and adoption purposes. Support for the state standards may be found at other locations besides those explicitly stated in this document.

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[1] http://www.ade.state.az.us/standards/science/articulated.asp

Science in Global Issues Biology Unit Title	Student Book Pages	Issue Focus
Sustainability	1-46	Aspects of sustainability from a personal, community and global perspective
Ecology: Living on Earth	43-154	Sustainability from an ecosystems perspective, with a focus on humans' impacts on ecosystems Making decisions regarding fisheries management
Cell Biology: World Health	155-258	Disparities between developing and developed countries in terms of diseases' impacts on life Making decisions about priorities for diseases that limit social, economic, and environmental progress
Genetics: Feeding the World	259-412	Comparison of selective breeding and genetic modification Use of genetically modified organisms, particularly in the production of agricultural crops
Evolution: Maintaining Diversity	413-512	Conserving genetic, species and ecosystem diversity Ecosystems services and intrinsic value models for conservation

Key to SEPUP Assessment System:

SEPUP materials include research-based assessment system developed by SEPUP and the Berkeley Evaluation and Assessment Research Group (BEAR) in the University of California Graduate School of Education. Forming the core of the SEPUP Assessment System are the **assessment variables** (content and process skills to be assessed), **assessment questions or tasks** used to gather evidence and **scoring guides** for interpreting students' responses (correspond to assessment variables).

The seven assessment variables are:

Designing Investigations (DI)
Organizing Data (OD)
Analyzing Data (AD)
Understanding Concepts (UC)
Evidence and Trade-offs (ET)
Communication Skills (CS)
Group Interaction (GI)

Types of assessment:

Quick Checks (✔) present opportunities for informal formative assessment and may be used prior to instruction to find out what students know or think. They may also be used to help teachers track students' knowledge of key information or progress in understanding a concept.

Some embedded questions and tasks and all item bank questions are all suitable for summative assessment. Analysis questions are included at the end of each activity.

Citations included in the correlation document are as follows:

5 AQ 1-4 means that the standard or benchmark may be assessed using Analysis Questions 1-4 for Activity 5.

5: AQ 1-4, 5 UC means that in addition to AQ1-4, AQ 5 uses the Understanding Concepts scoring guide for Activity 5.

16 Proc UC means that the procedure (Proc) of Activity 16 contains an embedded task and uses the Understanding Concepts scoring guide.

For more information on program assessment and using SEPUP rubrics, consult the Teacher's Guide, TR part IV.

Strand 1: Inquiry Process

AZ Descriptor	*Location in SGI*
Concept 1: Observations, Questions, and Hypotheses Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate resources.	
PO 1. Evaluate scientific information for relevance to a given problem. (See R09-S3C1, R10-S3C1, R11-S3C1, and R12-S3C1)	Throughout, especially DI ('Designing Investigation') activities, e.g., Eco 10, 11
PO 2. Develop questions from observations that transition into testable hypotheses.	
PO 3. Formulate a testable hypothesis.	
PO 4. Predict the outcome of an investigation based on prior evidence, probability, and/or modeling (not guessing or inferring).	Throughout, e.g., Eco 2, 5, 10, 11, 14-16 Cell 7, 8, 11 Gen 3, 7, 9, 13, 16 Evo 3, 11, 12
Concept 2: Scientific Testing (Investigating and Modeling) Design and conduct controlled investigations.	
PO 1. Demonstrate safe and ethical procedures (e.g., use and care of technology, materials, organisms) and behavior in all science inquiry.	Throughout, e.g., safety notes for each lab activity, and Appendix D, 'Science Classroom Safety'
PO 2. Identify the resources needed to conduct an investigation.	Throughout, especially DI ('Designing Investigation') activities, e.g., Eco 10, 11 Cell 11
PO 3. Design an appropriate protocol (written plan of action) for testing a hypothesis: • Identify dependent and independent variables in a controlled investigation. • Determine an appropriate method for data collection (e.g., using balances, thermometers, microscopes, spectrophotometer, using qualitative changes).	

AZ Descriptor	*Location in SGI*
• Determine an appropriate method for recording data (e.g., notes, sketches, photographs, videos, journals (logs), charts, computers/calculators).	
PO 4. Conduct a scientific investigation that is based on a research design.	Throughout, e.g. Eco 2, 10, 11 Cell 11 Gen 9
PO 5. Record observations, notes, sketches, questions, and ideas using tools such as journals, charts, graphs, and computers.	Sus 1, 2, 3 Eco 2, 9, 10, 11 Cell 1 Evo 3
Concept 3: Analysis, Conclusions, and Refinements Evaluate experimental design, analyze data to explain results and propose further investigations. Design models.	
PO 1. Interpret data that show a variety of possible relationships between variables, including: • *positive relationship* • *negative relationship* • *no relationship*	Sus 1, 2, 3, 5* Eco 2, 9, 10, 11 Cell 1 Evo 3
PO 2. Evaluate whether investigational data support or do not support the proposed hypothesis.	Throughout, especially DI ('Designing Investigation') activities, e.g., Eco 10, 11 Cell 11
PO 3. Critique reports of scientific studies (e.g., published papers, student reports).	See, for example, 'Case Studies; in: Eco 1, 4, 18 Cell 2, 3, 8, 13, 16 Gen 2, 6, 7, 13, 17, 18 Evo 9

AZ Descriptor	*Location in SGI*
PO 4. Evaluate the design of an investigation to identify possible sources of procedural error, including: • sample size • trials • controls • analyses	Eco 10, 11 Cell 11
PO 5. Design models (conceptual or physical) of the following to represent "real world" scenarios: • carbon cycle • water cycle • phase change • collisions	Eco 2, 5, 10, 11, 14-16 Cell 7, 8, 11 Gen 3, 7, 9, 13, 16 Evo 3, 11, 12
PO 6. Use descriptive statistics to analyze data, including: • mean • frequency • range (See MHS-S2C1-10)	Sus 2, 3 Eco 2 Cell 1
PO 7. Propose further investigations based on the findings of a conducted investigation.	Eco 10, 11 Cell 8, 11
Concept 4: Communication Communicate results of investigations.	
PO 1. For a specific investigation, choose an appropriate method for communicating the results. (See W09-S3C2-01 and W10-S3C3-01)	Eco 1, 18, 19 Cell 1, 15, 17, 18 Gen 20 Evo 1, 2, 15
PO 2. Produce graphs that communicate data. (See MHS-S2C1-02)	Sus 2, 3, 5

AZ Descriptor	*Location in SGI*
	Eco 2, 3, 14, 15 Cell 1
PO 3. Communicate results clearly and logically.	Eco 1, 18, 19 Cell 1, 15, 17, 18 Gen 20 Evo 1, 2, 15
PO 4. Support conclusions with logical scientific arguments.	

Strand 2: History and Nature of Science

AZ Descriptor	*Location in SGI*
Concept 1: History of Science as a Human Endeavor Identify individual, cultural, and technological contributions to scientific knowledge.	
PO 1. Describe how human curiosity and needs have influenced science, impacting the quality of life worldwide.	Eco 1, 4, 18 Cell 2, 3, 8, 13, 16 Gen 2, 6, 7, 13, 17, 18 Evo 9
PO 2. Describe how diverse people and/or cultures, past and present, have made important contributions to scientific innovations.	*Not covered*
PO 3. Analyze how specific changes in science have affected society.	Cell 15, 16, 17, 18 Gen 2, 3, 11, 17 Evo 4, 10
PO 4. Analyze how specific cultural and/or societal issues promote or hinder scientific advancements.	See, for example, 'Case Studies,' in: Eco 1, 4, 18 Cell 2, 3, 8, 13, 16

AZ Descriptor	*Location in SGI*
	Gen 2, 6, 7, 13, 17, 18 Evo 9
Concept 2: Nature of Scientific Knowledge Understand how science is a process for generating knowledge.	
PO 1. Specify the requirements of a valid, scientific explanation (theory), including that it be: • logical • subject to peer review • public • respectful of rules of evidence	Evo 4 Appendix I, 'What is Science?'
PO 2. Explain the process by which accepted ideas are challenged or extended by scientific innovation.	Evo 4, 14 Appendix I, 'What is Science?'
PO 3. Distinguish between pure and applied science.	Eco 2, 7, 8, 9, Cell 11, Gen 12, Evo 5-7 as compared with Eco 19, Cell 18, Gen 4, 5, 6, 7, 19, 20, Evo 15
PO 4. Describe how scientists continue to investigate and critically analyze aspects of theories.	Cell 17 Gen 1, 2, 17, 20 Evo 4, 10

Strand 3: Science in Personal and Social Perspectives

AZ Descriptor	*Location in SGI*
Concept 1: Changes in Environments Describe the interactions between human populations,	

AZ Descriptor	*Location in SGI*
natural hazards, and the environment.	
PO 1. Evaluate how the processes of natural ecosystems affect, and are affected by, humans.	Eco 16-19 Evo 1-2
PO 2. Describe the environmental effects of the following natural and/or human-caused hazards: • flooding • drought • earthquakes • fires • pollution • extreme weather	Not applicable
PO 3. Assess how human activities (e.g., clear cutting, water management, tree thinning) can affect the potential for hazards.	Eco 16-19 Evo 1-2, 15
PO 4. Evaluate the following factors that affect the quality of the environment: • urban development • smoke • volcanic dust	Not applicable
PO 5. Evaluate the effectiveness of conservation practices and preservation techniques on environmental quality and biodiversity.	Eco 18, 19 Evo 1-2, 15
Concept 2: Science and Technology in Society Develop viable solutions to a need or problem.	
PO 1. Analyze the costs, benefits, and risks of various ways of dealing with the following needs or problems: • various forms of alternative energy • storage of nuclear waste	Not applicable

AZ Descriptor	*Location in SGI*
• abandoned mines • greenhouse gases • hazardous wastes	
PO 2. Recognize the importance of basing arguments on a thorough understanding of the core concepts and principles of science and technology.	Eco 1, 18, 19 Cell 1, 15, 17, 18 Gen 20 Evo 1, 2, 15
PO 3. Support a position on a science or technology issue.	Eco 1, 18, 19 Cell 1, 15, 17, 18 Gen 20 Evo 1, 2, 15
PO 4. Analyze the use of renewable and nonrenewable resources in Arizona: • water • land • soil • minerals • air	Local standard
PO 5. Evaluate methods used to manage natural resources (e.g., reintroduction of wildlife, fire ecology).	Eco 16, 18, 19 Evo 1, 2, 15
Concept 3: Human Population Characteristics Analyze factors that affect human populations.	
PO 1. Analyze social factors that limit the growth of a human population, including: • affluence • education	Sus 1, 2*, 3

AZ Descriptor	*Location in SGI*
• access to health care • cultural influences	
PO 2. Describe biotic (living) and abiotic (nonliving) factors that affect human populations.	Sus 1, 2, 3
PO 3. Predict the effect of a change in a specific factor on a human population.	Sus 1, 2, 3 Eco 18, 19 Cell 18 Evo 15

Strand 4: Life Science

AZ Descriptor	*Location in SGI*	*Where assessed*
Concept 1: The Cell Understand the role of the cell and cellular processes.		
PO 1. Describe the role of energy in cellular growth, development, and repair.	Cell 12	12 AQ 8 UC
PO 2. Compare the form and function of prokaryotic and eukaryotic cells and their cellular components.	Cell 4, 5, 6	4 AQ 2 UC 5 AQ 1 UC 6 AQ 4 UC
PO 3. Explain the importance of water to cells.	Cell 8	8 AQ 1&2 AD
PO 4. Analyze mechanisms of transport of materials (e.g., water, ions, macromolecules) into and out of cells: • passive transport • active transport	Cell 8, 9	8 AQ 1&2 AD 9 AQ 3, 5, 6 UC
PO 5. Describe the purposes and processes of cellular reproduction.	Cell 13	13 AQ 1-6
Concept 2: Molecular Basis of Heredity Understand the molecular basis of heredity and resulting		

AZ Descriptor	*Location in SGI*	*Where assessed*
genetic diversity.		
PO 1. Analyze the relationships among nucleic acids (DNA, RNA), genes, and chromosomes.	Gen 10, 14	10 AQ 1-4 14 AQ 1 UC
PO 2. Describe the molecular basis of heredity, in viruses and living things, including DNA replication and protein synthesis.	Gen 11-12, 16-17	11 AQ 1-5 12 AQ 1 UC 16 Proc UC 17 AQ 1-7
PO 3. Explain how genotypic variation occurs and results in phenotypic diversity.	Gen 5	5 AQ 1-4
PO 4. Describe how meiosis and fertilization maintain genetic variation.	Gen 13	13 AQ 1-4
Concept 3: Interdependence of Organisms Analyze the relationships among various organisms and their environment.		
PO 1. Identify the relationships among organisms within populations, communities, ecosystems, and biomes.	Eco 3, 13	3 AQ 5, 6 UC 13 AQ 3 UC
PO 2. Describe how organisms are influenced by a particular combination of biotic (living) and abiotic (nonliving) factors in an environment.	Eco 7, 8	7 AQ 2, 3 , 4 UC 8 AQ 3 UC
PO 3. Assess how the size and the rate of growth of a population are determined by birth rate, death rate, immigration, emigration, and carrying capacity of the environment.	Eco 12, 14, 15	12 AQ 7 UC 14 AQ 1-9 15 Proc OD
Concept 4: Biological Evolution Understand the scientific principles and processes involved in biological evolution.		
PO 1. Identify the following components of natural selection, which can lead to speciation: • potential for a species to increase its numbers • genetic variability and inheritance of offspring	Evo 10, 11	10 AQ 2, 3 UC 11 AQ 1-4

AZ Descriptor	*Location in SGI*	*Where assessed*
due to mutation and recombination of genes • finite supply of resources required for life • selection by the environment of those offspring better able to survive and produce offspring		
PO 2. Explain how genotypic and phenotypic variation can result in adaptations that influence an organism's success in an environment.	Evo 11	11 AQ 1-4
PO 3. Describe how the continuing operation of natural selection underlies a population's ability to adapt to changes in the environment and leads to biodiversity and the origin of new species.	Gen 4, 11	4 11
PO 4. Predict how a change in an environmental factor (e.g., rainfall, habitat loss, non-native species) can affect the number and diversity of species in an ecosystem.	Evo 1, 2, 9	1 AQ 1-6 2 Proc GI 9 AQ 1 ET
PO 5. Analyze how patterns in the fossil record, nuclear chemistry, geology, molecular biology, and geographical distribution give support to the theory of organic evolution through natural selection over billions of years and the resulting present day biodiversity.	Evo 5, 6, 7	5 AQ 1-5 6 AQ 1-3 7 AQ 1-4
PO 6. Analyze, using a biological classification system (i.e., cladistics, phylogeny, morphology, DNA analysis), the degree of relatedness among various species.	Appendix G	
Concept 5: Matter, Energy, and Organization in Living Systems (Including Human Systems) Understand the organization of living systems, and the role of energy within those systems.		
PO 1. Compare the processes of photosynthesis and cellular respiration in terms of energy flow, reactants, and products.	Eco 9 Cell 12	9 AQ 3, 6 UC 12 AQ 7 UC
PO 2. Describe the role of organic and inorganic chemicals (e.g., carbohydrates, proteins, lipids, nucleic acids, water, ATP) important to living things.	Cell 10, 11, 12	10 AQ 3 UC 11 AQ 4 AD 12 AQ 8 UC
PO 3. Diagram the following biogeochemical cycles in	Eco 8, 9	8 AQ 1, 2 AD

AZ Descriptor	*Location in SGI*	*Where assessed*
an ecosystem: • water • carbon • nitrogen		9 AQ 3, 5, 6 UC
PO 4. Diagram the energy flow in an ecosystem through a food chain.	Eco 7	7 AQ 1-7
PO 5. Describe the levels of organization of living things from cells, through tissues, organs, organ systems, organisms, populations, and communities to ecosystems.	Eco 7 Cell 6 Evo 1-2	7 AQ 1-7 6 AQ 4 UC 1 AQ 1-6 2 Proc GI