CONNECTIONS TO ACADEMIC STANDARDS

LINKS TO CORE BIOLOGY CONTENT

ABE meets many of the Next Generation Science Standards (NGSS) and the Common Core State Standards (CCSS). The biology explored by students in the program is core to the learning of science and technology. Students gain content knowledge, proficiency with scientific practices, and understanding of several disciplinary core ideas. Students also explore scientific reading and writing that meets the CCSS English Language Arts standards.

The following symbols denote when a concept is introduced, developed more fully, or elaborated on:

* = Introduced

** = Developed

*** = Elaborated on

NEXT GENERATION SCIENCE STANDARDS

Learning Expectations	Chapter						
	Introduction	1	2	3	4	5	6
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.	*	*	**			***	
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.			*	**			***
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.			*			**	
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.				*			

Scientific Practices	Chapter						
	Introduction	1	2	3	4	5	6
Constructing Explanations and Designing Solutions							
Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws describing the natural world operate today as they did in the past and will continue to do so in the future.			*	**	**	**	***
Asking Questions and Defining Problems							
Ask questions that arise from examining models or a theory to clarify relationships.		*	**	**	**	**	***
Planning and Carrying Out Investigations							
Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design; decide on types, how much, and the accuracy of data needed to produce reliable measurements, consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.			*			**	
Engaging in Argument from Evidence							
Make and defend a claim based on evidence about the natural world that reflects both scientific knowledge and student-generated evidence.			*		**	**	***

Disciplinary Core Ideas	Chapter						
	Introduction	1	2	3	4	5	6
LS1.A: Structure and Function							
Systems of specialized cells within organisms help them perform the essential functions of life.	*	*					
All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.		*	**	**	**	**	***

Disciplinary Core Ideas	Chapter						
	Introduction	1	2	3	4	5	6
LS1.C: Organization for Matter and Energy Flow in Organisms							
The sugar molecules thus formed contain carbon, hydrogen, and oxygen. Their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), which can then be used, for example, to form new cells.		*	**	**			***
LS3.A: Inheritance of Traits							
Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no known function (thus far).		*	**	**	**	***	
LS3.B: Variation of Traits							
In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited.				*			
Environmental factors also affect expression of traits and hence affect the probability of occurrences of traits in a population. Thus, the variation and distribution of traits observed depends on both genetic and environmental factors.			*				

COMMON CORE STATE STANDARDS

English Language Arts/Literacy	Chapter						
	Introduction	1	2	3	4	5	6
RST.11-12.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.		*	*	**	**	**	***
WHST.9-12.1: Write arguments focused on discipline-specific content.			*	*	**	**	***
WHST.9-12.9: Draw evidence from informational texts to support analysis, reflection, and research.		*	**	**	**	**	***

LINKS TO 21ST CENTURY CORE COMPETENCIES[2]

The ABE Program allows many opportunities for students to develop 21st Century Core Competencies in the cognitive and interpersonal domains.

Cognitive Domain	Chapter						
	Introduction	1	2	3	4	5	6
Cognitive Processes and Strategies							
Critical thinking				*	**	**	***
Problem solving			*	**	**	**	***
Analysis			*	**	**	**	***
Reasoning/argumentation		*	**	**	**	**	***
Interpretation		*	**	**	**	**	***
Knowledge							
Oral and written communication		*	**	**	**	**	***
Active listening		*	**	**	**	**	***

Interpersonal Domain	Chapter						
	Introduction	1	2	3	4	5	6
Teamwork and Collaboration							
Communication		*	**	**	**	**	***
Collaboration		*	**	**	**	**	***
Teamwork		*	**	**	**	**	***
Interpersonal skills		*	**	**	**	**	***

[2] From National Research Council (2012), Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century, Washington, DC: The National Academies Press.