



EVERETT PUBLIC SCHOOLS BIOLOGY AND THE ENVIRONMENT

Course: Biology and the Environment	Total Framework Hours: 180
CIP Code: 300103 <input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory	Date Last Modified: 07.2022
Career Cluster: Agriculture, Food and Natural Resources	Cluster Pathway: Environmental Service Systems

Industry-Recognized Certificates:

Work-Based Learning:

Course Information:

National AFNR Content Standards, Revised 2015

COMPONENTS AND ASSESSMENTS	
Performance Assessments: <ul style="list-style-type: none"> Develop and maintain a stable ecosystem using water, elodea, snails, and fish. Students will use Vernier Probe ware to track temperature, pH, and dissolved oxygen. Students will track animal behavior connected to changes in abiotic factors. Students will analyze their ecosystem data to identify and inform what modifications they may need to make to their ecosystem to achieve stability. (Note – this performance assessment spans two instructional segments.) 	
Leadership Alignment:	
Standards and Competencies	
Unit: Instructional Segment 1: Ecosystem Interactions and Energy	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 30
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Aligned Washington State Learning Standards	
English Language Arts	ELA Standards: The following seven standards address typical environmental science curriculum and activities. For each unit identify the standards intentionally taught and assessed. Erase the rest. If a unit does not address ELA standards, leave blank. Key Ideas and Details: CCSS.ELA-LITERACY.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. Craft and Structure CCSS.ELA-LITERACY.RST.9-10.5

	<p>Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p> <p>Integration of Knowledge and Ideas: CCSS.ELA-LITERACY.RST.9-10.7</p> <p>Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. CCSS.ELA-LITERACY.RST.9-10.8</p> <p>Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. CCSS.ELA-LITERACY.RST.9-10.9</p> <p>Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. CCSS.ELA-LITERACY.RST.11-12.3</p> <p>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text CCSS.ELA-LITERACY.RST.11-12.8</p> <p>Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information</p>
Mathematics	<p>CCSS.MATH.CONTENT.HSS.ID.A.1</p> <p>Represent data with plots on the real number line (dot plots, histograms, and box plots)</p>
Science	<p>HS-LS2-1</p> <p>Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.</p> <p>HS-LS2-2</p> <p>Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.</p> <p>HS-LS2-4</p> <p>Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.</p> <p>HS-LS2-8</p> <p>Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.</p>

COMPONENTS AND ASSESSMENTS

Performance Assessments:

- Develop and maintain a stable ecosystem using water, elodea, snails and fish.
- Students will use Vernier probe ware to track temperature, pH, and dissolved oxygen.
- Students will track animal behavior connected to changes in abiotic factors.
- Students will analyze their ecosystem data to identify and inform what modifications they may need to make to their ecosystem to achieve stability. (Note – this performance assessment spans two instructional segments.)

Leadership Alignment:

Standards and Competencies

Unit: Instructional Segment 2: Earth's Atmosphere: Photosynthesis and Respiration

Industry Standards and/or Competencies

Total Learning Hours for Unit: 30

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Aligned Washington State Learning Standards	
Science	<p>HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.</p> <p>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.</p> <p>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</p> <p>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.</p> <p>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.</p> <p>HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.</p> <p>HS-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.</p> <p>HS-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.</p>

COMPONENTS AND ASSESSMENTS	
Performance Assessments: <ul style="list-style-type: none"> Students will 	
Leadership Alignment:	
Standards and Competencies	
Unit: Instructional Segment 3: Evidence of Evolution (Part 1)	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 30
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Aligned Washington State Learning Standards	
Science	<p>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.</p> <p>HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.</p> <p>HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. *</p>

COMPONENTS AND ASSESSMENTS

Performance Assessments:	
<ul style="list-style-type: none"> Students will 	
Leadership Alignment:	
Standards and Competencies	
Unit: Instructional Segment 6 (Part 1)	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 30
<ul style="list-style-type: none"> 	
Aligned Washington State Learning Standards	
Science	

COMPONENTS AND ASSESSMENTS	
Performance Assessments:	
<ul style="list-style-type: none"> Students will 	
Leadership Alignment:	
Standards and Competencies	
Unit: Instructional Segment 3 (Part 2 and 3): Evidence of Evolution	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 30
<ul style="list-style-type: none"> 	
Aligned Washington State Learning Standards	
Science	<p>HS-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. (Originally from Segment 2 Scope 3)</p> <p>HS-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.</p> <p>HS-ESS1-5 Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.</p> <p>HS-ESS2-5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</p> <p>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.</p> <p>HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations.</p>

COMPONENTS AND ASSESSMENTS

Performance Assessments:	
<ul style="list-style-type: none"> Students will be able to explain that species can only change as populations and not individuals, because DNA determines the traits that allow them to respond to the environment. Students will use Nasonia cultures to investigate and track genetic changes within a population, given variation in environmental conditions (warm vs. cold). Students will analyze data and compare data to Punnett Square predictions to connect how environmental factors influence genetic traits/variation. In addition, students will learn about Nasonia as a potential biopesticide and communicate how/why using wasps is a more environmentally friendly way to control agricultural pests on feed lots. 	
Leadership Alignment:	
<i>Standards and Competencies</i>	
Unit: Instructional Segment 4: Inheritance in Traits	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 30
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<i>Aligned Washington State Learning Standards</i>	
Science	<p>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.</p> <p>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.</p> <p>HS-LS3-3 - Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</p> <p>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.</p> <p>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.</p> <p>HS-LS4-4 - Construct an explanation based on evidence for how natural selection leads to adaptation of populations.</p>

COMPONENTS AND ASSESSMENTS	
Performance Assessments:	
<ul style="list-style-type: none"> Students will 	
Leadership Alignment:	
<i>Standards and Competencies</i>	
Unit: Instructional Segment 5: Structure, Function and Growth	
Industry Standards and/or Competencies	Total Learning Hours for Unit: 30
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<i>Aligned Washington State Learning Standards</i>	
Science	<p>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</p> <p>HS-LS1-4 - Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.</p> <p>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.</p>

	HS-LS1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
	HS-LS1-3 - Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

21st Century Skills

Check those that students will demonstrate in this course:

LEARNING & INNOVATION

Creativity and Innovation

- ☐ Think Creatively
- ☐ Work Creatively with Others
- ☐ Implement Innovations

Critical Thinking and Problem Solving

- ☐ Reason Effectively
- ☐ Use Systems Thinking
- ☐ Make Judgments and Decisions
- ☐ Solve Problems

Communication and Collaboration

- ☐ Communicate Clearly
- ☐ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy

- ☐ Access and /evaluate Information
- ☐ Use and Manage Information

Media Literacy

- ☐ Analyze Media
- ☐ Create Media Products

Information, Communications and Technology (ICT Literacy)

- ☐ Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability

- ☐ Adapt to Change
- ☐ Be Flexible

Initiative and Self-Direction

- ☐ Manage Goals and Time
- ☐ Work Independently
- ☐ Be Self-Directed Learners

Social and Cross-Cultural

- ☐ Interact Effectively with Others
- ☐ Work Effectively in Diverse Teams

Productivity and Accountability

- ☐ Manage Projects
- ☐ Produce Results

Leadership and Responsibility

- ☐ Guide and Lead Others
- ☐ Be Responsible to Others