

## Understanding by Design Living Systems - Grade 5

<b>Title of Unit</b>	Living Systems	<b>Grade Level</b>	5
<b>Curriculum Area</b>	Science	<b>Time Frame</b>	10 weeks
<b>Developed By</b>	WTS		
<b>Identify Desired Results (Stage 1)</b>			
<b>Unit Summary:</b>			
<p>This unit has four investigations that focus on systems as the unit of study. The idea of a system is one of the grand integrating (cross-cutting) concepts that pervades all of science. Students start by looking at Earth as the interaction of four Earth systems or subsystems—the geosphere, the atmosphere, the hydrosphere, and the biosphere. The focus of the module then turns to the biosphere as students explore ecosystems and organisms in terms of their interacting parts.</p> <ul style="list-style-type: none"> <li>● Analyze everyday systems and subsystems.</li> <li>● Analyze food chains and food webs as a way to study the biosphere.</li> <li>● Make and analyze a worm habitat as a decomposition system.</li> <li>● Investigate nutrient-getting systems of yeast, plants, and animals, including humans.</li> <li>● Investigate and model transport systems in plants and animals.</li> <li>● Investigate sensory systems in animals.</li> </ul>			
<b>Content Standards</b>			
<p><b>5-PS3-1. Use models to describe that energy in animals’ food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. [Clarification Statement: Examples of models could include diagrams, and flow charts.]</b></p> <p><b>5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]</b></p> <p><b>5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]</b></p> <p><b>5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and</b></p>			

*ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]*

**(5-ESS3-1) Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**

### **Career Ready Practices**

**CRP1.** Act as a responsible and contributing citizen and employee.

**CRP2.** Apply appropriate academic and technical skills.

**CRP3.** Attend to personal health and financial well-being.

**CRP4.** Communicate clearly and effectively and with reason.

**CRP5.** Consider the environmental, social and economic impacts of decisions.

**CRP6.** Demonstrate creativity and innovation.

**CRP7.** Employ valid and reliable research strategies.

**CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.

**CRP9.** Model integrity, ethical leadership and effective management.

**CRP10.** Plan education and career paths aligned to personal goals.

**CRP11.** Use technology to enhance productivity.

**CRP12.** Work productively in teams while using cultural global competence.

<https://www.state.nj.us/education/aps/cccs/career/CareerReadyPractices.pdf>

### **Technology Standards Grade 3-5**

**8.1.5.A.1** Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

**8.1.5.A.2** Format a document using a word processing application to enhance text and include graphics, symbols and/ or pictures.

**8.1.5.A.3** Use a graphic organizer to organize information about problem or issue.

**8.1.5.A.4** Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.

**8.1.5.A.5** Create and use a database to answer basic questions.

**8.1.5.A.6** Export data from a database into a spreadsheet; analyze and produce a report that explains the analysis of the data.

**8.1.5.B.1** Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

**8.1.5.C.1** Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources for all steps.

**8.1.5.D.1** Understand the need for and use of copyrights.

**8.1.5.D.2** Analyze the resource citations in online materials for proper use.

**8.1.5.D.3** Demonstrate an understanding of the need to practice cyber safety, cyber security, and cyber ethics when using technologies and social media.

**8.1.5.D.4** Understand digital citizenship and demonstrate an understanding of the personal consequences of inappropriate use of technology and social media.

**8.1.5.E.1** Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks

**8.1.5.F.1** Apply digital tools to collect, organize, and analyze data that support a scientific finding.

**8.2.5.A.1** Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.

**8.2.5.A.2** Investigate and present factors that influence the development and function of a product and a system.

**8.2.5.A.3** Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.

**8.2.5.A.4** Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.

**8.2.5.A.5** Identify how improvement in the understanding of materials science impacts technologies.

**8.2.5.B.1** Examine ethical considerations in the development and production of a product through its life cycle.

- 8.2.5.B.2** Examine systems used for recycling and recommend simplification of the systems and share with product developers.
- 8.2.5.B.3** Investigate ways that various technologies are being developed and used to reduce improper use of resources.
- 8.2.5.B.4** Research technologies that have changed due to society's changing needs and wants.
- 8.2.5.B.5** Explain the purpose of intellectual property law.
- 8.2.5.B.6** Compare and discuss how technologies have influenced history in the past century.
  
- 8.2.5.C.1** Collaborate with peers to illustrate components of a designed system.
- 8.2.5.C.2** Explain how specifications and limitations can be used to direct a product's development.
- 8.2.5.C.3** Research how design modifications have lead to new products.
- 8.2.5.C.4** Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.
- 8.2.5.C.5** Explain the functions of a system and subsystems.
- 8.2.5.C.6** Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.
- 8.2.5.C.7** Work with peers to redesign an existing product for a different purpose.
  
- 8.2.5.D.1** Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
- 8.2.5.D.2** Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.
- 8.2.5.D.3** Follow step by step directions to assemble a product or solve a problem.
- 8.2.5.D.4** Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.
- 8.2.5.D.5** Describe how resources such as material, energy, information, time, tools, people and capital are used in products or systems.
- 8.2.5.D.6** Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.
- 8.2.5.D.7** Explain the impact that resources such as energy and materials used in a process to produce products or system have on the environment.
  
- 8.2.5.E.1** Identify how computer programming impacts our everyday lives.
- 8.2.5.E.2** Demonstrate an understanding of how a computer takes input of data, processes and stores the data through a series of commands, and outputs information.
- 8.2.5.E.3** Using a simple, visual programming language, create a program using loops, events and procedures to generate specific output.

**8.2.5.E.4** Use appropriate terms in conversation (e.g., algorithm, program, debug, loop, events, procedures, memory, storage, processing, software, coding, procedure, and data).

Enduring Understandings	Essential Questions	
Students will understand that...	Overarching	Topical
<p>There are systems in the world.</p> <p>Plants get the materials they need for growth chiefly from air and water.</p> <p>Well supported arguments help to understand concepts.</p> <p>The geosphere, biosphere, hydrosphere and/or atmosphere interact.</p> <p>Models help to represent living systems.</p> <p>Instinctive and learned behaviors help organisms survive,</p> <p>Response is a reaction of a living thing to a stimulus.</p> <p>Food systems are subsets of ecosystems which describe the transfer of matter and energy within the system.</p>	<p>What would the world be like without systems?</p> <p>How do you support an argument?</p> <p>What happens when living things cannot adapt to the environment?</p> <p>Describe a stimulus-response relationship.</p> <p>Why are systems vital to living things?</p> <p><b>Guiding Questions for Phenomenon:</b>  <b>Investigation 1:</b> How does matter and energy move through ecosystems of a biosphere?  <b>Investigation 2:</b> What is food, where does it come from, and how do organisms use it?  <b>Investigation 3:</b> How do plants and animals get nutrients to all of cells?  <b>Investigation 4:</b> How do animal sensory systems function in the biosphere?</p>	<p>What is the definitions of a geosphere, biosphere, hydrosphere and atmosphere?</p> <p>Why are models important?</p> <p>What is the definition of a plant, an animals, decomposers, and the environment?</p> <p>What is meant by an adaptation?</p> <p>What is the definition of both an instinctive and a learned behavior?</p> <p>What is an ecosystem?</p>
<b>Related Misconceptions (False; Truth)</b>		
Response is only visual and verbal;Response can be an adaptation.		

<b>Knowledge (Declarative)</b> Students will know...	<b>Skills (Procedural)</b> Students will be able to...
<p>Living Systems</p> <p>plants, animals, decomposers, and the environment</p> <p>The movement of matter</p> <p>Argument</p> <p>Models</p> <p>Energy</p> <p>Energy transfer</p> <p>Adaptations</p> <p>Instinctive behaviors</p> <p>Learned behaviors</p> <p>Ecosystem</p> <p>geosphere, biosphere, hydrosphere and atmosphere</p> <p>Stimulus-response relationship</p>	<ul style="list-style-type: none"> <li>- Identify a system</li> <li>- Create/support an argument that plants get the materials they need for growth chiefly from air and water</li> <li>- Define how plants grow and where they get their materials from</li> <li>- Describe the movement of matter</li> <li>- Identify the function of plants, animals, decomposers in their systems</li> <li>- Describe ways the geosphere, atmosphere, biosphere, and hydrosphere</li> <li>- Synthesize information to develop ideas on how individual communities use science to protect the environment</li> <li>- Define unit key vocabulary</li> <li>- Identify a stimulus-response relationship</li> </ul>

From: Wiggins, Grant and J. Mc Tighe. (1998). *Understanding by Design*, Association for Supervision and Curriculum Development

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