



VALWOOD

GO BEYOND

Seventh Grade Science Curriculum

Life Science

Course Description	Topics at a Glance
<p>Life Science seeks to give students an overview of the great diversity of living organisms. This is accomplished by group learning, paired activities, class discussions, project based assignments, labs, lecture, and hands on learning. The class is largely a taxonomic review of life, beginning with the basic make up of living organisms. Each kingdom will be discussed, with the similarities and differences between the kingdoms being learned. Students will distinguish the difference in prokaryotic and eukaryotic organisms. Students do simple lab activities and are introduced to dissection of simple invertebrate organisms. Human anatomy and the function of body systems are introduced at the end of this class.</p>	<ul style="list-style-type: none"> • Life: Structure and Function • From Bacteria to Plants • Animals • Human Body Systems • Interactions of Life
Assessments	Effective Components of a Life Science Program
<ul style="list-style-type: none"> • Teacher generated assessments • Lab Reports • Standardized test assessment • 	<ul style="list-style-type: none"> • Maintains an inquiry-based learning environment • Addresses a limited number of concepts, but does so in depth • Provides students with multiple opportunities to learn and timely feedback to help students know what they need to improve upon • Explains concepts and problems in multiple ways • Uses assessment to guide instruction • Differentiates instruction to meet student needs • Draws out and actively engages the preexisting understandings about the natural world that students bring with them • Assists students in developing metacognitive skills within the context of learning about science • Provides opportunities and support to apply writing, reading, and mathematics skills in the context of investigating scientific concepts, including hand-graphing data • Provides a safe, equitable and engaging learning environment for all students
Grade Level Expectations	
<ul style="list-style-type: none"> • Obtain, evaluate, and communicate information to investigate the diversity of living organisms and how they can be compared scientifically. • Obtain, evaluate, and communicate information to describe how cell structures, cells, tissues, organs, and organ systems interact to maintain the basic needs of organisms. • Obtain, evaluate, and communicate information to explain how organisms reproduce either sexually or asexually and transfer genetic information to determine the traits of their offspring. • Obtain, evaluate, and communicate information to examine the interdependence of organisms with one another and their environments. • Obtain, evaluate, and communicate information from multiple sources to explain the theory of evolution of living organisms through inherited characteristics. 	

Grade Level Expectations		
Standard	Big Ideas	
2. Life Science	<ol style="list-style-type: none"> 1. Individual organisms with certain traits are more likely than others to survive and have offspring in a specific environment. 2. The human body is composed of atoms, molecules, cells, tissues, organs, and organ systems that have specific functions and interactions. 3. Cells are the smallest unit of life that can function independently and perform all the necessary functions of life. 4. Photosynthesis and cellular respiration are important processes by which energy is acquired and utilized by organisms. 5. Multiple lines of evidence show the evolution of organisms over geologic time. 6. Human activities can deliberately or inadvertently alter ecosystems and their resiliency. 7. Organisms reproduce and transmit genetic information (genes) to offspring, which influences individuals' traits in the next generation. 8. Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species. 9. Organisms interact with each other and their environment in various ways that create a flow of energy and cycling of matter in an ecosystem. 	<p>stating hypotheses, identifying variables, identifying constants, and collecting data accurately.</p> <ul style="list-style-type: none"> - Use appropriate tools, technology and measurement units to gather and organize data and to report results. - Interpret data and recognize bias in order to formulate logical conclusions. - Communicate the design and results of scientific investigations in appropriate ways (written, oral, graphical, pictorial, digital). - Follow lab and safety procedures when conducting scientific investigations. - Explain that a controlled experiment must have comparable results when repeated. - Create and use physical and conceptual models for explanations and predictions. - Recognize that people from different cultures and from different times in history make contributions to the advancement of science. - Recognize that the interrelationship of science and technology has implications for the social, cultural, and ecological systems within which we live. - Use technology responsibly for communication and transfer of ideas. - Use technology to gather, organize, analyze, and communicate about data. - Collaborate with others to identify information problems and to seek solutions. - Create a labeled diagram that supports information being shared. - Organize and report information in a variety of complex ways including tables, graphs, charts, and reports. - Identify different information sources and assess reliability of sources. - Present information in a variety of formats including written paragraphs, posters, illustrations, oral reports, etc.

2. Life Science

Students know and understand the characteristics and structure of living things, the processes of life and how living things interact with each other and their environment.

Valwood Graduates

The preschool through twelfth-grade concepts and skills that all students must master to ensure their success in a postsecondary and workforce setting.

Valwood Graduate Competencies in the Life Science standard:

- Analyze the relationship between structure and function in living systems at a variety of organizational levels, and recognize living systems' dependence on natural selection
- Explain and illustrate with examples how living systems interact with the biotic and abiotic environment
- Analyze how various organisms grow, develop, and differentiate during their lifetimes based on an interplay between genetics and their environment
- Explain how biological evolution accounts for the unity and diversity of living organisms

Content Area: Science – Middle School	
Standard: 2. Life Science	
Valwood Graduates: Explain and illustrate with examples how living systems interact with the biotic and abiotic environment	
GRADE LEVEL EXPECTATION Concepts and skills students master: 1. Human activities can deliberately or inadvertently alter ecosystems and their resiliency	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Develop, communicate, and justify an evidence-based scientific example of how humans can alter ecosystems Analyze and interpret data about human impact on local ecosystems Recognize and infer bias in print and digital resources while researching an environmental issue Use technology resources such as online encyclopedias, online databases, and credible websites to locate, organize, analyze, evaluate, and synthesize information about human impact on local ecosystems Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate an environmental issue <i>Compare and contrast food webs within and between different ecosystems</i> 	Inquiry Questions: <ol style="list-style-type: none"> Do humans have a unique responsibility to the ecosystems in which they live? <i>What does it mean to be a steward of an ecosystem?</i> How can a young person be a steward of an ecosystem? <i>How have human activities influenced climate patterns in a way that precipitates change in ecosystems?</i> 5. EXTENSION: What are biotic and abiotic factors of the ecosystems in Boulder County?
	Relevance and Application: <ol style="list-style-type: none"> Human activities such as cutting down forests and polluting water or covering deserts with fields of solar panels are constantly changing various cycles and habitats in the natural world. There are laws that preserve and protect wilderness areas such as national parks and other natural areas but such laws also limit the utilization of the natural resources in those areas. <i>Ecosystems exist in populated areas such as on school grounds or in parks. These ecosystems can be studied through direct observation.</i>
	Nature of Discipline: <ol style="list-style-type: none"> Critically evaluate scientific claims in popular media and peer generated explanations regarding interactions in ecosystems, and determine if the evidence presented is appropriate and sufficient to support the claims.

Content Area: Science - Middle School	
Standard: 2. Life Science	
Valwood Graduates: Analyze how various organisms grow, develop, and differentiate during their lifetimes based on an interplay between genetics and their environment Explain how biological evolution accounts for the unity and diversity of living organisms	
GRADE LEVEL EXPECTATION Concepts and skills students master: 2. Organisms reproduce and transmit genetic information (genes) to offspring, which influences individuals' traits in the next generation	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Develop, communicate, and justify an evidence-based scientific explanation for how genetic information is passed to the next generation Use direct and indirect observations, evidence, and data to support claims about genetic reproduction and traits of individuals Gather, analyze, and interpret data on transmitting genetic information Use models and diagrams to predict the phenotype and genotype of offspring based on the genotype of the parents Use computer simulations to model and predict phenotype and genotype of offspring based on the genotype of the parents <i>Infer the traits of offspring based on genes of parents (including dominant and recessive traits by using Punnett square diagrams)</i> 	Inquiry Questions: <ol style="list-style-type: none"> How are traits passed from one generation to the next? What traits can be passed to the next generation and what traits cannot? How can patterns in the inheritance of traits be used to predict how frequently they appear in offspring? <i>What is the relationship between DNA, genes and chromosomes?</i> <i>EXTENSION: How does gene expression influence the way that traits are revealed and conveyed through a population?</i>
	Relevance and Application: <ol style="list-style-type: none"> There are benefits and risks to genetic engineering such as cloning, genetically modifying organisms, and replacing genes for therapy. Genome sequencing has many potential applications to the field of medicine.
	Nature of Discipline: <ol style="list-style-type: none"> Understand the interconnected nature of math and science by utilizing math in the prediction of future generations. Recognize that current understanding of genetics has developed over time and become more sophisticated as new technologies have lead to new evidence. Critically evaluate models used to represent deoxyribonucleic acid (DNA) and genes; identify strengths and weaknesses of these models for representing complex natural phenomena.

Content Area: Science - Middle School	
Standard: 2. Life Science	
Valwood Graduates: Explain how biological evolution accounts for the unity and diversity of living organisms Analyze how various organisms grow, develop, and differentiate during their lifetimes based on an interplay between genetics and their environment	
GRADE LEVEL EXPECTATION Concepts and skills students master: 3. Individual organisms with certain traits are more likely than others to survive and have offspring in a specific environment	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Develop, communicate, and justify an evidence-based explanation for why a given organism with specific traits will or will not survive to have offspring in a given environment Analyze and interpret data about specific adaptations to provide evidence and develop claims about differential survival and reproductive success Use information and communication technology tools to gather information from credible sources, analyze findings, and draw conclusions to create and justify an evidence-based scientific explanation Use computer simulations to model differential survival and reproductive success associated with specific traits in a given environment <i>Compare and contrast ways that various organisms transport nutrients and wastes (plant vascular vs. animal circulatory system, etc.)</i> 	Inquiry Questions: <ol style="list-style-type: none"> What is the relationship between an organism's traits and its potential for survival and reproduction? <i>How do adaptations affect an organism's potential to survive and reproduce?</i> How is the use of the word "adaptation" different in everyday usage than in biology?
	Relevance and Application: <ol style="list-style-type: none"> Bacteria have evolved to survive in the presence of the environmental pressure of antibiotics – giving rise to antibiotic resistance. Species that can live with humans –such as rats and pigeons – are more common around towns and cities.
	Nature of Discipline: <ol style="list-style-type: none"> Create and use sound experimental designs to collect data around survival and genetic traits. Describe several ways in which scientists would study genetics, and suggest ways that this has contributed to our understanding of survival and populations.

Content Area: Science - Middle School	
Standard: 2. Life Science	
Valwood Graduates: Analyze the relationship between structure and function in living systems at a variety of organizational levels, and recognize living systems' dependence on natural selection	
GRADE LEVEL EXPECTATION Concepts and skills students master: 4. The human body is composed of atoms, molecules, cells, tissues, organs, and organ systems that have specific functions and interactions	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Develop and design a scientific investigation about human body systems Develop, communicate, and justify an evidence-based scientific explanation regarding the functions and interactions of the human body Gather, analyze, and interpret data and models on the functions and interactions of the human body 	Inquiry Questions: <ol style="list-style-type: none"> How does each body system contribute to supporting the life of the organism? How do organs and organ systems in the human body interact to perform specific functions? 3. EXTENSION: How can environmental factors affect body systems? 4. EXTENSION: How does disease affect body systems?
	Relevance and Application: <ol style="list-style-type: none"> There are technologies such as magnetic resonance imaging (MRI), computed tomography (CT) scans, and chemical lab tests that are related to the diagnosis and treatment of the human body's diseases. <i>Personal wellness choices and practices such as exercise and diet can have an effect on body systems.</i>
	Nature of Discipline: <ol style="list-style-type: none"> Critically evaluate models, and identify the strengths and weaknesses of the model in representing our understanding of the human body.

Content Area: Science - Middle School	
Standard: 2. Life Science	
Valwood Graduates: Analyze the relationship between structure and function in living systems at a variety of organizational levels, and recognize living systems' dependence on natural selection	
GRADE LEVEL EXPECTATION Concepts and skills students master: 5. Cells are the smallest unit of life that can function independently and perform all the necessary functions of life	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Gather, analyze, and interpret data and models on the different types of cells, their structures, components and functions Develop, communicate, and justify an evidence-based scientific explanation regarding cell structures, components, and their specific functions Compare and contrast the basic structures and functions of plant cells, animal cells, and single-celled organisms Employ tools to gather, view, analyze, and report results for the scientific investigations of cells <i>Differentiate between mitosis and meiosis</i> 	Inquiry Questions: <ol style="list-style-type: none"> How is the basic structure of a cell related to its function? How are the components – or organelles – of a cell related to the cell's function? How are various cells unique, and what do they have in common with other cells? 4. <i>EXTENSION: How are differences in cells used to classify organisms?</i>
	Relevance and Application: <ol style="list-style-type: none"> Stem cells are undifferentiated cells that have potential use in medicine. Cancer is caused by a cell that isn't functioning correctly. Cells can be cultured to benefit humanity. <i>There is ethical debate surrounding stem cell research.</i>
	Nature of Discipline: <ol style="list-style-type: none"> Recognize that our current understanding of cells has developed over centuries of studies by many scientists, and that through continued scientific investigations and advances in data collection, we will continue to refine our understanding of cells.

Content Area: Science - Middle School	
Standard: 2. Life Science	
Valwood Graduates: Analyze the relationship between structure and function in living systems at a variety of organizational levels, and recognize living systems' dependence on natural selection	
GRADE LEVEL EXPECTATION Concepts and skills students master: 6. Photosynthesis and cellular respiration are important processes by which energy is acquired and utilized by organisms	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Gather, analyze, and interpret data regarding the basic functions of photosynthesis and cellular respiration Use direct and indirect evidence to describe the relationship between photosynthesis and cellular respiration within plants – and between plants and animals Use computer simulations to model the relationship between photosynthesis and cellular respiration within plants – and between plants and animals <i>Identify and manipulate the raw materials and products of respiration and photosynthesis</i> 	Inquiry Questions: <ol style="list-style-type: none"> What is the relationship between photosynthesis and cellular respiration? What energy transformations occur in both the processes of photosynthesis and cellular respiration? 3. EXTENSION: What is the relationship between photosynthesis and atmospheric O₂ and CO₂?
	Relevance and Application: <ol style="list-style-type: none"> Plants are essential for human health and the health and survival of Earth's ecosystems. The energy in food comes from sunlight via photosynthesis and is the basis for most ecosystems on earth. Fossil fuels come from the photosynthesis of organisms that lived millions of years ago. 4. EXTENSION: In addition to photosynthesis, there are other processes by which organisms acquire energy, such as chemosynthesis.
	Nature of Discipline: <ol style="list-style-type: none"> Ask a testable question and make a falsifiable hypothesis about photosynthesis or respiration and design an inquiry based method to find an answer. Design an experiment to observe photosynthesis or respiration, and clearly define controls and variables. Share experimental data, and respectfully discuss conflicting results emulating the practice of scientists.

Content Area: Science - Middle School	
Standard: 2. Life Science	
Valwood Graduates: Explain how biological evolution accounts for the unity and diversity of living organisms	
GRADE LEVEL EXPECTATION Concepts and skills students master: 7. Multiple lines of evidence show the evolution of organisms over geologic time	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Interpret and analyze data from the fossil record to support a claim that organisms and environments have evolved over time Analyze and critique the evidence regarding the causes and effects of a mass extinction event Analyze and interpret data that show human evolution Use technology to share research findings about the evidence regarding the causes and effects of a mass extinction event 	Inquiry Questions: <ol style="list-style-type: none"> What might life on Earth have been like in the distant past, and what evidence is there for this? How does the evidence about the way life has evolved on Earth from long ago tell us about Earth today? <i>How do we know that organisms have evolved over time?</i> 4. EXTENSION: How do new techniques of classification utilizing DNA sequencing provide evidence regarding the evolution of life on earth?
	Relevance and Application: <ol style="list-style-type: none"> There is growing concern over the current extinction of organisms around the world – and the consequences of these extinctions. 2. EXTENSION: Coevolution occurs in many species and can take on varying forms such as parasitism, mutualism and symbiosis.
	Nature of Discipline: <ol style="list-style-type: none"> Share experimental data, and respectfully discuss conflicting results emulating the practice of scientists. Cite various scientific arguments regarding the causes and effects of mass extinctions.

Content Area: Science - Middle School	
Standard: 2. Life Science	
Valwood Graduates: Explain and illustrate with examples how living systems interact with the biotic and abiotic environment	
GRADE LEVEL EXPECTATION Concepts and skills students master: 8. Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Interpret and analyze data about changes in environmental conditions – such as climate change – and populations that support a claim describing why a specific population might be increasing or decreasing Develop, communicate, and justify an evidence-based explanation about how ecosystems interact with and impact the global environment Model equilibrium in an ecosystem, including basic inputs and outputs, to predict how a change to that ecosystem such as climate change might impact the organisms, populations, and species within it such as the removal of a top predator or introduction of a new species Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate how environmental conditions affect the survival of individual organisms 	Inquiry Questions: <ol style="list-style-type: none"> How do ecosystem changes affect biodiversity? How does biodiversity contribute to an ecosystem's equilibrium? <i>How does climate change precipitate changes in ecosystems?</i>
	Relevance and Application: <ol style="list-style-type: none"> The development and application of technologies are intended to aid some populations and ecosystems. <i>(Modern scientists are developing and applying technologies that are intended to preserve biodiversity and manage ecosystems).</i>
	Nature of Discipline: <ol style="list-style-type: none"> Ask testable questions and make a falsifiable hypothesis about how environmental conditions affect organisms, populations, or entire species and design a method to find the answer. Recognize and describe the ethical traditions of science: value peer review; truthful reporting of methods and outcomes; making work public; and sharing a lens of professional skepticism when reviewing the work of others. Use models and technology tools to show what might happen to individuals, populations, and species as environmental conditions change.

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Standard: 2. Life Science	
Valwood Graduates: Explain and illustrate with examples how living systems interact with the biotic and abiotic environment	
GRADE LEVEL EXPECTATION Concepts and skills students master: 9. Organisms interact with each other and their environment in various ways that create a flow of energy and cycling of matter in an ecosystem	
Evidence Outcomes	21st Century Skills and Readiness Competencies
Students can: <ol style="list-style-type: none"> Develop, communicate, and justify an evidence-based explanation about why there generally are more producers than consumers in an ecosystem Design a food web diagram to show the flow of energy through an ecosystem Compare and contrast the flow of energy with the cycling of matter in ecosystems 	Inquiry Questions: <ol style="list-style-type: none"> <i>How are food webs and trophic levels ways of describing the flow of energy between organisms in an ecosystem?</i> <i>How do trophic levels illustrate transfers in biomass?</i> How do different ecosystems cycle matter differently? What “jobs” do organisms do to facilitate the flow of energy and cycling of matter?
	Relevance and Application: <ol style="list-style-type: none"> Humans use an understanding of the cycling of matter and energy to help mitigate environmental problems. For example, they treat waste water and clean up oil spills.
	Nature of Discipline: <ol style="list-style-type: none"> Scientists work from the assumption that the universe is a single system in which the basic rules are the same everywhere – that energy follows the same rules in an ecosystem as it does in physics experiments. Generate solutions to help mitigate environmental problems based on an understanding of the cycling of matter and energy. Create and evaluate models that show how interactions create a flow of energy and a cycling of matter in an ecosystem.