North Polk Community Schools Pacing & Course Description Guide

Grade Level: 9-10	Content: Biology	Year: 2022-2023

Course Description/Rationale

This course is designed to provide information regarding the fundamental concepts of life and life processes. Topics include cell structure and function, ecology, genetics, and natural selection and evolution. (2 HS credits)

Name of Unit	Time Frame	Essential Learning Target	Standard(s)
1 - Intro to Science	2-3 Weeks	LS 10 - Science and engineering practices are used to investigate and understand natural systems.	HS-LS 1.3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
2 - Ecology I	3 Weeks	LS 1 - Matter and energy are organized in living things and cycle through ecosystems. (1-6, 2-4, 2-5) LS 2- Interactions between organisms and human impacts affect ecosystem dynamics. (2-1, 2-2, 2-6, 2-7, 2-8, 4-6) LS 4 - Photosynthesis and cellular respiration transfer energy for life processes through building and breaking molecules. (1-5, 1-7, 2-3)	HS-LS 2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. HS-LS 2-5 Develop a model to illustrate the role of photosynthesis & cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, geosphere. HS-LS-1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy HS-LS-1-7 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 HS-LS-2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions
3 - Ecology II	4 Weeks	LS 1 - Matter and energy are organized in living things and cycle through ecosystems. (1-6, 2-4, 2-5) LS 2 - Interactions between organisms and human impacts affect ecosystem dynamics. (2-1, 2-2, 2-6, 2-7, 2-8, 4-6)	HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. HS-LS 2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

			HS-LS 2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS 4-6 Create or revise a simulation to test a solution to mitigate adverse impacts on human activity on biodiversity
4 - Cell	2 Weeks	LS 1 - Matter and energy are organized in living things and cycle through ecosystems. (1-6, 2-4, 2-5) LS 3 - Cell structure and function affect organism structure and function. (1-2) LS 4 - Photosynthesis and cellular respiration transfer energy for life processes through building and breaking molecules. (1-5, 1-7, 2-3)	HS-LS 1.2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provided specific functions within multicellular organisms. HS-LS-1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy HS-LS-1-7 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 HS-LS-2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions
5 - Cell Transport	2 -3 Weeks	LS 3 - Cell structure and function affect organism structure and function. (1-2) LS 10 - Science and engineering practices are used to investigate and understand natural systems. (SEPs, 1-3)	HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. LS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
6 - Cell Division	1 - 2 Weeks	LS 3 - Cell structure and function affect organism structure and function. (1-2) LS 5 - Cell division allows organisms to grow, develop, and reproduce. (1-4)	HS-LS-1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
7 - Meiosis/ Reproduction	1 - 2 Weeks	LS 3 - Cell structure and function affect organism structure and function. (1-2) LS 5 - Cell division allows organisms to grow, develop, and reproduce. (1-4) LS 7 - Inheritance patterns can be used to predict outcomes of gamete combinations. (3-2, 3-3)	HS-LS 3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instruction 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.
8 - Genetics	2 -3 Weeks	LS 7 - Inheritance patterns can be used to predict outcomes of gamete combinations.	HS-LS 3.2 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 the environment HS-LS 3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
9 - Advanced Genetics	2 -3 Weeks	LS 7 - Inheritance patterns can be used to predict outcomes of gamete combinations.	HS-LS 3.2 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 the environment HS-LS 3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
10 - DNA Structure and Replication	1 -2 Weeks	LS 6 - DNA serves as instructions for gene expression. NGSS SEP Modeling is emphasized heavily in this unit.	HS-LS-1-1 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-LS-3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring
11 - Protein Synthesis	2 Weeks	LS 6 - DNA serves as instructions for gene expression. LS 7 - Inheritance patterns can be used to predict outcomes of gamete combinations.	HS-LS 1.1 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-LS 3.1 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-LS 3.2 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 the environment HS-LS 3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
12 - Genetic Engineering	2 Weeks	LS 6 - DNA serves as instructions for gene expression.	HS-LS 1.1 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-LS 3.1 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-LS 3.2 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 the environment HS-LS 3.3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

13 - Adaptations/ Evolution	3 Weeks	LS 7 - Inheritance patterns can be used to predict outcomes of gamete combinations. LS 8 - Natural selection acts on heritable traits, leading to adaptation of populations. LS 9 - Science and engineering practices are used to investigate and understand natural systems.	HS-LS 4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of evidence. HS-LS 4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for the 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. HS-LS 4-3. 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. HS-LS 4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. HS LS 4-5. 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. HS-LS 2-8 Evaluate the evidence for the role of group behavior on individual and species chances to survive and reproduce.