

	Name of Course: Introduction to Aquaponics Team Members: Erin Hobbs Number of Days: 10	
Unit	Unit 1. Intro to Aquaponics and Building a system	
Essential Questions	What is aquaponics, hydroponics and aquaculture? Why is aquaponics, hydroponics and aquaculture a solution to environmental sustainability? How does an aquaponics and hydroponics system work?	
Content Standards	HS-LS2-5. Use a model that illustrates the roles of photosynthesis, cellular respiration, decomposition, and combustion to explain the cycling of carbon in its various forms among the biosphere, atmosphere, hydrosphere, and geosphere. HS-LS2-7. Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.	
Concepts and Subskills	- How to construct a hydroponics and aquaponics system - Water Cycle	Science and Engineering practices S1. Asking questions (for science) and defining problems (for engineering). S2. Developing and using models. S3. Planning and carrying out investigations. S4. Analyzing and interpreting data. S5. Using mathematics and computational thinking. S6. Constructing explanations (for science) and designing solutions (for engineering). S7. Engaging in argument from evidence. S8. Obtaining, evaluating, and communicating information
Content Objectives (Student Friendly Language)	I can construct a Hydroponics or aquaponics system. I can describe how my system works.	
Content Vocabulary	Tier One Vocabulary	

	Tier Two Vocabulary
	Ebb and flow Circulation Pump Tank
	Tier Three Vocabulary
	Hydroponics Aquaponics Aquaculture Bell siphon Drip system Kratky method Deep water system
Assessments, Products, Projects	Tank Research Assignment Tank Log
Text, Materials, and Resources	Google Classroom

	Name of Course: Introduction to Aquaponics Team Members: Erin Hobbs Number of Days: 20
Unit	Unit 2. Water Chemistry and Nutrient cycling
Essential Questions	What is the importance of water chemistry and nutrient cycles within aquaponics, hydroponics and aquaculture? What are the chemical and nutrient requirements for my system? What decisions/actions need to be made regarding water and nutrient chemistry within my system?
Content Standards	HS-LS4-4. Research and communicate information about key features of viruses and bacteria to explain their ability to adapt and reproduce in a wide variety of environments. HS-LS1-3. Provide evidence that homeostasis maintains internal body conditions through both body-wide feedback mechanisms and small-scale cellular processes.

	HS-LS1-6. Construct an explanation based on evidence that organic molecules are primarily composed of six elements, where carbon, hydrogen, and oxygen atoms may combine with nitrogen, sulfur, and phosphorus to form monomers that can further combine to form large carbon-based macromolecules. HS-LS1-7. Use a model to illustrate that aerobic cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new bonds form, resulting in new compounds and a net transfer of energy. HS-LS2-1. Analyze data sets to support explanations that biotic and abiotic factors affect ecosystem carrying capacity. HS-LS2-4. Use a mathematical model to describe the transfer of energy from one trophic level to another. Explain how the inefficiency of energy transfer between trophic levels affects the relative number of organisms that can be supported at each trophic level and necessitates a constant input of energy from sunlight or inorganic compounds from the environment. HS-LS2-5. Use a model that illustrates the roles of photosynthesis, cellular respiration, decomposition, and combustion to explain the cycling of carbon in its various forms among the biosphere, atmosphere, hydrosphere, and geosphere.	
Concepts and Subskills	Nitrogen Cycle pH scale in a system Water chemistry and nutrients problem solving	Science and Engineering practices S1. Asking questions (for science) and defining problems (for engineering). S2. Developing and using models. S3. Planning and carrying out investigations. S4. Analyzing and interpreting data. S5. Using mathematics and computational thinking. S6. Constructing explanations (for science) and designing solutions (for engineering). S7. Engaging in argument from evidence. S8. Obtaining, evaluating, and communicating information
Content Objectives (Student Friendly Language)	I can create a model and describe how nutrients exchange and move through my system. I can describe the nutrient ranges needed for my system. I can describe the importance of pH and what the correct pH range is in my system. I can carry out an investigation on nutrient deficiency in plants I can identify problems involving water chemistry and nutrient by examining fish and plant health I can analyze the water chemistry/nutrient through weekly monitoring I can identify and design solutions to problems within my system	
Content Vocabulary	Tier One Vocabulary	

	Tier Two Vocabulary
	Nutrients Evaluate and analyze
	Tier Three Vocabulary
	pH Scale Nutrient Deficiency Nitrate, nitrite, Ammonia Nitrosomonas Bacteria
Assessments, Products, Projects	Tank Log Nutrient Deficiency lab Student's Performance maintaining system
Text, Materials, and Resources	Google Classroom

	Name of Course: Introduction to Aquaponics Team Members: Erin Hobbs Number of Days: 15
Unit	Unit 3. Plants and agriculture
Essential Questions	What is the anatomy of a seed and plant? What is the anatomy of a flower? How do plants reproduce? How are plants Classified? What are the different ways food is produced in the US?
Content Standards	HS-LS1-4. Construct an explanation using evidence for why the cell cycle is necessary for the growth, maintenance, and repair of multicellular organisms. Model the major events of the cell cycle, including (a) cell growth and DNA replication, (b) separation of chromosomes (mitosis), and (c) separation of cell contents. HS-LS3-1. Develop and use a model to show how DNA in the form of chromosomes is passed from parents to offspring through the processes of meiosis and fertilization in sexual reproduction.

Concepts and Subskills	Anatomy of a seed Anatomy of a plant's vascular system Anatomy of a flower Plant reproduction Classification between monocot and dicot	Science and Engineering practices S1. Asking questions (for science) and defining problems (for engineering). S2. Developing and using models. S3. Planning and carrying out investigations. S4. Analyzing and interpreting data. S5. Using mathematics and computational thinking. S6. Constructing explanations (for science) and designing solutions (for engineering). S7. Engaging in argument from evidence. S8. Obtaining, evaluating, and communicating information
Content Objectives (Student Friendly Language)	I can model and draw the parts of a monocot and dicot seed during germination. I can identify the parts of a flower. I can describe how a plant reproduces using sexual and asexual reproduction. I can describe different methods for producing food and farming in the USA.	
Content Vocabulary	Tier One Vocabulary	
	Tier Two Vocabulary	
	Germination Propagation Agriculture Fisheries	
	Tier Three Vocabulary	
	Monocot and Dicot Xylem and phloem Radical Cotyledons Epicotyl Leaf and petal Stigma, stamen, ovary, anther Pollen Organic agriculture	

	Monocropping Industrial farming
Assessments, Products, Projects	Seedling germination observation lab Flower Dissection Plant propagation within system or in the classroom Agriculture research project
Text, Materials, and Resources	Google Classroom

	Name of Course: Introduction to Aquaponics Team Members: Erin Hobbs Number of Days: 10	
Unit	Unit 4. Fisheries and aquaculture	
Essential Questions	What are the advantages and disadvantages of aquaculture, agriculture, hydroponics and aquaponics? What are the external and internal structures of a fish? What are the traditional methods of fishing? How is art used to describe anatomical structures of an organism?	
Content Standards	HS-LS1-2. Develop and use a model to illustrate the key functions of animal body systems, including (a) food digestion, nutrient uptake, and transport through the body; (b) exchange of oxygen and carbon dioxide; (c) removal of wastes; and (d) regulation of body processes. HS-LS2-7. Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.	
Concepts and Subskills	advantages and disadvantages of aquaculture, agriculture, hydroponics and aquaponics Anatomy of a fish Scientific Illustration Traditional fishing practices	Science and Engineering practices S1. Asking questions (for science) and defining problems (for engineering). S2. Developing and using models. S3. Planning and carrying out investigations. S4. Analyzing and interpreting data. S5. Using mathematics and computational thinking. S6. Constructing explanations (for science) and designing solutions (for engineering).

		S7. Engaging in argument from evidence. S8. Obtaining, evaluating, and communicating information
Content Objectives (Student Friendly Language)	I can use the process of scientific illustration to demonstrate my knowledge of external fish anatomy. I can describe the advantages and disadvantages of aquaculture, agriculture, hydroponics and aquaponics. I can describe traditional fishing practices and how they compare to aquaculture and aquaponics. I can age a fish using fish scales.	
Content Vocabulary	Tier One Vocabulary	
	Tier Two Vocabulary	
	Fish Fishing fins	
	Tier Three Vocabulary	
	Aquaculture vs aquaponics Scientific illustration Fins (dorsal, pectoral, anal, caudal, pelvic) Operculum Gills Lateral line Scales Nares	
Assessments, Products, Projects	Scientific illustration of a fish Fisheries research assignment	
Text, Materials, and Resources	Google Classroom	

