Nature's Design: Systems, Cycles, Patterns, Relationships, and Adaptations in the Garden System
Theme 4: Scope and Sequence - Grades K-8

Strand	Topic	K–2		3–5		6–8	
		Learning Outcomes	Garden Activities	Learning Outcomes	Garden Activities	Learning Outcomes	Garden Activities
Food	Understand the plant nutrient cycle (Carbon cycle, nitrogen cycle, N-P-K, and minerals in plant growth)	Describe what plants need to survive. Include water, sun, and micronutrients. Explain how composting recycles nature's nutrients, (greens are nitrogen and browns are carbon). Draw a model.	Install and/or manage a school garden. Discuss and model behaviors support optimal plant growth. Build, care for, harvest, and apply compost to the garden. Observe and discuss results over time.	Identify and explain the role nutrients play in plant growth. Explain the effect micronutrients have on plant parts such as nitrogen supports leafy growth, Phosphorus supports flower and root development. Explain and illustrate how composting recycles nature's nutrients (greens are nitrogen and browns are carbon). Identify nitrogen-fixing plants and describe their physical characteristics. Describe the role of nitrogen fixing plants in the nitrogen cycle. Represent how plants bring nitrogen from the air and fix it into the ground. Connect healthy soils and healthy plants to nutrition.	Discuss and draw a model of nutrient cycling. Create signs and labels to place in the garden to mark carbon and nitrogen sources. Plant disease detectives: Identify nutrient deficiencies on plants by reading clues such as yellowing leaves, spots on leaves, etc. Treat plants with appropriate amendments to cure plant diseases.	Explain the components of nutrient cycles and their interrelationships. Healthy/vital soils = healthy/vital foods = healthy vital bodies. Demonstrate or explain where, how and why to apply soil amendments such as compost and mulch to ensure that soils and foods are nutrient rich. Explain how nitrogen fixing cover crops support nutrient cycling and increase soil fertility in the garden.	Research and plant cover crops that enhance soil fertility. Use nitrogen-fixing cover crops as a green manure when preparing a bed for planting. Examine the roots of nitrogen-fixing crops; identify the nitrogen nodules on roots. Describe or illustrate the symbiotic relationship of the plants with the soil bacteria.
	The Soil Food Web Understand the Soil Food Web as a complex living system of organisms in the soil Understand that interactions and relationships within the Soil Food Web contribute to the health of the whole	Describe a food web. Name some organisms within a food web. Identify and explain the relationships within a food web. Explain how healthy soil makes healthy plants, and healthy plants make healthy food.	Discuss the food web while students grow, harvest, prepare and eat simple snacks from the garden. Identify, observe, and draw organisms in soil and compost. Record data over time. * See Appendix: Learn *The FBI is on the*	Explain that the Soil Food Web includes fungi, bacteria, and invertebrates (FBI). Give examples of how fungi, bacteria, and invertebrates (FBI), and the soil food web create healthy soil and nutritious foods.	Explore fungi, bacteria, and invertebrates (FBI) in the soil. Magnify, categorize, and illustrate findings. Discuss and report.	Compare and contrast soils rich with fungus, bacteria, and invertebrates (FBI) with soils that are not. Identify the abiotic components in soil that support the soil food web (carbon, water, air). Explain how the health of the soil food web impacts	Design a side-by-side experiment using at least two beds with different kinds of amendment. (no compost vs. compost) Observe and record data from control and treatment beds. Interpret the data and present results. Design an experiment using three distinct parts

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	system	Describe soil as a living system full of organisms that transform organic matter into food for plants.	*Scene* song by The Banana Slug String Band.			the health of the soil. Describe the relationship between soil, food, body: Healthy/vital soils = healthy/vital foods = healthy vital bodies.	of the garden (compost, path, bed). Lay a transect line, randomly sample along the transect line using a quadrat. Observe and record quantitative and qualitative data such as plant and insect diversity within each quadrat. Analyze and interpret the data. Present findings using graphs, illustrations and oral arguments.
	Understand a variety of growing systems in Hawai‘i such as indigenous, conventional, aquaponic, hydroponic, agroforestry, permaculture, and organic gardening	Describe where food comes from. Give examples of three different growing systems.	Share stories about canoe crops. Identify, grow, and taste canoe crops. Lead a discussion about where our food comes from. Include a variety of examples such as the garden, a grocery store, the ocean and forest, a farm, and a farmers' market. Tend the school garden. Make observations about where food comes from. Visit a local farm. Observe and describe the systems that occur at the farm.	Compare and contrast properties and qualities of various food growing systems. Include but do not limit to yield, size, inputs, ecological impact, nutrition profile. Identify and describe canoe crops' growing systems and experiment with growing those crops in other systems (e.g., aquaponics).	Identify and describe a variety of growing systems such as indigenous, conventional, aquaponic, hydroponic, agroforestry, permaculture, and organic gardening. Grow a food crop in two to four different growing systems. Compare and contrast properties and qualities of food produced. Include but do not limit to yield, size, inputs, ecological impact, nutrition profile, etc.	Compare and contrast several different types of growing systems and soil mediums. Collect data and make conclusions about information from data collected. Report results. Describe characteristics of canoe crops and explain how they are well adapted to the environment in Hawai‘i.	Design and implement one or more types of growing systems. Collect data of properties, qualities (taste), cost of inputs, and human labor to build and maintain systems. Compare and contrast several different types of growing systems and soil mediums. Evaluate for health and production of biomass. Identify and describe canoe crops growing systems and experiment with growing those crops in other systems (e.g., aquaponics).

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Energy and Matter	Understand the energy cycles in the garden system	Describe photosynthesis as the flow of energy from sun to plants to food through storytelling. Describe thermal heat. Identify heat sources in the garden environment. Describe how the sun warms the land, the water, and the air.	Explore, record, and graph sources of heat in the garden environment using touch or a thermometer. Explore the concept of thermal energy as a form of heat (e.g., heat in compost, body heat after physical exercise, and reflected and absorbed heat of dark and light objects). Describe observations. Plan and conduct an investigation to determine if plants can grow without sunlight. Compare the temperature of water in direct sunlight and water in the shade. Draw conclusions.	Explain the transfer of energy from sun to plants to animals. Identify and illustrate examples of energy transfer and flow in the garden.	Make observations of plants and animals in the garden. Organize and record observations of energy cycles in the garden. Compare survival needs and relationships of plants and animals in the garden.	Explain how the sun is the source of energy for all living things on the planet. Define photosynthesis and explain how photosynthesis is the foundation the food chain. Compare and contrast organisms in the garden to organisms in other ecosystems.	Design an experiment to analyze the effects of different amounts of light on germinated seedlings. Plant 2 rows of lettuce or root crops. Cover half with shade-cloth and leave remaining crop exposed to full sun. Compare and contrast the differences. Measure temperature in compost and graph heat over stages of decomposition. Infer heat is a byproduct of the processes of cellular respiration of bacteria. Observe how ambient temperature affects the movement of macroorganisms in the garden.
	Energy and Matter in the Food Web: Understand trophic levels of the food web and the proportional relationships of producers to consumers, carrying capacity and population equilibrium	Identify and name producers and consumers in the garden. Identify and name pests and predators in the garden. Give examples of interdependent relationships among plants, animals, and humans in the garden environment.	Identify and name producers and consumers in the garden and community. * See Appendix: Play *The Pest and Predator Game.* Define and identify pests and predators in the garden. Illustrate the characteristics of pests and predators.	Identify producers, consumers in the garden. Explain the role humans play as producers and/or consumers in the garden. Describe the relationship between producers and consumers. Which population has more, how do they affect the garden systems, when are the populations out of balance and in balance?	Observe and collect data of plants, animals, and humans in the garden. Categorize them as producer and/or consumer. Define balance as it relates to producers and consumers in the garden environment. Investigate the relationship between producers and	Describe and illustrate the proportional relationship between producers and consumers. Explain how producers and consumers dictate carrying capacity in a garden system. Explain consumption of energy along the food chain.	Identify producers, consumers, tertiary consumers and decomposers in the garden. Investigate proportional relationship between producers and consumers and how they dictate carrying capacity in garden systems. Define carrying capacity.

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		Explain how resources can be limited. Give an example of a limited resource.	Create stories that describe interdependent relationships of pests to their habitat. Find examples in the garden that illustrate that natural resources can be used, underused, and overused (e.g., soil, water, sunlight, mulch).	Provide examples from the garden that demonstrate populations in and out of balance. Explain the soil food web, energy transfer, and the trophic levels. Give examples of how they are interrelated.	consumers. Predict which populations are greater in number. Infer how producers and consumers affect the garden systems. Cite examples of when populations are in and out of balance.	Analyze the impact of an invasive species on the diversity of an ecosystem. Describe the impact of invasive species on carrying capacity. Evaluate the interdependence of organisms on environmental resources and how they affect population size.	Food System: Create a representation that explains how food is energy and matter that is passed from organism to organism and through trophic levels. Describe a scenario in which a higher population of consumers can exist by consuming lower on the food chain. School Garden: Observe, count and record number of plant species in two distinct locations in the garden. Select one with invasive species and one without. Evaluate population diversity and analyze abundance. Compost PIle: Observe and collect data of volume in a compost pile over time. Relate findings to availability of resources. Discuss carrying capacity for fungi, bacteria, and invertebrates (FBI).

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	Understand forms and transformation, and conservation of energy. Understand kinetic, potential, thermal, and chemical energies.	Describe the effect of sunlight on the earth's surface. Explain how to reduce the warming effect of sunlight on an area. Describe or illustrate how energy cycles from sun to plant to animal and human. Give examples of ways that energy is used to move an object.	Design and build a structure that will reduce the warming effect of sunlight on an area. Explain how the structure reduces the warming effect of sunlight. Observe and compare the temperature of differences of surfaces in the garden such as mulch, soil, rock, and grass. Select a variety of light absorbing and reflecting surfaces. Measure and record the temperature in a variety of locations in the garden. Record data. Discuss how temperature would change over time and what would influence that change.	Identify and explain examples of energy types such as kinetic, potential, thermal, chemical. Use examples from the garden when possible. Cite examples of evidence that energy can be transferred by light and heat.	Conduct a garden energy identification walk. Discuss observations. Identify and explain three methods of moving water in the garden such as through a hose or pipe, carrying water in buckets, using gravity. Identify how energy is transformed as the water moves. Design and implement a system to move water in the garden. Discuss energy transfer of food to human body after eating lunch or a garden snack. Identify and explain examples of energy types such as kinetic, potential, thermal, chemical.	Explain how humans are an intrinsic part of energy transfer in the garden. Identify and describe energy transformation in the forms of potential, kinetic, thermal, and chemical in the garden. Apply transfer of energy to food in the garden. Assess changes in matter (garden products) that occur as a result of processing such as cooking, fermenting, drying, and making compost tea.	Kinesthetic activity: Explain how plants build sugars up, humans break them down. Evaluate and measure the kinetic energy during cooking. Explain how higher temperature equals higher kinetic energy. Fill different colored hand-washing tubs with water at the beginning of class. Leave them in the sun and compare the temperatures at the end of class.
	Understand chemical and physical changes in the garden system and classroom kitchen	Explain the difference between a chemical and physical change. Give examples. Give examples of changes in matter due to heating or cooling. Describe taste and texture differences between raw, frozen and cooked vegetables or fruits.	Harvest and prepare fruits or vegetables from the garden. Heat, freeze, and leave some raw. Compare the taste and texture of each. Discuss whether changes can be restored or are permanent.	Explain the difference between a chemical and physical change. Give examples. Explain how some changes caused by heating and cooling can be reversed and some cannot be reversed. Describe the physical changes such as texture and color that occur with varying cooking times.	Explore a variety of food processing methods such as fermentation, blanching, steaming, freezing, and drying. Observe and discuss changes in the food before and after processing. Compare and contrast - texture, color, taste, smell.	Explain the difference between a chemical and physical change. Give examples. Make predictions about the physical and chemical changes of food in the garden and kitchen. Describe the wind, sun, and water patterns in the garden in terms of potential energy sources.	Create four examples of physical and chemical changes that occur in the garden and kitchen. Examine ingredients before change occur, make predictions about what will happen, and describe the changes after they occur. Design an experiment for solar heating of water. Use different colored materials as an independent variable. Compare temperature

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				Describe chemical changes in terms of taste, odor, and texture of the same ingredient during different stages of fermentation.			from beginning and end of class. Boil and freeze a variety of substances from the garden. Identify changes in states of matter. Describe the relationship between kinetic and thermal energy. Identify and examine a variety of physical and chemical changes: ● Cook food in solar ovens. ● Mix salt and pepper. ● Emulsify salad dressing. ● Oxidize fruits and vegetables ● Cut, mince, and puree vegetables.
	Understand fossil fuels and renewable energy in terms of inputs, outputs, and the transformation of energy	Define and give examples of renewable energy resources at home, in the school environment, or in the community. Name and describe examples of renewable energy resources in the garden.	Identify and discuss renewable energy sources in the garden, school environment, or community. Draw a renewable energy resource that occurs in the garden, school environment, or community.	Define renewable energy sources in the garden, home, school environment, or community. Define non-renewable energy sources in the garden, home, school environment or community. Compare and contrast renewable energy resources and fossil fuels. Infer the impact of renewable resources and fossil fuels.	Identify, describe, compare and contrast one renewable energy resource with fossils fuels. Assess the impact of each energy form on environment and human labor. Outline pros and cons of each energy resource.	Identify and explain the types of energy available in Hawai‘i. Distinguish between energy that comes from the island and not from the island. Critique different models for generating electrical energy: renewable, fossil fuels, nuclear, etc. Critique may include: cost, human labor to build and maintain the systems. * See Appendix: Kokua Foundation’s N*utrition Lesson Skit.*	Identify where Hawai‘i’s energy comes from. Identify and describe different models for generating electrical energy such as renewable, fossil fuels, nuclear, etc. Include cost of materials, human labor to build and maintain the systems, and environmental impact. Compare energy inputs of cultivating a plot of land with a tractor, a rototiller, and a garden fork.

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							Compare use of a solar pump or an electric pump for a hydroponic system. (Discussion Topic)
Water	Understand the water cycle and its interrelationship with weather and climate Understand the properties of water	Explain why water is important for the survival of all living things. Identify that approximately 75% of the earth and our bodies are made of water. Describe the Water Cycle and name the three forms of water.	* See Appendix: Play the *Water Cycle Relay Game.* *Water exploration with various sizes of containers.* Sing the *Water Cycle Boogie.*	Explain and illustrate the water cycle. Define the terms precipitation, condensation, and evaporation. Explain that earth's water has existed since the earth was formed.	Label all parts of the water cycle. Illustrate how weather cycles impact the water cycle. Map a local watershed; include drinking water sources and wastewater treatment systems. Have a class discussion.	Describe the cyclical patterns of air and water movement on Earth and Identify these patterns in the garden. Explain that Earth's water has existed since the Earth was formed.	Observe water in the garden. Reflect and relate that this water has existed since the Earth was formed. Research water sources in garden. Collect rainwater for use in garden. Create a rain station: use a rain gage to log rainfall in the garden. Observe and report seasonal trends. Compare school garden data to official rainfall data for your location. Identify and describe parts of the water cycle found in the school garden. * See Appendix: *The Earth's Water as an Apple activity.*

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	Understand the action of water on living systems	Define erosion. Create a model or identify a solution that slows/prevents the impact of water on the shape of the land. Explain why water flows down hill. Explain why the forest is an essential component of the Water Cycle.	Conduct an investigation and compare plants grown or seeds started with and without water. Develop a system for watering the garden and nursery plants. Explain how to know when and how much water is needed. Use sensory indicators (sight and touch) to determine soil moisture. Identify areas of the garden or school campus that are impacted by water. Discuss and design a solution for the problem. Compare multiple solutions.	Understand the functions of water as dilutor, solvent, transporter, insulator, and diffuser. Provide evidence of erosion damage by water in the garden or local environment.	Make compost tea. Observe and document the changes in the color and shade of the tea as water is added. Explain dilution and transport. Drink fresh drinking water. Then dissolve some salt into the water - compare and contrast. Develop an experiment that compares the results of putting worm castings directly into the soil versus making tea. Explain in terms of diffuser and transporter. Blow up a balloon with air. Fill another balloon with water. Hover both balloons over a flame. Which one bursts? Which one doesn't? Water as insulator.	Demonstrate and explain the use of water in the garden as diluter, solvent, transporter, insulator, diffuser. Define erosion	Create an example of watering through capillary action over time using a string and bucket. Use water as a diluter when applying worm or compost tea and soil amendments. Make herbal tea with various quantities of Fresh herbs. Place 2 identically shaped pans in the sun. Fill one pan with water. Measure the temperature beneath the pans. After some time in the sun measure the temperature beneath the pans. Move them to the shade for 20 minutes and compare temperatures again. Identify erosion by water in your garden. Take steps to prevent erosion.
	The hydrology of Hawai'i Island Identify drinking water sources for Hawai'i Island	Identify and illustrate where our water comes from, how it is used, and where it goes. Explain and demonstrate ways to conserve water at home, in the garden, in the school environment, and community. Identify the type of bodies of water in your area.	Investigate and discuss where the water used in the school garden comes from. Students discuss how water can be conserved in the garden. Discuss and create ways to conserve water at school and at home. Create a model to represent the shapes and	Recognize the unique features of the hydrology of Hawai'i as presented in place-based stories. Identify local drinking water sources for home and school.	Map a local watershed including drinking water source and wastewater treatment systems. Have a class discussion Conduct tests on irrigation water and/or stream water for pH, nitrogen, phosphate, and salinity. Report results.	Identify local freshwater sources and explain how the freshwater sources are a result your locale's land formations. Assess the renewability/future availability of water as resource in the garden.	Identify and describe the role plants play in the water cycle. Use transpiration bags as evidence. Observe wind patterns in the garden and identify seasonal trends. Create a rain station: use a rain gage to log rainfall in the garden. Observe and report seasonal trends. Compare school

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			kinds of land and bodies of water in your area.				garden data to official rainfall data for your location.
	Understand water storage, sources, and management	Identify current and potential water sources in the garden. Identify when a plant needs water. Demonstrate appropriate amount and method of watering. Identify where water is found on the island and on the earth. Explain the three forms it can take. Identify and present solutions to a water related problem in the garden.	Conduct a water hunt: Locate water in the garden. Observe and interpret a rain gauge. Make wet versus dry observations and perform sight and touch tests of the soil moisture. Observe and discuss the role of mulch and soil in the garden. Eliminate standing water as vector for disease. Develop and implement wise water practices in the garden. Identify a water problem in the garden or school environment. Develop and test solutions. * See Appendix: *"Fight the bite." Hawai'i Department of Health*	Identify water systems in the garden. Define public water system and explain the role of the school garden water systems as a part of the public water system.	Create a water usage or best practices plan for the garden. Design an irrigation system. Eliminate standing water as vector for disease. Map the local public water system include homes, parks, schools, and buildings.	Identify water sources in the garden. Identify where water is needed in the garden and design irrigation systems for garden.	Evaluate where water is needed in the garden Design, construct, and implement various irrigation systems. Record effects on garden ecosystems such as soil salinification and plant growth. Eliminate standing water as vector for disease: Compare irrigation systems efficiency in terms of water conservation such as drip irrigation versus overhead watering. * See Appendix: *"Fight the bite". Hawai'i Department of Health*
Natural Resource Management and Conservation	Understand water conservation and management practices	Identify solutions that reduce the impact of humans on land, water, air, and other living things in the local environment. Describe or illustrate how water can be safely reused.	Identify a problem concerning wastewater. Create a solution and design a model to solve it. Demonstrate safe harvesting, washing, and handling practices for preparing garden produce.	Define water conservation and management. Give examples of water conservations and management practices. Observe and measure water use. Identify and recommend best practices to support water	Define and describe various types of wastewater in school environment. Include garden greywater, kitchen greywater, and water water. Design a system to use garden greywater in a garden system.	Explain why fresh water is a finite resource. Identify the roles and impact that individuals and communities play in water conservation. Illustrate a garden water system nested within an entire watershed.	Utilize grey water in garden systems for plants. Create a catchment system to mitigate effects of treated water. Identify water conservation practices at home and at school.

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		Explain the importance of using potable water for washing garden produce.		conservation at home, school and in the community.		Identify appropriate use and limitations of greywater and county water.	Investigate the impacts of home and garden use on water systems. Investigate the impacts of community conservation efforts.
	Understand water quality	Define potable and nonpotable water. Identify sources of clean drinking water at school, in the garden, at home, and in the community. Identify rainwater as a resource for watering plants.	Define and identify sources of clean drinking water in the garden and in the school environment. Discuss the importance of drinking water during the day. Make and use a simple and clean drinking cup from available resources.	Define and describe the differences between black water and greywater. Define potable water. Explain why it is used for hand washing and washing fresh fruits and vegetables. Compare and contrast how different water sources impact plants.	Develop a system that utilizes grey water in the garden to solve a problem. Investigate how to safely use greywater in the garden. Design a system that safely uses greywater in the garden. Conduct an experiment in the garden by watering plants with water from different sources. Example: Watering plants with rainwater vs. municipal water - growth, yield, color, etc.	Define blackwater, greywater, potable and nonpotable water. Analyze water systems in the garden and design improvements for greywater use. Design a water system that uses potable and non-potable water correctly in the garden, such as using potable water for processing garden products and greywater for watering plants. Explain or illustrate.	Utilize grey water in garden systems for plants. Compare and contrast how different water sources impact garden. Example: Rainwater vs. municipal water in garden uses. Define the distinctions between and identify potable and non-potable water in the garden. Discuss the health implications of non-potable water. Explain how water is a vector for contaminants and examine inputs and outputs in garden water systems. Create a catchment system to mitigate effects of treated water. Examine impacts of home and garden practices on water systems.

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	Understand organic nutrients for soil fertility and identify local sources of organic nutrients	Identify organic resource materials in the garden and on campus. Explain how organic materials can be reused. Explain how compost is nature's recycling system. List the organisms involved in recycling organic matter. Explain and illustrate how food production creates waste that can be recycled.	Identify, gather and use organic materials on campus for composting. Design and construct a composting system using recycled waste from the garden, classroom, and cafeteria and home. Observe and manage a vermicompost bin. Harvest and use vermicompost in growing systems.	Explain organic materials as output and input for other organisms. Describe a healthy disposal of discarded materials from human systems that uses fungi, bacteria, and invertebrates to recycle matter and natural materials. Draw a map or create a model that shows the production and use of organic nutrients.	Create a compost pile using paper and prunings to demonstrate layering brown and green waste. Identify discarded materials from human systems. Categorize organic and inorganic materials. Sort organic materials into green and brown layers. Integrate into compost systems. Identify byproducts from food growing, production, transportation, and consumption.	Explain how to create and utilize local sources of organic nutrients for soil fertility. Differentiate between the bi-products of organic vs. inorganic materials as they decompose. Design a zero waste system for the school environment.	Assess the school environment as a resource for building a layered compost system: Identify and utilize local resources for soil fertility. "Feed the Soil and the Soil Feeds You." Collect, weigh and record discarded organic materials from school and apply to compost system. Examine debris from the garden and identify how it is used in the garden ecosystem. Use correct proportions of carbon, nitrogen, moisture and air.
	Understand recycling, upcycling, downcycling of inorganic materials	Define organic and inorganic materials. Define waste. Identify ways that inorganic materials can be reused. Identify waste as a human generated material. Explain how nature reuses materials and humans produce waste. Define and give examples of the Four Rs: Reduce, Reuse, Recycle, and Refuse.	Identify discarded materials from human systems. Sort into organic and inorganic materials. Bury organic and inorganic materials and dig them up after 1 week, 1 month, and 6 months. Mark the spot & date. Compare and contrast finding. Compost, recycle, or reuse as much as possible in the garden. Discuss: Where does our trash go? Why do we have to reduce, reuse,	Categorize human discards aka waste into compostable, recyclable, refuse, and reusable. Identify uses for discarded materials from human systems. Explain how human waste is made from natural resources. Identify how human waste can be a useful material. Define and give examples of the Four Rs: Reduce, Reuse, Recycle, and Refuse. Formulate ways to incorporate the	Explore using a composting toilet on campus. Audit discarded materials in the classroom and cafeteria trash. Create recycling signs for campus recycle center. Set-up recycling center for garden area. Read *Hawai'i Recycling Guide.* Take copy home and discuss.	Explain the difference between the bi-products of organic versus inorganic materials. Describe how organic and inorganic materials have different rates of decomposition. Explain why inorganic materials persist over time. Critique individual and collective consumer behaviors. Assess bi-products from garden food, and processed and packaged foods. Define or illustrate a "Zero Waste" system.	Compare and contrast the volume, mass, and reusability of packaging from various sources. Design, create, and maintain a zero waste system for the school garden. Create a decomposition timeline of discarded products with real examples. Reuse and repurpose materials in the garden.

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			recycle, and refuse? Where are the recycling stations on our Island?	Four Rs into daily practices.			
	Understand components of air quality	Define air quality. Explain how human and natural systems impact air quality.	Track local air quality and compare it to a sister school. Identify factors that affect air quality. Identify air cleaners. Explore the earth's air. Identify what it is made of and how we rely on it.	Identify human activities that produce and reduce air pollution. Describe natural systems that increase air quality.	Discuss cigarette smoking air pollution and potential water, soil and pollution. Discuss the effect of cigarette smoking on human health--both first and second hand smoke. Describe or illustrate the process of photosynthesis as nature's air quality filter.	Describe ways in which the garden can mitigate human behaviors that impact air quality.	Observe systems in the garden that produce clean energy such as photosynthesis, solar pumps, human power, and weed mats.
	Understand carbon footprint and carbon sequestration	Describe how plastic is made. Explain how an organic material is transformed into an inorganic material.	Create a plastics recycling program for the classroom and school. Wash, reuse, or recycle all plastics that are used in the garden. Repurpose containers such as egg or milk cartons, for seedlings and potted plants.	Define and give examples of carbon footprint and carbon sequestration. Explain how maintaining a garden reduces carbon footprint and sequesters carbon.	Obtain, record and assess information about the carbon footprint of personal and family activities. Identify carbon sources in the garden. Compare and contrast with carbon sources in the classroom. Discuss ways to mitigate carbon footprint. Create a carbon sequestration plan for families, school, or communities. Assess and report on the reduction of carbon footprint and increase of carbon sequestration in the garden.	Understand, describe, and interpret the carbon footprints of human activities and their impact on air quality.	Identify practices in the garden that impact the carbon footprint. Identify practices that mitigate the carbon footprint.

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		Learning Outcomes	Garden Activities	Learning Outcomes	Garden Activities	Learning Outcomes	Garden Activities
	Understand sources and impacts (air water and soil) of clean energy in the community	Describe human activities at school or home that consume energy.	Discuss energy consumption and give examples. List sources of energy for human activities.	Identify and explain systems that produce clean energy. Explain that human energy consumption impacts air, water, and soil quality.	Describe solar, wind, and methane gas collection as clean energy sources. Identify and describe how petroleum gas causes air pollution.	Define carbon footprint. Explain garden systems that sequester carbon. * See Appendix: *"Carbon Footprint Survey"*	Build compost piles to sequester carbon.
Best Conservation Practices	Understand the individual's and collective's role in the conservation of natural resources Understand that conservation is a set of practices that preserve, restore, and protect natural resources and ecosystems	Identify and describe natural resources in your location and explain how humans use them. Give examples of behaviors that reduce the impact of humans on land, water, air, and/or other living things in the local environment.	Recycle and reuse all natural resources in the garden. Discuss how humans impact the land, water, air, soil, or other living things. Create a plan to plant trees in the school environment or community. Identify invasive species in your community. Create a plan to reduce invasive species. Identify and plant native species in your school garden or environment. Learn their Hawaiian names and stories. Plant the state flower Hibiscus Brackenridgei Ma'o Hau Hele	Identify human activities that consume or pollute natural resources. Identify human activities that restore, preserve, and/or protect natural resources. Describe the significance of both local and non-regional historical, cultural, and/or archeological conservation practices.	Study plastic bags as pollution. Identify the effect on birds, ecosystems, and marine life. Discuss Hawai'i as the first state to ban plastic bags. Pick up litter on campus. Examine ahupua'a map. Discuss the use of ahupua'a names in everyday language. Connect use of ahupua'a names to conservation practice. Identify and participate in local historical, cultural, and/or archaeological conservation practices. Identify and participate in non-regional historical, cultural, and/or archeological conservation practices.	Interpret data from the garden about renewable and nonrenewable resources. Identify and explain garden systems that preserve, restore, and/or protect non-renewable resources such as saving water. Identify and describe various sources of mulch. Compare and contrast local and non-regional historical, cultural, and/or archeological conservation practices.	Collect and interpret data from the garden about renewable and nonrenewable resources. Design garden systems that preserve, restore, and/or protect non-renewable resources (e.g., saving water). Identify, collect and use sources of mulch. Compare and contrast local and non-regional historical, cultural, and/or archeological conservation practices in your garden.

Strand	Topic	K–2		3–5		6–8	
		Learning Outcomes	Garden Activities	Learning Outcomes	Garden Activities	Learning Outcomes	Garden Activities
	Understand how to preserve, repair, and prevent deterioration of the environment, topsoil, water, and natural resources Understand invasive species Understand that waste reflects imbalance in a system	Identify and explain water damage and soil erosion in the garden environment. Design a Zero Waste system for the garden, classroom, or home. Define, explain behaviors, and give examples of invasive species in your geographical area. Describe their impact on the environment.	Plant trees in school environment. Conduct a native plant identification project in the garden or school environment. Share stories of the native plants in your geographic region. Identify and research invasive species in your geographic region. Create a plan to reduce the impacts of invasive species.	Identify and explain water damage and soil erosion in the garden environment. Explain how Zero Waste system works in the garden. Identify the impacts of invasive species.	Identify and explain erosion in the garden. Design and implement a plan to mitigate the erosion. Design and implement a Zero Waste system for your garden. Design and implement a simple Integrated Pest Management plan.	Identify and explain water damage and soil erosion in the garden environment. Design and explain a Zero Waste system. Explain a 4R (refuse, reduce, recycle, reuse) system for the garden. Describe how the system preserves, repairs, and prevents deterioration of the environment. Explain how Zero Waste system works in the garden. Explain the impacts of invasive species and cite examples of management practices for invasive species.	Identify erosion in the garden and implement a plan to mitigate it. Design and implement a 4R (refuse, reduce, recycle, reuse) system for the garden. Design and implement a Zero Waste system for the garden. Design and implement a simple Integrated Pest Management plan Manage and dispose of invasive species in the garden and in the school environment.