Nature's Design: Systems, Cycles, Patterns, Relationships, and Adaptations in the Garden System
Theme 4: Curriculum Map – K–2

Strand	Topic	K–2 Learning Outcomes	Garden Activities	Classroom Extensions	Common Core ELA Standards	Common Core Math Standards	NGSS Standards	NHES
Food	The plant nutrient cycle (Carbon cycle, nitrogen cycle, N-P-K, and minerals in plant growth)	Understand that plants need water, sun, and nutrients to survive and thrive. Recognize that composting recycles nature's nutrients (greens are nitrogen and browns are carbon).	Students tend the classroom garden and learn what plants need to thrive. Students build, care for, harvest and apply compost to the garden K2. 2-7	What do humans, plants, and animals need in order to survive and thrive? How are humans and plants the same or different? K2. 4-2	K.RI.1 K.SL.2 1.RI.10 1.SL.2 2.RI.3 2.SL.2	K.CC.5 1.NBT.1	K-LS1-1 2-LS2-1 SC.K.1.2 SC.1.3.1 SC.2.4.1	1.2.2 HE.K-2.1.2
	The Soil Food Web The Soil Food Web is a complex living system of organisms in the soil and their interactions with each other, the environment, plants and animals	Show understanding of the relationship of organisms in a food web. Recognize that healthy soil grows healthy plants and healthy people. Recognize that soil is a living system full of organisms that transform organic matter into food for plants.	Students grow, harvest, prepare and eat simple snacks from the garden. K2: 3-14 Identify, observe, and record/draw organisms in soil and compost. K2: 2-5 Learn the FBI song. K2: 2-4	Use magnifying tools to observe selected soil samples. How are they the same or different? Create a collection of organisms found outdoors (, insects, living, and nonliving materials). Create a Nature Table in your classroom of found and/or seasonal natural objects.	K.W.2 K.W.7 1.W.7 1.SL.4 2.W.7 2.SL.2	K.MD.3 1.MD.4 2.MD.10	K-ESS3-1 1-LS1-1 2-PS1-1 SC.K.4.1 SC.1.3.1 SC.2.3.1	1.2.2 2.2.2 HE.K-2.5.1
	Growing systems in Hawai'i: • Indigenous, • Conventional • Aquaponics • Hydroponics • Agroforestry • Permaculture • Organic gardening	Understand where our food comes from and that it is grown in different ways.	Share stories about, identify, grow, and taste a few canoe crops. K2: 1-7 Classroom or garden discussion: Where does our food come from, (e.g., garden, farm, farmer's market, the wild, supermarket, ocean, forest, etc.)?	Create a wall chart of pictures drawn by students identifying sources of food in their community. Visit a local food market or farm and write a reflection and/or thank you letter on return.	K.SL.1 K.SL.2 1.SL.1 1.SL.2 2.SL.1 2.SL.3		K-ESS2-2 2-LS4-1 SC.K.1.2 SC.1.4.1 SC.2.3.1	HE.K-2. -2.1 2.2.2 4.2.1

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			Students tend the school garden and observe where food comes from. Visit a local farm and observe and describe the systems that are seen.	Post the Kamehameha School's Ahu'upa'a poster in your classroom and use it for rich discussion, story writing, or poetry around growing and community systems.				
Energy and Matter	Energy cycles in the garden system	Understand the flow of energy from sun to plants to food (Photosynthesis) via storytelling. K2. 4-4 Explore heat sources in the garden environment and identify the source of energy. Explore and describe how the sun warms the land, the water, and the air.	Explore, record, and graph sources of heat in the garden environment with your hand or a thermometer. Explore thermal energy (e.g., heat in compost, body heat after playing and running on the field, dark and light objects - reflected heat, etc.). Plan and conduct an investigation to determine if plants can grow without sunlight. STEM Gather dry wood and show children how to make a safe fire and control it.	Identify through stories, observation, games, & discussion, what plants, animals, and people need to survive and the role the sun plays in the survival of all living things. Observe and be able to describe in a drawing or words how the sun warms the land, the water, and the air (e.g., day and night, temperature differences). Introduce the thermometer as a tool to measure and compare temperature. Explore how fire was used in different cultures and in Hawai'i (e.g., cooking with fire in the imu).	K.W.2 K.SL.2 1.W.2 1.SL.4 2.W.2 2.SL.4	K.MD.1 K.MD.2 1.MD.4 1.NBT.3 2.NBT.5	K-LS1-1 1-LS1-1 2-LS2-1 SC.K.1.1 SC.1.2.2 SC.2.6.1	1.2.2

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	The Food Web, trophic levels and proportional relationships of producers to consumers, carrying capacity and population equilibrium Relationship between producers and consumers and effect on habitat	Identify and name producers and consumers in the garden. Identify and name pests and predators in the garden. Observe, discuss, and give examples of interdependent relationships among plants, animals, and humans in the garden environment. Observe and understand that resources are limited.	Identify and name producers and consumers in the garden and community. Play *The Pest and Predator Game.* K2. 2-13 Define and identify pests and predators in the garden. Create stories that describe their interdependent relationships. K2: 2-24 & 25 Find examples in the garden that illustrate how natural resources can be used or overused (e.g., soil, water, sunlight, mulch).	Draw a simple food web using local plant and animal relationships, and have the children make a copy. Then, let them construct another example using the model. Play the *Food Web Game.* Role-play using the cards. * See Appendix. Read and create stories of the interrelationships with the different organisms of the food web.	K.W.2 K.SL.2 1.W.7 1.SL.5 2.W.7 2.SL.2		K-ESS3-1 1-LSI-1 2-LS4-1 SC.K.3.1 SC.1.3.1 SC.2.3.1	
	Forms and transformation of energy: • potential • kinetic-thermal • chemical Conservation of energy	Observe the effect of sunlight on the Earth's surface. Reduce the warming effect of sunlight on an area. Describe how energy cycles from sun to plant to animal and human. Explore ways that energy can be used to move an object	Using tools and materials, design and build a structure that will reduce the warming effect of sunlight on an area. Observe and compare the temperature of differences of surfaces in the garden (e.g., mulch, soil, rock, grass, etc.). Students use a thermometer to measure and record heat in various areas of the garden. Record in Journal. How would that change over time? What	Students identify the flow of energy through the food chain. Sun-Plant-Animal-Human. Illustrate that cycle. Play a push and pull game like tug-of-war to exemplify the way energy is used to move objects. Use marbles to show how energy can move objects in different directions. Make a paper pinwheel to show the power of wind. Place light and dark	K.W.7 K.SL.2 1.W.7 1.SL.4 2.W.7 2.SL.2	K.MD.1 K.MD.2 1.MD.4 1.NBT.3 2.NBT.5	K-PS2-1 K-PS2-2 1-PS4-3 2-LS2-1 SC.K.1.1 SC.1.7.1 SC.2.3.1	

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			would influence that change?	colored paper outside under sunlight; test by touching the surfaces which color warms up faster.				
	Chemical and physical changes in the garden system and classroom kitchen	Observe and identify that some changes caused by heating and cooling can be reversed and some cannot. Identify taste and texture differences between raw and cooked vegetables or fruits.	Offer taste tests when available. Identify taste and texture changes between raw and cooked fruits and vegetables.	Reversible changes: heat and cool water or butter. Irreversible changes: cook an egg, freeze a plant leaf, or heat paper.	K.W.7 K.SL.2 1.W.7 1.SL.2 2.W.7 2.SL.2	K.MD.1 K.G.1 1.MD.4 2.MD.10	2-PS1-4 SC.K.1.1 SC.1.1.1 SC.2.1.1	
	Fossil fuels and renewable energy inputs, outputs, and the transformation of energy	Define and identify renewable energy resources in our school, home, or community. Be able to name the renewable energy resources in the garden.	Identify renewable energy sources in the garden and the community.	Discussion: Where does our electricity come from? Where does oil come from? What is solar energy? What is renewable energy? What are examples in our school, home, and community? Show examples of the photovoltaic effect in which solar cells convert light into electricity (solar lights). Discussion: Compare a tractor, a rototiller, and a garden fork to cultivate a garden bed. Compare use of a solar pump vs. an electric pump for a hydroponic system.	K.SL.2 1.SL.2 2.SL.2		K-PS3-1 SC.K.2.1 SC.1.2.1 SC.2.2.1	

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Water	The Water Cycle and its interrelationship with weather and climate The properties of water	Understand that all living things need water to survive. Recognize that our bodies and the earth are made mostly of water (approximately 75%). Introduce the Water Cycle and the three forms of water.	Water Cycle Relay K2: 2-13 Water-play activities in the Garden. Experiment with various sizes of containers. Water-play table. * See Appendix Sing the *Water Cycle Boogie.* K2. 4-3	Introduce the components of the water cycle and create a water cycle diagram. Experiment and describe the properties of the different forms of water. Create a small terrarium in the classroom with plants, soil, and a small container of water. Experiment using water to show floatation, mixtures, water vapor or frozen form. Check how fast evaporation can work by outlining with chalk the perimeter of a large puddle on a cement or an asphalt surface; see how long it takes for all the water to “disappear” into vapor. Read *Where Does Water Come From?* By C. Vance Cast	K.W.7 K.SL.2 1.W.7 1.SL.3 2.W.7 2.SL.3	K.MD.1 1.MD.2 2.MD.9	K-LS1-1 2-PS1-1 2-ESS2-2 SC.K.1.2 SC.1.2.2 SC.2.1.2	
	Recognize the action of water in living systems	Develop a model or solution that slows or prevents water from making changes to the shape of the land. Discover that water flows down hill. Understand that the forest is an essential	Conduct an investigation and compare plants or seeds grown with and without water. Develop a system for watering the garden (use watering cans) and nursery plants. Learn how to water and when and how much water is needed (e.g., test for soil	Students explore how their family gets water in their home (e.g., bottled water, well, county piped water, rain catchment). Students list all the ways water is used. * See Appendix: Read or tell the story: “Rain Follows the	K.SL.1 K.SL.2 1.SL.1 1.SL.5 2.SL.1 2.SL.5		K-LS1-1 2-ESS2-1 SC.K.1.1 SC.1.3.1 SC.2.1.2	HE.K-2.5.2

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		component of the Water Cycle.	moisture using a finger as indicator). Identify areas of the garden or school campus that are impacted by water. Discuss and design a solution for the problem. Compare multiple solutions.	Forest."				
	The hydrology of Island drinking water for Hawai'i Island.	Identify where our water comes from, how it is used, and where it goes. Discuss and create ways to conserve water at school and at home. Develop a model to represent the shapes and kinds of land and bodies of water in your area.	Investigate and discuss where the water used in our school garden comes from. Students discuss how water can be conserved in the garden.	Students share ideas about where our water comes from, how it is used in daily life and where it goes. Create a mural or model that illustrates this story. Students create a list of ways they can conserve water at school and at home. Discuss safe drinking water practices.	K.SL.4 K.SL.5 1.SL.4 1.SL.5 2.SL.4 2.SL.5	K.MD.2	2-ESS2-2	7.2.1 HE.K-2.1.5
	Water storage, sources, and management	Identify water sources or potential sources in the garden. Develop the ability to determine when a plant needs water and apply appropriately. Observe and identify water sources and storage sources at home and at school. Eliminate standing water as vector for disease. Fight the Bite. Obtain information to identify where water is	Water hunt, "Where do we find water in the garden?" How do we find water in the garden (e.g., wet vs. dry observations, testing the soil moisture with their finger) Observe and learn to read a rain gauge. Observe the role of mulch and soil in the garden (e.g., organic matter stores water). K2: 4-1 Use wise water	Students look at a map of Hawai'i and identify where water is collected and stored on the Island. Discuss salt vs. fresh water.	K.RI.10 K.SL.2 1.RI.10 1.SL.2 2.RI.5 2.SL.2	K.MD.1 K.MD.2 1.MD.2 2.MD.9	K-LS1-1 2-LS2-1 2-ESS3-3 K-2-ETS1-1 SC.K.1.1 SC.1.1.1 SC.2.1.1	1.2.3 2.2.2 HE.K-2.1.4

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		found on Earth and that it can be solid or liquid. Students identify a water problem in the garden and develop possible solutions. NGSS - Engineering K-2 STEM	practices to maintain the garden. Eliminate standing water. Students identify a water problem in the garden or school campus and develop possible solutions.					
Natural Resource Management and Conservation	Water conservation and management	Communicate solutions that will reduce the impact of humans on land, water, air, and other living things in the local environment. Understand that water can be reused safely. Understand why it is important to use potable water for washing garden produce.	Students identify a problem concerning waste and create a solution and model to solve it. Students use safe harvesting, washing, and handling practices for preparing garden produce.	Research how people in different environments get their drinking water. Students brainstorm ideas of how to conserve water.	K.W.7 1.W.7 2.W.7		K-ESS3-3 K-2ETS1-1 SC.K.1.2 SC.1.3.1 SC.2.8.2	1.2.1 7.2.2 HE.K-2.1.4 HE.K-2.1.7
	Water quality	Identify sources of clean drinking water at school, in the garden, at home, and in the community. Recognize that rainwater is the perfect source for watering plants.	Children identify sources of clean drinking water on campus and in the garden. Discussion of the importance of drinking water during the day. Students learn how to fold a piece of paper to make a simple clean	Children share their discussions about clean drinking water. Reminding children of the importance of drinking water during the day. Making water available in the classroom.		K.G.3 1.G.2	K-LS1-1 SC.K.1.2 SC.1.3.1 SC.2.1.1	1.2.1 7.2.1 7.2.2 HE.K-2.1.5

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			drinking cup.					
	Local sources of organic nutrients for soil fertility	Identify organic resource materials in the garden and on campus. Understand organic materials can be reused. Be able to explain how compost is nature's recycling system. Identify how worms and other organisms help recycle organic matter. Understand that food production creates discards that are organic and can be recycled.	Students look for, help gather, and use organic materials on campus that can be used for composting. Construct a composting system using recycled materials from student waste (e.g., paper, fruit and vegetable peelings) from classroom, FFVP, home, cafeteria, etc. K2: 2-7 Students observe and manage worms in the vermicompost bin. They harvest and use vermicompost in growing systems. K2: 2-3	Discuss the value of decomposition as a vital and natural process. Write a story from the point of view of an earthworm. (Read *Diary of a Worm* or The Life Cycle of an Earthworm.) Gather discards from the Fresh Fruit and Vegetable Program and give to the school garden for recycling. Make a compost bucket for collection.	K.W.7 K.SL.2 1.W.7 1.SL.2 2.W.7 2.SL.3		K-ESS3-1 2-PS1-2 SC.K.1.1 SC.1.2.2 SC.2.8.2	
	Recycling, upcycling, and downcycling of inorganic materials	Identify ways that inorganic materials can be reused. Identify waste as human discards. Understand that waste does not exist in nature. Define the 4 R's: Reduce, Reuse, Recycle, and Refuse.	Identify discarded materials from human systems and 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. Compost, recycle, or reuse as much as possible in the garden. Discuss: Where does our trash go?	Look for ways to recycle inorganic materials in the classroom. Gather and shred used paper and use in the compost or worm bin. Participate in a school wide Zero Waste or Recycling Program. Save and utilize recyclable materials to create, repurpose, and reinvent useful products.	K.W.7 K.SL.4 1.W.7 1.SL.4 2.W.7 2.SL.4	K.G.3 1.G.2 2.G.1	K-2-ETS1-1 K-2-ETS1-2 K-2-ETS1-3 SC.K.1.3 SC.1.2.2 SC.2.8.2	

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			Why do we have to reduce, reuse, recycle, and refuse? Where are the recycling stations on our island?	Create an art product that uses only recycled materials (Trash Art show). Read Pollution and Waste by Sally Morgan & Rosie Harlow				
	Components of air quality	Understand that human and natural systems impact air quality.	Plants and trees provide oxygen for the air we breathe. The volcanoes emit vog in the island air. People and plants can be affected by vog in different ways. All the air we breathe is the same air that has always been on the earth. Share a story about that idea and discuss.	Track daily weather by recording regularly (at the same time) on a monthly log to include sunny, cloudy, rainy, windy, and voggy days. Use collected data to bar graph and analyze results.	K.W.7 K.SL.4 1.W.7 1.SL.4 2.W.7 2.SL.2	K.MD.1 1.MD.4 2.MD.10	K-ESS2-1 K-ESS3-2 SC.K.1.3 SC.1.1.2 SC.2.1.2	1.2.2
	Carbon footprint and Carbon sequestration.	Understand that plastics are made from oil, and participate in a plastics classroom recycling program. All plastic that has ever been made is still on the earth.	Recycle all plastics that are used in the garden. Wash and reuse plastic pots. Use repurposed containers for seedlings and potted plants (e.g., egg cartons, milk cartons).	Recycle and separate plastics from paper discards in the classroom. Children create posters, stories, poems or drawings that illustrate the opportunities of recycling at school, at home, or in the community. Students discuss recycling solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.	K.W.2 K.SL.1 1.W.5 1.SL.1 2.W.2 2.SL.1		K-ESS3-3 SC.K.1.3 SC.1.1.2 SC.2.8.2	

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				NGSS				
	Sources and Impacts (air water and soil) of clean energy in the community	Describe human activities at school or home that consume energy. Describe sources of energy for human activities.						
Best Conservation Practices	The individual's role in the conservation of natural resources. Conservation is a set of practices that preserve, restore, and protect natural resources and ecosystem Preserve, repair, and prevent deterioration of the environment, topsoil, water, and natural resources Waste is a system out of balance	Identify and describe natural resources in your community and how humans use them. Identify how resources can be renewable or nonrenewable. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. NGSS Identify invasive species in your geographical area and get to know them. Understand how they move and multiply. Understand how they impact the environment. Repair water damage and soil erosion in the garden environment. Design a Zero waste system for your garden, classroom or home.	Recycle and reuse all natural resources in the garden. Discuss how we impact the land, water, air, soil, or other living things. Identify a problem on campus or in the garden. Brainstorm and design a solution and choose one or more to implement Plant trees on campus. Native Plant identification Garden/Campus walk. Share stories of the native plants in your garden, campus, coastline, or forest. Identify and get to know invasive species in your community. Collect research by reading or asking questions. Identify ways that students can help reduce the impacts of invasive species.	What are natural resources and what is conservation? What causes an extinction of a plant or animal species? What would happen if there were no trees on our island? Discuss the impact of humans on the natural environment. What are native plant species? What are some alien and invasive plant species? How can we protect the native habitat? Identify ways that we can recycle discards in our classroom or at home.	K.W.8 K.SL.2 1.W.8 1.SL.2 2.W.8 2.SL.2 K.W.8 K.SL.2 1.W.8 1.SL.2 2.W.8 2.SL.2		K-ESS3-1 K-ESS3-3 SC.K.1.2 SC.1.2.2 SC.2.8.2 1-LS3-1 2-LS4-1 SC.K.1.3 SC.1.5.2 SC.2.8.2	5.2.1 5.2.2

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		STEM	Get to know alien invasive species in your garden, school, and community. Plant more native species in your school garden or campus and learn their Hawaiian names and stories. Plant the state flower Hibiscus Brackenridgei Ma'o Hau Hele. Create a wildlife garden section in your school garden to attract pollinators and predators.					