Spring School Garden Lessons & Next Generation Science Standards
Grade 2

STC Curriculum Life Cycles of a Butterfly provides great opportunity to observe the life cycle of a butterfly - caterpillars, metamorphosis and butterflies.
Below is a table of suggested 2nd grade garden lessons to enhance current curriculum with expanded focus on flower anatomy, other insect and plant lifecycles, structures and habitats. There is opportunity to find the caterpillar food source and observe the caterpillar and butterfly habitat in the real world.

It also provides a hands on experiment to demonstrate that plants require sunlight to grow, a direct performance expectation of Next Generation Science Standards (NGSS)

LL Science = Life Lab Science Curriculum; GC = Growing Classroom book (also by Life Lab); SGP = School Garden Project of Lane County lessons available on their website NGSS 2= Next Generation Science Standards for second grade

2nd Grade Lessons	Garden Lesson ideas to Bolster STC Life Cycles of the Butterfly – and meet NGSS – Spring 2017		
Lesson # and Date	**Lessons**	**Source**	**NGSS 2-**
1) Mid to late March	A)Plant Detective – what defines a plant	LL Science 2.2.a	
	B)Plant Peas discuss plant needs and life cycle		
	C)Plant Anatomy – illustrating and finding the Plantain or mallow Plant – a caterpillar's food and real habitat	LL Science 1.6.d	K-LS1-1 Patterns LS1.C
2) Mid April	A)Scientists at work part I – cover some pea seedlings; add some climbing poles to ½ peas w/light	LL Science 2.2.d	LS2-1
	B)What is an insect – create an insect/ are you an insect/ insect bingo		
	C)Plant Flowers to attract pollinators		
3) Late April	A)Scientists at work part II -Plant Reporter – record findings pea plants deprived of light	LL Science 2.2.e	LS2-1
	B)Insect mouth part differences and modeling	LL Science 3.7.d	LS4-1 LS1.A
	C)plant to deter bad insects and attract good insects		
4) Late April to early May	A)Dissect a real flower – give the parts names	LL Science 5.7.d	
	B)Observe trellised pea plants and record findings	LL Science 3.6.i	LS2-1 LS1.A
	C)wind pollination game	School Garden Project	
5) Mid to late May	A)Build a flower from a model – compare with the dissected real flower parts read The Reason For a Flower		
	B)Pollination game to test materials Bees vs Butterflies	School Garden Project - modified	LS2-2 ETS1-3 K-ESS3-1
	C)Plant carrot seeds into the garden – butterfly food		

Lesson objective summary and questions

In the spirit of science as an outcome of curiosity, instead of starting lessons with full descriptions of what students need to know and then conducting garden activities that demonstrate the knowledge, we'll work to get students into the garden activities first to fire up the brain with observations and creating questions. Then it will be vital to leave 15 minutes at the end of each garden time to summarize and ask questions to guide them to what students need to know. Below is the outline of lessons with a reference to the NGSS ideas being met and questions that station leaders should have ready to spur contemplation and help students bring their thoughts together around the main ideas. Read the actual lessons first. *In preparation for the lesson, the garden coordinators provide electronic and hard copy versions to the teacher, and provide all station leaders with their full lesson to read beforehand.*

Standard Code	Performance Expectation or Standard Description
2-LS2-1	Plan and conduct an investigation to determine if plants need sunlight and water to grow
2-LS2-2	Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants
2-LS4-1	Make observations of plants and animals to compare the diversity of life in different habitats
K-2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs

2nd Grade Spring Lessons	
Date - lessons	**Summary ideas, questions to ask and theme roundup for all stations (if possible)**
1) 3/23-4/03 A-plant detective B-Finding mallow C-Planting peas	Plants may look different from one another. They all have the same parts and needs This is an introduction to plants and their needs in preparation of the next lesson when the pea seedlings are covered to restrict light to look for affect on growth. A) What clues should we watch for in determining if something is a plant? How can we tell if something is a plant? What is a Plant? Accept all answers! What plant characteristics tell us what a plant does? What things tell us what a plant needs? B) Why do we call this a plant? What parts does this plant have? Comparing two plants - What do the plants have in common? Use observation skills to draw what the plant looks like and label the parts. C) What do plants need to grow? How can we test to see if plants really need light to grow? How should we plant a pea seed? Make sure to label the area planted. **NGSS:** Plants depend on air, water, minerals and light to grow. Different Plants survive better in different settings because they have varied needs for water, minerals, and sunlight.
2) 4/13-4/17 A-Plants needs B-Insect inquiry C-Plant Flowers	Follow up on Plants needs. Begin study of insects and plant/insect interaction A) You will be blocking sunlight on some of the pea seedlings and adding trellis (if feasible) for other seedlings. This is an introduction to fair testing in science so review all of the elements that plants need to grow (light, water, soil, air/space) and ask if everything could be considered equal for all seedlings. Would you like to be a scientist and do an experiment to find out if your plants really need light? Draw a life size drawing of the pea seedling. Place boxes to block light. What do you guess will happen? When will we know if there are results? How much time do you think it will take? Is the test a fair test? B) School Garden Project's Insect lesson has terrific background and activities. Follow directions for *Am I an Insect*. If time allows have students view garden creatures pre-

	collected in bug boxes to determine if they are insects. What things are the same? What things are different between the creatures? What do all insects have? (6 legs, 3 body parts, 2 antennae, compound eyes). Are all garden creatures insects? C) Plant flower seeds to attract insects which help pollinate crop flowers. What is pollination? Why is pollination important? How does pollination happen? Accept all answers. This will be covered in more depth in future lessons. **NGSS:** Plants depend on air, water, minerals and light to grow. Different Plants survive better in different settings because they have varied needs for water, minerals, and sunlight. Organisms obtain the materials they need to grow and survive from the environment. When animals and plants get too hot or too cold, they may die. If they cannot find enough food, water, or air, they may die. Animals can move around, but plants cannot, and plants often depend on animals for pollination or to move their seeds around.
3) 4/20–4/24 A)-Science report on peas B)-Insects mouths C)-Plant Borage to attract good insects	Follow up on Plants needs. Continue study of insects and plant/insect interaction and discussion of diversity of life A) What happened to your test plants without light? What have we learned about what plants need? How did it compare with your guess? Was there anything that surprised you in the experiment? Do you know why you needed a comparison plant in your experiment? Talk about the next stages of plant life cycle. B) We want students to understand the diversity of organisms that live in different habitats. Divide the group into 4 pair. Provide each pair with one tool (either a straw, sponge, tweezers or spoons). Provide each pair with one of the same food sample (bottle with colored water, container with floating cereal, or rice in soil). Give them 30 seconds per food type to test their mouthpart tools. Before starting, show students how to hold liquid in a straw without sucking it with their mouths – by holding a finger over the top and releasing. Consider diversity in our garden animals by investigating their mouth parts – caterpillars, worms, butterflies, flies, ladybugs all have similarities and big differences. They have specialized for survival. Why is it important that animals are not all trying to eat the same thing? Which tools worked best for each type of food? How does each tool correspond to animal mouth parts found in nature? Different diets help to ensure survival of a wide range of species. For example, caterpillars have different mouth parts and tastes than butterflies, so larva and adults are not competing for food in the same habitat. Organisms adapt to live in different habitats like ducks living in ponds. C) We need insects and other animals in our garden for a variety of things. Worms, millipedes, centipedes, pill bugs all help decompose vegetation to break down nutrients in the soil for plants to absorb. Ladybugs, pirate bugs, lacewings, hoverflies, wasps and praying mantis prey on problem insects like aphids and leaf miners. Butterflies, bees and moths help pollinate flowers to make seeds. Plant **Borage** *(Borago officinalis)* This annual herb has bright blue clusters of edible, cucumber-flavored flowers. Studies have shown borage to be exceptionally attractive to good bugs, with an average of over 100 beneficials found in just 1 square yard of borage. In addition, common green lacewings have a very strong preference to lay their eggs on borage. Have a picture of lacewing insect. **NGSS:** Plants depend on air, water, minerals and light to grow. Different Plants survive better in different settings because they have varied needs for water, minerals, and sunlight. How can there be so many similarities among organisms yet so many different kinds of plants and animals? There are many different kinds of living things in any area, and they exist in different places on land and in water.

	Animals can move around, but plants cannot, and they often depend on animals for pollination or to move their seeds around.
4) 4/24-5/08 A)Flowery investigation B)Plant adaptation on peas C)Wind pollination	Flower parts, adaptations and pollination. More follow up with Pea Plants to see adaptations plants have made to allow them to climb. A) To help students learn about flower structure, encourage them to distinguish the various flower parts they see and to name these parts according to what they look like or do. Later you may give them the correct names. Start by exploring the flower with a magnifying glass. After/while dissecting flowers ask what parts did you find in your flower? As part of the lesson, students tape parts of the flower onto a lab page provided and give the parts names. Collect the pages so students can refer to them in next week's lesson when they build a model flower. Did you find anything resembling eggs or seeds? Are all the flowers the same in certain ways? What do flowers do for the plant? What is pollination? Which plant parts are involved in pollination? If a butterfly helps pollinate a plant, is that an interaction? Which does the interaction help- the butterfly or the flower? (*Both – that's called mutually beneficial = mutualism).* B) In week two you added a trellis pole or wire cage to some pea plants. This week you will loosely follow "Get a Grip" lesson from life lab to examine what happened with the pea plants that were able to climb vs. those that did not have something to climb. Ask students: What are you testing in this experiment? Did you make some predictions about what would happen? Why do you think the pea plant can climb? What did you learn? How does a pea plant climb? How might this help the pea plant survive? C) A game in the School Garden Project Flower Pollination Lesson on pg.5 titled wind pollination game. Reading the full lesson gives great background information - good for review. Review what pollination is and the types of pollinators and the relationship that pollinators have with flowers. After the wind pollination game, it becomes clear why having a pollinator is more successful than relying on the wind. This will be covered in more detail in the next week's lesson. **NGSS:** Biological evolution explains both unity and diversity of plants *(flowers*) and animals. Plants depend on air, water, minerals and light to grow. Living things can survive only where their needs are being met. Animals can move around, but plants cannot, and plants often depend on animals for pollination or to move their seeds around.
5) 5/11 – 5/29 A)Model Flower B)Pollination game C)Plant Squash	After an initial flower investigation and wind pollination game, this final lesson allows students to take part in constructing a model foam flower while describing the parts of the flower and taking part in another pollination game to solidify knowledge about the relationship between flowers and their pollinators. A) A large foam model flower helps students clearly visualize the parts of a flower and, when they help construct this model, reflect on the flower they dissected the previous garden lesson. If the model is already constructed to save time, have each student in the group help name all the flower parts, and find the real flower part on their lab page. The book, <u>The Reason for a Flower</u> by Ruth Heller helps students understand interactions between plants and animals and the reason for pollination. Do all plants require pollination to produce seeds? *Yes.* Does all pollination require bees or butterflies? *No- there are other pollinators and the wind can also help spread pollen.* Will bees pollinate all flowers? *No, they don't see red so are attracted to white, yellow, pink, purple flowers.* Butterflies see red so are attracted to red flowers. They also see ultra violet which helps them find nectar pockets in the flower. B) This lesson loosely copies a pollination game from the School Garden Project Flowers and Pollinators lesson called Insect Pollination Game. Instead of using a cotton ball to transfer powder (pollen), use a pipe cleaner (short bee legs on a bee body) and a straightened, 2 pronged paper clip (longer butterfly legs) to transfer pollen. Play the game

	twice, once when both teams have the bee model and once when both teams have a butterfly model. Keep the resulting plates separate so students can check which was able to carry more pollen. After students race to see how much chalk powder they can transfer from one bowl (flower 1) to the next (flower 2), have students compare the transfer of pollen by the pipe cleaner bee to the paper clip butterfly. Although bees transfer more pollen, butterflies are still important pollinators because they are attracted to different flowers and travel longer distances. C) Work with students to plant winter squash seeds into the garden. Notice the size of these seeds – you can plant them 2 inches down into the soil. Discuss the space needs of a squash type plant. Do these seeds look familiar? Do you know what other plants are in the squash family? (cucumbers, pumpkins, zucchini, watermelon, cantaloupe are all in the cucurbit family) **NGSS:** Students use a simple model that mimics the function of an animal in pollinating plants. Students also analyze data from a test of two objects designed to solve the same problem (pollination) to compare the strengths and weaknesses of how each performs. Students also make observations of plants and animals, compare the similarities and differences and understand the mutually beneficial relationship between flowers and their pollinators. Animals can move around, but plants cannot, and plants often depend on animals for pollination or to move their seeds around. There are many different kinds of living things in any area and they exist in different places.