

In this unit students will plant a flower garden of marigolds, zinnias, and cosmos. The garden will serve as an important source of food (nectar) and shelter for butterflies. Each class will also care for a live Monarch caterpillar and observe its transformation into a chrysalis and finally a butterfly. Key concepts for the unit include 'āina, the needs and life cycles of flowers and butterflies, planting and caring for a flower garden, metamorphosis, caring for caterpillars, pollination, habitats, and seed saving.

RECOMMENDED GRADE LEVEL

Kindergarten

This unit is easily adaptable for other grade levels.

LESSON DELIVERY

This unit consists of four 45-minute lessons to be taught at 3 to 5 week intervals (about one lesson per month) over the course of one semester. Regular garden care and observations should take place between lessons, and teachers are encouraged to use the Lesson Extensions or create their own extension activities in order to connect the gardens with other classroom learning. In Hawai'i, populations of Monarch caterpillars and butterflies fluctuate throughout the year and may vary by location; local observations should be made. Consider this factor when planning for the live caterpillar experience with students. Flower seeds may be planted year-round, and will often reseed themselves (new plants will grow after flower seeds fall to the soil).

GARDEN CARE

- Teachers and students are responsible for watering and weeding their garden. Regular applications of organic nutrients (vermicast) are scheduled as part of each lesson.
- Add **Garden Monitor** to the list of classroom jobs assigned; these students should visit the garden daily to water the soil, check on the gardens, and make observations.
- Set up a shared weekly watering schedule amongst grade level teachers and/or parents and garden docents to make sure the garden receives adequate moisture.
- Please do not use synthetic chemicals (pesticides, herbicides, and/or fertilizers) in or around school and home gardens. If necessary, use "OMRI" (organic certified) products only.
- Post the **Garden Agreements** in the classroom and review them often with students.

PERENNIAL BUTTERFLY HABITATS

Consider planting your nectar flower seeds in a permanent location on campus so that your butterfly garden can live on perennially (year to year), providing a constant source of food for butterflies. Host plants, where butterflies lay their eggs, are another essential element of a butterfly habitat that can be planted on campus, with approval. Monarch butterflies only lay their eggs on milkweed plants, such as crown flower plants.

PRE & POST UNIT SURVEYS, TAKE HOME LETTERS, & STUDENT WORKBOOKS

- Pre and Post Unit Surveys measure student progress related to content knowledge, attitudes, and behavior change related to 'ĀINA Lessons.
- Take Home Letters contain suggested questions/activities for each lesson for families to help reinforce, engage, and learn along with their child.
- Student Workbooks include Student Worksheets and Take Home Letters, available for download at www.kokuahawaiifoundation.org/aina.
- Regular student observation time in the garden is encouraged with the use of individual Garden Journals or Folders, where drawings and writings can be kept by each student, or a Class Journal where weekly garden observations can be recorded by Garden Monitors.
- Plan to review and select examples of student work to be shared with the Kōkua Hawai'i Foundation.

LESSON EXTENSIONS

Gardens offer infinite, engaging learning opportunities, and teachers are encouraged to utilize them beyond these lessons. The lesson plans include a number of suggested activities (Lesson Extensions) designed for teachers and students to make the most of the gardening experience!

NEED HELP?

Contact the Kōkua Hawai'i Foundation with any questions or comments about this unit:

- aina@kokuahawaiifoundation.org
- (808) 638-5145



THE BUTTERFLY GARDEN			
Lesson 1	Lesson 2	Lesson 3	Lesson 4
Flower Life Cycle	Butterfly Life Cycle	Pollinators	Seed Harvest
SUGGESTED DELIVERY TIMES FOR FALL SEMESTER (3 to 5 weeks apart)			
September	October	November	December
SUGGESTED DELIVERY TIMES FOR SPRING SEMESTER (3 to 5 weeks apart)			
February	March	April	May
LESSON OVERVIEW			
Key Concepts <ul style="list-style-type: none"> • Flower life cycle • Needs of plants • Garden Agreements • Planting seeds 	Key Concepts <ul style="list-style-type: none"> • Butterfly life cycle • Metamorphosis • Needs of butterflies • Caring for caterpillars and the garden 	Key Concepts <ul style="list-style-type: none"> • Pollination • Life cycles • Garden care, observations, and drawing from life 	Key Concepts <ul style="list-style-type: none"> • Habitats • Seed saving • Roll of pollinators in the formation of fruits, vegetables, and seeds
Introduction Read <i>Zinnia's Flower Garden</i> . Discuss the needs of plants and people. Introduce the Garden Agreements.	Introduction Read the <i>Life Cycles: Butterflies</i> book. Discuss and act out the butterfly life cycle. Discuss the needs of butterflies.	Introduction Read the <i>Insect Pollinators</i> book. Discuss the caterpillar experience and the important role of pollinators.	Introduction Read <i>The Butterfly</i> book and discuss what butterflies need in their habitat. Discuss seed saving and observe a seed collection.
Activity 1: Flower Life Cycle Review the book and what plants need. Discuss and draw the flower life cycle.	Activity 1: Caterpillar Experience Observe live caterpillars and discuss how to care for them.	Activity 1: Garden Drawing, Exploration, & Harvest Draw pictures of the garden. Search for pollinators and explore using magnifying glasses. Harvest fresh and withered flowers (for seeds).	Activity 1: Flower Harvest Harvest fresh flowers and make bouquets.
Activity 2: Butterfly Garden Planting Make observations, plant flower seeds, add vermicast, water the soil, and practice the Garden Agreements. Act out the flower life cycle during the Closing.	Activity 2: Garden Activities Collect natural items and create a home for butterflies and garden creatures. Care for the garden by watering and adding vermicast. Make observations.	Activity 2: Garden Care Care for the garden by watering and adding vermicast. Optional: Add compost and mulch. Act out the life cycles of flowers and butterflies.	Activity 2: Seed Saving Cut withered flowers and harvest the seeds. Look at them closely with magnifying glasses. Enjoy a fruit/vegetable/seed snack during the Closing.
Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Remove cover cloth when sprouts emerge (if used) • Student Worksheet: Flower Life Cycle • Teacher Handout: Butterfly Information • Journaling and discussion • Lesson Extensions • Take Home Letter 	Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Teacher Handout and Class Data Sheet: Caterpillar Care & Observations • Student Worksheet: Butterfly Life Cycle • Journaling and discussion • Lesson Extensions 	Follow Up Activities <ul style="list-style-type: none"> • Daily garden care and observations • Student Worksheet: Butterfly Garden Drawing (complete by coloring) • Compare flower and butterfly needs and life cycles • Continue to harvest and dry seeds from withered flowers • Journaling and discussion • Lesson Extensions 	Follow Up Activities <ul style="list-style-type: none"> • Continue to care for the gardens and harvest fresh and withered flowers; dry and save seeds • Place mulch over bare soil • Student Worksheet: Garden Reflection • Journaling and discussion • Lesson Extensions • Submit examples of student work to Kōkua Hawai'i Foundation

ACADEMIC STANDARDS GUIDE: KINDERGARTEN ALIGNMENT

Common Core Standards (CCSS), Language Arts		
K.RL.10	Reading Literature: Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.	Lessons 1, 2, 3, 4
K.RI.10	Reading Informational: Range of Reading and Level of Text Complexity: Actively engage in group reading activities with purpose and understanding.	Lesson 2
K.W.2	Writing: Text Types and Purposes: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.	Lesson 2
K.W.3	Writing: Text Types and Purposes: Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened.	Lessons 1, 2, 3, 4
K.W.8	Writing: Research to Build and Present Knowledge: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.	Lessons 1, 2, 3, 4
K.SL.2	Speaking and Listening: Comprehension and Collaboration: Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.	Lessons 1, 2, 4
K.SL.5	Speaking and Listening: Presentation of Knowledge and Ideas: Add drawings and other visual displays to descriptions as desired to provide additional detail.	Lesson 1
K.L.6	Language: Vocabulary Acquisition and Use: Use words and phrases acquired through conversations, reading and being read to, and responding to texts.	Lessons 1, 2, 3, 4

Hawai'i Content & Performance Standards III (HCPS III)		
FA.K.1.2	How the Arts are Organized: Use developmentally appropriate art media, tools, and processes	Lessons 2, 3, 4
FA.K.3.1	How the Arts are Organized and Applied: Perform imitative movements	Lessons 1, 2, 3
FA.K.4.2	How the Arts Communicate: Create movements that represent ideas, persons, and places	Lessons 1, 2, 3
HE.K-2.1.7	Personal Health and Wellness: Describe the benefits associated with personal cleanliness	Lessons 1, 2, 3, 4

(Academic Standards Guide continues on page 4)



ACADEMIC STANDARDS GUIDE: KINDERGARTEN ALIGNMENT (CONTINUED)

Next Generation Science Standards (NGSS)		
Disciplinary Core Ideas		
LS1.C	Organization for Matter and Energy Flow in Organisms: All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.	Lessons 1, 2, 3, 4
ESS3.A	Natural Resources: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.	Lessons 1, 2, 3, 4
Science and Engineering Practices		
	Obtaining, Evaluating, and Communicating Information: Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas.	Lessons 2, 3, 4
	Analyzing and Interpreting Data: Use observations to describe patterns in the natural world in order to answer scientific questions.	Lessons 2, 3, 4
	Developing and Using Models: Use a model to represent relationships in the natural world.	Lesson 2, 3
Crosscutting Concepts		
	Patterns: Patterns in the natural and human designed world can be observed and used as evidence.	Lessons 1, 2, 3, 4
	Systems and System Models: Systems in the natural and designed world have parts that work together.	Lessons 1, 2, 3, 4

NGSS Performance Expectation: K-ESS3-3 Earth and Human Activity			
Students who demonstrate understanding can:			
K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.			
Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts	Lesson
Obtaining, Evaluating, and Communicating Information: Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. <ul style="list-style-type: none"> Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. 	ESS3.C Human Impacts on Earth Systems: Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. ETS1.B: Developing Possible Solutions: Design can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	Cause and Effect: Events have causes that generate observable patterns.	Lesson 3 Hawai'i's Native Butterflies Extension Activity

ABOUT 'ĀINA IN SCHOOLS

'ĀINA In Schools is a farm to school initiative that connects children to their local land, waters, and food to grow a healthier Hawai'i. In addition to encouraging the use of locally grown fruits and vegetables in school meals and snacks, the program includes standards-based nutrition, garden, and compost curricula that empower children to grow their own food, make informed food decisions, and reduce waste. 'ĀINA In Schools also provides field trips to local farms, chef cooking demonstrations in classrooms, as well as waste reduction, garden, and cooking educational opportunities for families and community members.



PUBLISHING INFORMATION

The 'ĀINA In Schools curriculum includes Nutrition Education, Garden-Based Learning, and Waste Reduction lessons for kindergarten through sixth grade students.

All 'ĀINA In Schools curriculum and materials are property of the Kōkua Hawai'i Foundation and are distributed to trained educators for use at schools participating in the 'ĀINA In Schools program. The curriculum and materials may be reproduced for individual classroom use by schools participating in the 'ĀINA In Schools program or by registered users approved by the Kōkua Hawai'i Foundation. Reproduction of the curriculum and materials is not permitted by unregistered users without the express written consent of the Kōkua Hawai'i Foundation.

The registration and training process helps Kōkua Hawai'i Foundation to gather educator feedback on the curriculum and to document how many children and schools are being reached through the lessons. Visit our website to become a registered user, sign up for trainings, and gain access to all Kōkua Hawai'i Foundation curriculum and resource guides. If you receive a copy of the curriculum via other means, we ask that you please email aina@kokuahawaiifoundation.org to share your plan for use of the materials. Please direct questions about the 'ĀINA In Schools program and curriculum to aina@kokuahawaiifoundation.org.

MAHALO

The Kōkua Hawai'i Foundation thanks the following organizations and individuals who have assisted with the development of the 'ĀINA In Schools curriculum and materials:

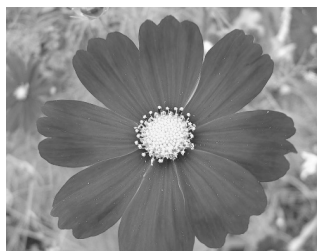
- **Kōkua Hawai'i Foundation:** Kaliko Amona, Lydi Morgan Bernal, Sarah Gelb, Kim Johnson, Julius Ludovico, Summer Maunakea, Debbie Millikan, Deanna Moncrief, Kelly Perry, www.kokuahawaiifoundation.org
- **The Green House:** Betty Gearen and Tia Meer, www.thegreenhousehawaii.com
- **GrowingGreat:** Marika Bergsund and Lori Sherman, www.growinggreat.org
- **Food for Thought:** Marty Fujita, www.foodforthoughtojai.org

Special thanks to the students, teachers, and volunteers who have participated and taught lessons in previous years and provided their valuable feedback to improve them.

Mahalo nui!

This Pre-Unit Survey is to see what you already know about these topics. It is ok if you don't know any of the answers. You will be learning about these topics this semester. Try your best and have fun!

1. Draw a **circle** around the pollinator:



Flower

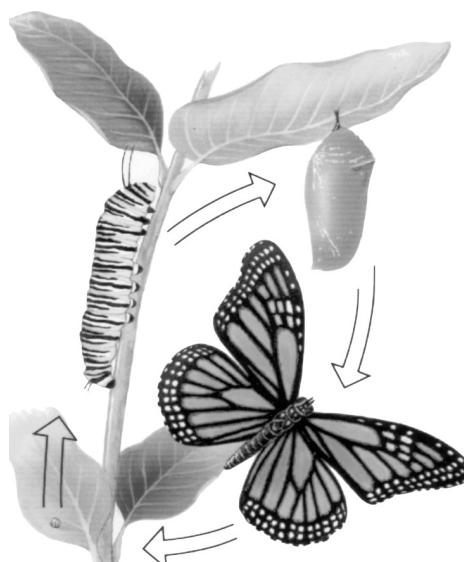


Carrot



Bee

2. Draw a **circle** around the chrysalis stage of the butterfly life cycle:



3. Draw a **circle** around what a seed grows into right after it is planted:



Sprout






Vegetable



Flower

4. Do you like gardening? **Circle** ONE answer:  Yes  I don't know  No

5. Do you like eating fruits and vegetables? **Circle** ONE answer:  Yes  I don't know  No

6. Do you like cooking? **Circle** ONE answer:  Yes  I don't know  No

7. Do you like 'ĀINA Lessons? **Circle** ONE answer:  Yes  I don't know  No

8. Draw a **Circle** around all the fruits and vegetables you like to eat:



9. Draw a picture of what 'āina means to you.

Dear Parent or Caregiver:

This semester, kindergartners will be participating in four garden lessons being delivered by volunteers of 'ĀINA In Schools, a program of Kōkua Hawai'i Foundation. 'ĀINA In Schools is a farm to school initiative that connects children to their local land, waters, and food to grow a healthier Hawai'i. Program components vary from school to school and include nutrition education, garden-based learning, healthy snacks, farm field trips, chef visits, waste reduction, and family and community outreach.

Although the lessons are delivered once a month, the students will be continually engaged in between lessons with regular garden activities that include watering, weeding, making observations, and spending time in the garden.

Photos and Media Releases: By now each of you should have received a Kōkua Hawai'i Foundation Media Release Form. We hope that you have filled out this form and have submitted it to your child's classroom teacher. From time to time, KHF takes photos/videos of our lessons to highlight activities that are noteworthy.

To keep yourself up to date on what your child is doing in 'ĀINA, we suggest putting this up on your refrigerator or bulletin board and follow up as the lessons are delivered. You can help reinforce, engage, and learn along with your child by going over the lessons and activities after each lesson. A unit summary and suggested questions/activity for each lesson are listed below.

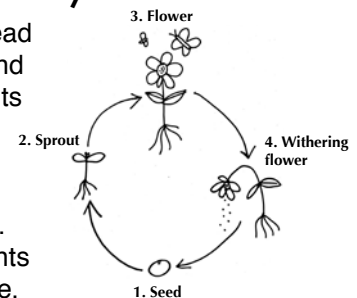
Mahalo!

In **The Butterfly Garden** unit, students will plant a flower garden of marigolds, zinnias, and cosmos. The garden will serve as an important source of food (nectar) and shelter for butterflies. Each class will also care for a live monarch caterpillar and observe its transformation into a chrysalis and finally a butterfly. Key concepts for the unit include 'āina, the needs and life cycles of flowers and butterflies, planting and caring for a flower garden, metamorphosis, caring for caterpillars, pollination, habitats, and seed saving.



Lesson 1 - Flower Life Cycle

In this lesson, students read *Zinnia's Flower Garden* and discuss the needs of plants and people. They explore the flower life cycle and plant flower seeds to create a Butterfly Garden. During the closing, students act out the flower life cycle.



Questions to discuss with your child:

- What do plants need in order to survive and thrive?
- What are the stages in the flower life cycle?
- How will the flower garden help butterflies?

Suggested home activity: Seed Collection

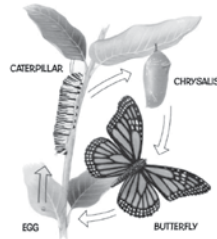
- Collect various seeds of differing sizes and texture.
- Make observations using senses and discuss differences and similarities.
- Ask questions: Are seeds alive? What are seeds for?

Lesson 2 - Butterfly Life Cycle

In this lesson, students read *Life Cycles: Butterflies*, and discuss and act out the butterfly life cycle. They discover what butterflies need to survive and thrive. Students observe a live monarch caterpillar and learn how to care for it while it transforms into a butterfly over the next few weeks. They care for their garden and create a home for butterflies.

Questions to discuss with your child:

- What do butterflies need in order to survive and thrive?
- What are the stages in the butterfly life cycle?



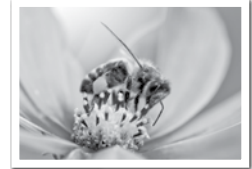
Suggested home activity:

Everything has a Cycle of Life

- Learn about other organisms life cycles and identify similarities and difference between them.
- Compare these organisms to non-living things, and how their life cycles are also similar or different.

Lesson 3 - Pollinators

In this lesson, students discuss their caterpillar experience and the important role of pollinators in helping plants create seeds (pollination). They act out the life cycles of flowers and butterflies, then visit their Butterfly Garden and draw the flowers and pollinators they see, explore the garden using magnifying glasses, and care for the garden.



Questions to discuss with your child:

- How do flowers help butterflies?
- How do butterflies help flowers?
- Why are pollinators important?

Suggested home activity: Native Hawaiian Butterflies

- Visit the website <http://cms.ctahr.hawaii.edu/pulelehua> and learn about the Kamehameha Butterfly, Hawai'i's State Insect and participate in the Pulelehua Project.



Lesson 4 - Seed Harvest

In this lesson, students read *The Butterfly* and discuss seed saving. They make flower bouquets, harvest and study flower seeds from the garden. They eat fruits, vegetables, and/or seeds that were created with the help of pollinators.



Questions to discuss with your child:

- What are the important elements of a butterfly habitat?
- Why is seed saving important?

Suggested home activity: Plant a Flower Garden

- Start a flower garden either in a pot or allot some space in the garden at home. Suggested seeds to plant: marigold, zinnias and cosmos.
- As flowers bloom, observe presence of pollinators - bees or butterflies and discuss the importance of this relationship.

If you have any questions or are interested in becoming an ĀINA In Schools docent, please do not hesitate to ask.

To learn more about ĀINA In Schools at your child's school, please contact your school's ĀINA Team Coordinator, or contact:



ĀINA In Schools

aina@kokuahawaiiifoundation.org



DESCRIPTION

Students will read *Zinnia's Flower Garden* and discuss the needs of plants and people. They will explore the flower life cycle and plant flower seeds to create a Butterfly Garden. During the Closing students will act out the flower life cycle.

TIME: 45 minutes

SUBJECTS: Fine Arts, Health, Language Arts, Science

LEARNING OBJECTIVES

After this lesson students will be able to:

- Understand that plants need soil, water, sun, air, and love in order to survive and thrive.
- Describe the stages of the flower life cycle: Seed, sprout, flower, withering flower with seeds.
- Understand that seeds are alive and contain a tiny plant inside; they should be planted with love.
- Recognize that gardens need people to care for them by watering and visiting them often.

ACADEMIC STANDARDS*

CCSS, Language Arts: K.RL.10, K.W.3, K.W.8, K.SL.2, K.SL.5, K.L.6 **HCPS III:** FA.K.3.1, FA.K.4.2, HE.K-2.1.7 **NGSS:** LS1.C, ESS3.A, Patterns, Systems and System Models **Lesson Extensions:** Obtaining, Evaluating, and Communicating Information

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. *Zinnia's Flower Garden*
 2. The Butterfly Garden (What Plants and People Need)
 3. Group Activities Overview
- II. Group Activities (20 minutes)
 1. Flower Life Cycle (10 minutes)
 2. Butterfly Garden Planting (10 minutes)
- III. Closing (10 minutes)
 1. Act Out Flower Life Cycle



KEY TERMS AND CONCEPTS

Āina - Land; that which feeds, nourishes, and sustains us (e.g., food, water, air)

Flower - The colorful part of a plant that attracts pollinators and produces seeds

Life Cycle - The series of changes occurring in an organism between one developmental stage and the identical stage in the next generation

Nectar - A sugary liquid secreted by plants, especially within flowers to encourage pollination; a source of food for many types of insects, birds, and mammals; collected by bees to make into honey

Seed - A tiny plant (embryo) and a food supply to nourish its first growth

Sprout - A small/young plant whose first leaves and stem have emerged from the ground and whose roots have begun to grow

Thrive - To grow or develop vigorously, to flourish

Wither - To lose freshness and moisture; to shrivel and fade



LESSON MATERIALS

Community Supplies:

- Small portable white board
- 2 dry erase pens
- Vermicast (about 1 cup per class)

Lesson Supplies:

- Book: *Zinnia's Flower Garden* by Monica Wellington
- Flowers & Seeds Sign
- Flower Life Cycle Sign
- Garden Agreements Sign
- Flower seeds: cosmos, marigolds, zinnias (about 1 Tbs. seed mix per 4'x4' garden bed)
- Water key with lanyard
- Student Workbook

Teaching Team to Provide:

- A sheet or blanket big enough for 10-12 students to sit on

School to Provide:

- 12 child-safe garden tools to loosen soil
- 5-gallon bucket and 5+ plastic cups for daily watering (and/or small watering cans)
- Optional: Cover cloth (sheet, burlap, or other) to cover newly planted seeds

ACCOMPANYING DOCUMENTS

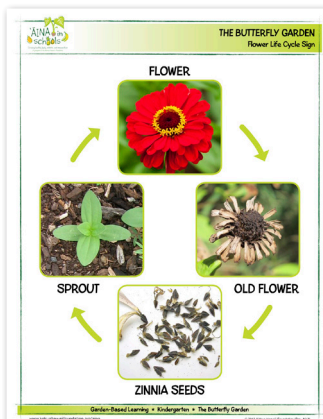
- ĀINA Pre-Unit Survey
- Take Home Letter
- Background Information: Butterflies
- Student Worksheet: Garden Agreements
- Student Worksheet: Flower Life Cycle

ADVANCE PREPARATION

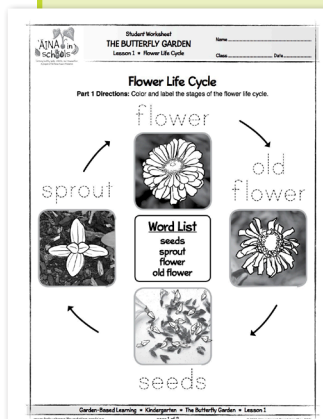
- Discuss lesson preparation and presentation plans with your teaching team.
- Confirm teachers have administered ĀINA Pre-Unit Surveys prior to the first lesson.
- Review the Background Information document.
- Make copies of the Student Worksheet and Take Home Letter, one per student if not using the Student Workbook.
- Get to know the garden! Allow students to explore their garden soil by having them dig with hands and tools and make careful observations. How does the soil feel and smell? What creatures live in our garden? In preparation for planting, loosen the soil and remove any weeds. Water the soil thoroughly one day before the lesson.



Flowers & Seeds Sign



Flower Life Cycle Sign



Student Worksheet:
 Flower Life Cycle



Background Information:
 Butterflies

INTRODUCTION

15 MINUTES

“Aloha! We are... (state docents’ names) with the ‘ĀINA In Schools program. The ‘ĀINA In Schools program connects us to our food and land so we can live healthy lives and be great stewards of the environment. ‘ĀINA is an important Hawaiian word that means land and that which feeds, nourishes, and sustains us all, including food, water, and air.”

“When we come to visit you we will learn to take care of the ‘āina and our garden plants and animals.”

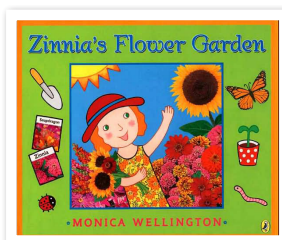
Get to know which ‘ĀINA components are being implemented at your school so you can briefly refer to them in this section. For example, “Some other classes are exploring nutrition and food choices, some are reducing waste through composting, and some are visiting local farms to learn about where our food comes from.”



“Today we will explore the life cycle of flowers. We are going to plant flower seeds to create a Butterfly Garden!” Show the Flowers & Seeds Sign.

ZINNIA'S FLOWER GARDEN

Read *Zinnia's Flower Garden* by Monica Wellington to the students, illustrating to students how to plant and care for a beautiful flower garden.



THE BUTTERFLY GARDEN

“Today we are going to plant flower seeds in our garden! We are going to help butterflies, who love to drink sweet NECTAR from flowers. If we take good care of our seeds they will grow into flowers and provide food for butterflies. Our garden will be called The Butterfly Garden.”

- **What plants need:** “Before we plant our garden let’s discuss what plants need in order to survive and THRIVE.” Ask students to raise their hands and share the things that plants need. Desired answers: Sunlight, water, soil, air, love.
- **What people need:** “Do we need the same things that plants do?” Accept a few student answers. “Yes, we need air, water, sunlight and love. Do we need soil?” Let the students ponder this question. “What do we eat?” Desired answer: Plants! “And where do plants grow? Plants grow in the soil so we need soil too!” Ask the students to name some food plants that grow in the soil.

GROUP ACTIVITIES OVERVIEW

“Today we will divide into two groups. One group will discuss and draw the life cycle of flowers. The other group will plant flower seeds in our Butterfly Garden. Then we will switch.”

Garden Agreements

Have students take a deep breath, then repeat and discuss the Garden Agreements as listed on the Garden Agreements Sign. Spend some time during this first lesson to review with students the examples on page 2 of the sign.



- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL

Divide the students into two groups before going outside.



GROUP ACTIVITIES

20 MINUTES

Gather in a circle around the garden. Share gratitude for the garden, our seeds, the sun, air, water, soil, and each other. Optional: Sing a garden/planting song. Note: Developing a routine protocol for entering the garden helps to cultivate a sense of respect and appreciation.

Direct students to their assigned group area. Rotate groups after 10 minutes. Regroup for closing.

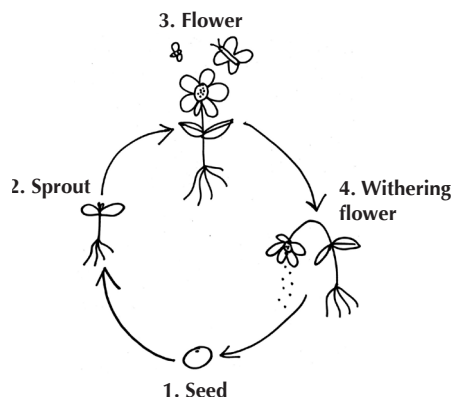
FLOWER LIFE CYCLE (10 minutes)

Bring the *Zinnia's Flower Garden* book, Flower Life Cycle Sign, portable white board, and dry-erase pens. **Sit in a circle on a sheet or blanket with the students.**

Review the book with students, allowing them to ask and answer questions about key details. Review what plants need, as discussed in the Introduction.

Using the white board and dry erase pens, ask a different student to draw each stage of a flower's life cycle, according to the procedure below. Label each stage and draw an arrow after each stage is added, in order to make the shape of a circle (see diagram below).

1. How does the life of a flower begin? As a SEED.
2. If the seed has everything it needs, what does the seed become? A SPROUT.
3. When the sprout grows up it becomes: A FLOWER.



- What types of insects visit the flower?
Bees and butterflies.
 - Do you know what forms inside the flower? Seeds.
4. What happens when the flower gets old? It will **WITHER** (shivel, fade, and turn brown) and the seeds will fall to the soil.
 - What happens next? The seeds begin to grow and the **LIFE CYCLE** begins again!



Flower Life Cycle Sign

Show students the Flower Life Cycle sign next to the drawing. Point out their circular shapes. "These pictures represent the **LIFE CYCLE** of a flower plant. New life (seeds) come from the old plants, and the circle of life goes around and around!"

BUTTERFLY GARDEN PLANTING (10 minutes)

Bring the flower seeds and gardening equipment.

1. **Practice the Garden Agreements:** Help students to practice the Garden Agreements while they are outside in the garden.
2. **Observe:** Allow time for students to explore the garden soil and make observations with their many senses. Encourage them to share and ask questions about what they observe.
3. **Loosen the Soil:** Have students loosen the soil with their tools so that the new plant roots will have air and room to grow. Students may crumble soil chunks with their hands to make the soil soft and smooth. Level the surface of the soil and have students put their tools away.
4. **Demonstrate:** Show students how to plant the flower seeds before handing them out. Sprinkle the seeds over the soil like salt and pepper, then sprinkle soil on top so that seeds are covered with a fine blanket, OR "rake" seeds into the soil with your fingers. Be sure to spread the seeds out evenly; if they are all together in one place they will be too crowded as they grow. Ask students to observe the seeds closely once they receive them,

GROUP ACTIVITIES

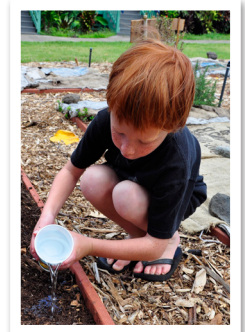
CONTINUED

and think about the tiny life inside! Have students hold them in their hand to give them energy to grow. Seeds should be placed gently in the soil (not thrown), then covered with soil (not buried). Students can say “Goodnight seeds!” as they cover the seeds with soil.



5. **Planting:** Give each child a pinch of seeds to plant. Ask students to observe the seeds closely once they receive them, and think about the tiny life inside! Have students hold the seeds in their hands to give them the energy and love they need to grow. Seeds should be placed gently in the soil (not thrown), then covered with soil (not buried). Students can say “Goodnight seeds!” as they cover the seeds with soil. Make sure the seeds are planted evenly over the entire bed and covered with a light layer of soil (about 1/4 to 1/2 inch).

6. **Vermicast:** Add about 1 cup of vermicast to the garden. If the vermicast is moist, dissolve it in water and water the soil with the nutrient-rich water. If the vermicast is dry, sprinkle it over the soil and mix it in lightly.
7. **Watering:** Have students take turns watering the soil gently with their watering can or cups (like rain, not waterfalls; allowing the soil to “sip and swallow”). Mention that young plants need lots of water and care. The seeds we are planting will create food for butterflies and other pollinators like bees.
8. **Cover Cloth (optional):** After the second group has planted, cover the soil and seeds with the cover cloth in order to protect them from the sun and birds. Be sure that the soil is thoroughly and adequately moist. Check daily and remove the cover cloth as soon as the seeds sprout.



CLOSING

10 MINUTES

Gather all the students in the garden. Ask them to share about their experience.

ACT OUT FLOWER LIFE CYCLE

Together with students, act out the four stages of the flower life cycle, from seeds to sprouts to tall plants with blooming flowers, to withering flowers filled with seeds!

Discuss with students:

- What do plants need in order to survive and thrive?
- What are the stages in the flower life cycle?
- What are our Garden Agreements?

“Please take good care of your garden and make sure to water and visit it every day. It is very important that the soil stays moist so the seeds will sprout and grow!”

All students must wash their hands thoroughly with soap and water after working in the garden. Demonstrate the proper hand washing method: Wet, lather, and scrub hands and wrists with soap for 15 seconds (sing the ABC’s), then rinse thoroughly. Be conscious of keeping hands clean after washing. Explain that washing our hands keeps us healthy!



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Assign one or more **Garden Monitors** to water the garden and check for sprouts every day. Supplement as needed; it is critical that the soil stay evenly moist during sprouting. Feel the soil with your hand to a depth of about 2 to 3 inches to ensure that the soil is adequately moist.
- If the soil is covered with a cover cloth, remove it as soon as the first sprouts appear (within about 4 to 10 days). Hang to dry and store for future use.
- Remove weeds from in and around the garden bed.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Have students complete the Garden Agreements and Flower Life Cycle Student Worksheets.
- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc.
- Count with students how many days go by before the first sprout appears.
- Discuss with students:
 - What do plants need to survive, just like you? Sunlight/energy, water, air, soil/food, love.
 - Name the stages of a flower's life cycle. Seed, sprout, flower, withering flower with seeds.
 - How will our garden help butterflies? The flowers will provide food (nectar) for the butterflies and a safe place for them to rest.
- Review the Butterfly Information Teacher Handout in preparation for Lesson 2, and as background information for any additional Lesson Extension activities.
- Send home Take Home Letter.

LESSON EXTENSIONS

Seed Collection

(Obtaining, Evaluating, and Communicating Information)

1. Collect various seeds of differing sizes and textures.
2. Have students observe the collection using their many senses and make drawings and notes.
3. Discuss the differences and similarities and encourage question asking. Are seeds alive? What are seeds for? Why is diversity important? Match the seed to its grown-up plant.

Seed Anatomy Study

(Obtaining, Evaluating, and Communicating Information)

1. Soak kidney or lima beans for 1-2 days (1 per student).
2. Have students take off the seed coat and carefully separate the two halves of the seed. Discover the tiny plant inside! Look for, draw, and label the root and two small leaves. The rest of the seed is food for the tiny plant!
3. Place seed parts in the soil where they will either grow or decompose and feed the soil.
4. Encourage the students to ask questions about what they have observed.



Butterflies

BUTTERFLY LIFE CYCLE NOTES

There are many different kinds of butterflies, but the one we focus on for The Butterfly Garden unit is called the **Monarch butterfly** (*Danaus plexippus*). Monarch butterflies begin life as tiny, white eggs laid on milkweed plants. The eggs hatch after 4 or 5 days, and the caterpillars that emerge eat a diet of milkweed leaves (e.g., crown flowers) for 10 to 20 days. The caterpillars will eat only milkweed leaves and they eat enormous quantities as they grow (one caterpillar can eat up to a total of 20 leaves). They will grow to 2,700 times their original size in only two weeks, molting five times in the process (shedding their skin to grow). Once fully grown, the caterpillar rests for a day, then hangs upside down in a “J” form. Do not touch them during this stage! Within several hours the caterpillar will turn into a green chrysalis. The case is emerald green and ringed with golden dots. For 7 to 14 days the caterpillar inside its chrysalis goes through an amazing metamorphosis and emerges as a butterfly. A day after the chrysalis turns black (the skin of the chrysalis has become clear), the butterfly will emerge. An hour or more later, after the butterfly dries its wings, it will begin to fly and needs to be taken out into the Butterfly Garden and released. The life span of an adult Monarch is normally 2 to 8 weeks.

PLANTING A BUTTERFLY GARDEN

Butterfly gardens should be placed in areas with full sun. There should be good air circulation, without too much wind. Stagger blooming of nectar plants to attract butterflies year-round. Unlike most of the continental U.S., butterflies in Hawai'i feed and breed all year, though there is usually a population explosion after the rainy season when larval food is more available. If you plant crown flower the Monarch butterflies are sure to come. Each butterfly species has specific “host” plants where they lay their eggs, as described below, but they will take nectar from just about any flower.



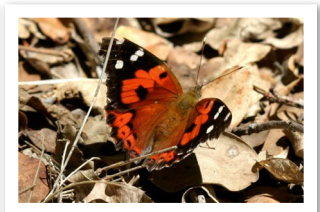
Butterfly Life Cycle

HAWAII'S NATIVE BUTTERFLIES

Hawai'i has two endemic butterflies and a host of introduced species. The endemic Blackburn's Blue or Hawaiian Blue (*Udara blackburnii*) is blue on top, green on bottom and is most often seen in the transition zone between the lowlands and mountains. The endemic Kamehameha butterfly (*Vanessa tameamea*) is similar in appearance to the Monarch, but is more red than orange with prominent black markings, especially under the wings. It is usually seen in higher elevations. 'Aiea State Park and Tantalus are good places to find them on O'ahu.



Hawaiian Blue



Kamehameha

NATIVE BUTTERFLY FOOD

Larval “Host” Plants

- 'A'ali'i (*Dodonaea viscosa*) – Blackburn's Blue or Hawaiian Blue
- Koa (*Acacia koa*) – Blackburn's Blue or Hawaiian Blue
- Mamaki (*Pipturus albidus*) – Kamehameha

Nectar Plants

- Hibiscus (*Hibiscus arnottianus*, *H. waimea* and *H. kokio*)
- Ko'oko'olau (*Bidens* spp.)
- Nehe (*Wollastonia* and *Lipochaeta*)
- 'Ōhi'a lehua (*Metrosideros polymorpha*)

INTRODUCED BUTTERFLIES FOUND IN HAWAII

- **Monarch** — Quite common; lays its eggs on milkweed plants such as crown flower trees.
- **Western Pygmy Blue** — Lays its eggs in pickle weed and is plentiful at West Loch Shoreline Park.
- **Citrus Swallowtail** – Resembles bird droppings in its early larval stages and as it grows develops foul-smelling orange antenna that come out if it is touched.

- **Two Skipper butterflies, the Fiery and the Banana** — These are on the cusp between moths and butterflies.
- **Cabbage White** — A smallish white butterfly with a single or double black spot on each forewing, depending on gender. Caterpillars eat the leaves of cabbage family plants (collard greens, kale, etc.)
- **Painted Lady and Painted Beauty** (also called the American painted lady) — Both have orange and black markings, but unlike the Monarch, are more mottled than striped.
- **Passion Vine butterfly** (or Gulf Fritillary) — Again, orange and black markings appear, but the passion vine has distinctive silver spots on its underwing.
- **Sleep Orange Butterfly** — These have orange wings with black edges. Butterfly lays elongated white eggs, often on caterpillars as they eat leaves.

NON-NATIVE BUTTERFLY FOOD

Larval “Host” Plants

- Butterfly weed (*Asclepias curassivica*) – Monarch butterfly
- Cabbages, collard greens, kale, broccoli (*Brassica* spp.) – Cabbage White butterfly
- Crown flower (*Calotropis gigantea*) – Monarch butterfly
- Passionflower vines (*Passiflora* spp.) – Passion Vine butterfly
- Thistles (*Cirsium* spp.) – Painted Lady butterfly
- Citrus trees (*Citrus* spp.) – Citrus Swallowtail butterfly

Nectar Plants

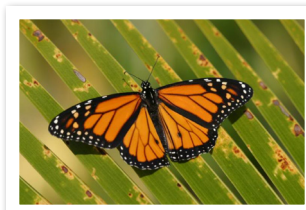
- Aster (*Aster* spp.)
- Bougainvillea (*Bougainvillea glabra*)
- Cosmos (*Cosmos bipinnatus* and *C. sulphureus*)
- Hibiscus (*Hibiscus rosa-sinensis*)
- Impatiens (*Impatiens wallerana*)
- Lantana* (*Lantana camara*)
- Marigold (*Tagetes* spp.)
- Butterfly bushes* (*Buddleia davidii*, *B. madagascariensis* and *B. asiatica*)
- Verbena (*Verbena* spp.)
- Zinnia (*Zinnia elegans*)

*Note: These plants are invasive and should not be planted.

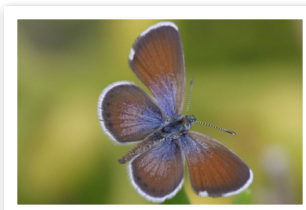
Source: Honolulu Advertiser (www.archives.starbulletin.com/2000/03/17/features/index.html)

Butterfly photos by Jim Snyder

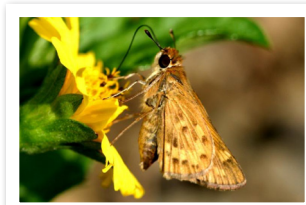
Sleepy Orange Butterfly photo by Forest & Kim Starr



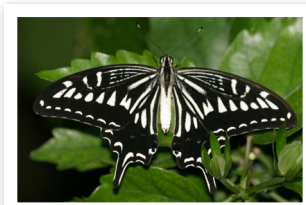
Monarch



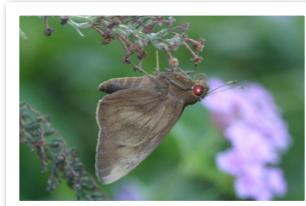
Western Pygmy Blue



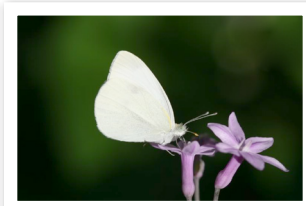
Fiery Skipper



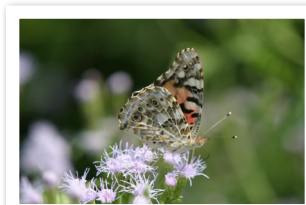
Citrus Swallowtail



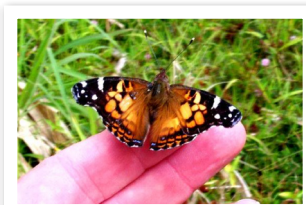
Banana Skipper



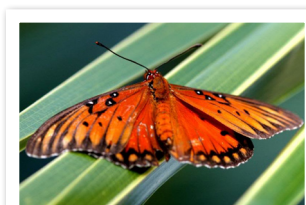
Cabbage White



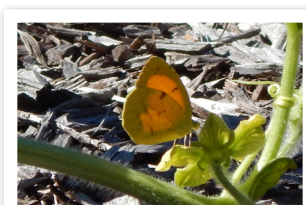
Painted Lady



Painted Beauty



Passion Vine



Sleepy Orange Butterfly



Student Worksheet
THE GARDEN AGREEMENTS

Name

Class Date

Directions: Draw a picture of you in the garden following the Garden Agreements.
Color the Garden Agreements on page 2.

I WILL BE SAFE

*

I WILL BE KIND

*

**I WILL HAVE
AN OPEN MIND**

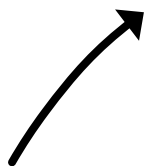
*

**I WILL USE
MY TIME WELL**

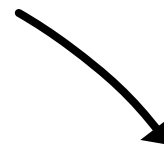
Flower Life Cycle

Part 1 Directions: Color and label the stages of the flower life cycle.

flower



sprout

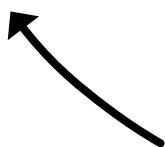


old
flower



Word List

seeds
sprout
flower
old flower

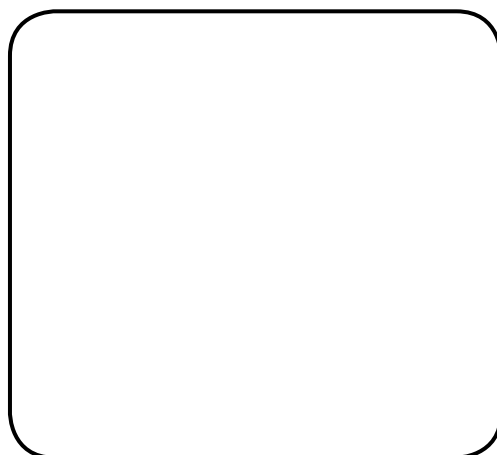
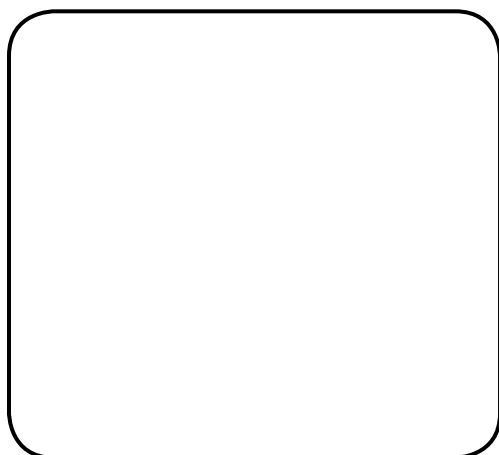
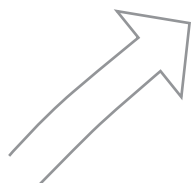
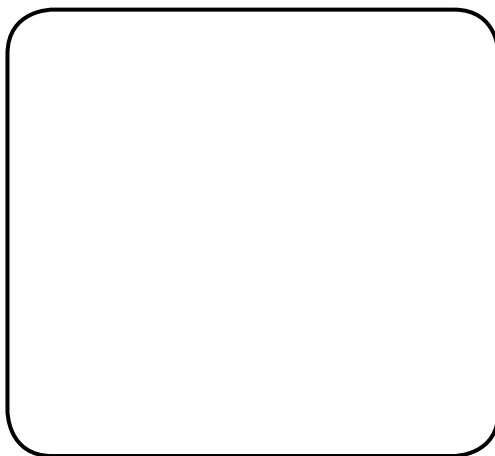


seeds



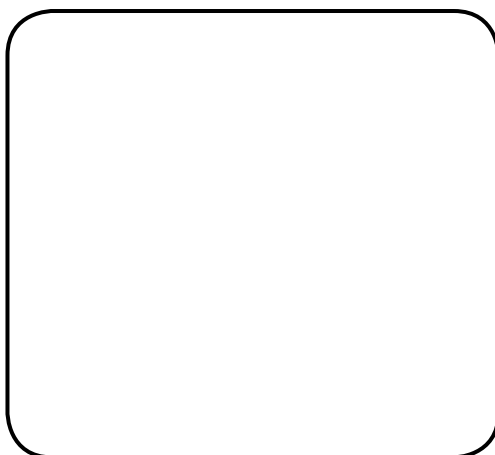
Part 2 Directions: Draw and color your own pictures of each stage of the flower life cycle.

FLOWER



SPROUT

OLD FLOWER



SEEDS

DESCRIPTION

Students will read *Life Cycles: Butterflies*, and discuss and act out the butterfly life cycle. They will discover what butterflies need to survive and thrive. Students will observe a live Monarch caterpillar and learn how to care for it while it transforms into a butterfly over the next few weeks. They will care for their garden and create a home for butterflies.

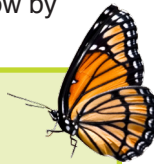
TIME: 45 minutes

SUBJECTS: Fine Arts, Health, Language Arts, Science

LEARNING OBJECTIVES

After this lesson students will be able to:

- Describe the stages of the butterfly life cycle: Egg, caterpillar, chrysalis, butterfly.
- Understand that butterflies need food, water, safety, and a place to lay their eggs in order to survive and thrive.
- Recognize that people can help gardens grow by giving them love and feeding the soil.



ACADEMIC STANDARDS*

CCSS, Language Arts: K.RI.10, K.W.3, K.W.8, K.L.6
HCPS III: FA.K.3.1, FA.K.4.2, HE.K-2.1.7 **NGSS:** LS1.C, ESS3.A, Obtaining, Evaluating, and Communicating Information, Analyzing and Interpreting Data, Developing and Using Models, Patterns, Systems and System Models **Lesson Extensions:** K.RL.10, K.W.2, K.W.3, K.W.8, FA.K.1.2, Patterns

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. Flower Life Cycle Review
 2. Butterfly Life Cycle
 3. What Do Butterflies Need?
 4. Group Activities Overview
- II. Group Activities (25 minutes)
 1. Caterpillar Experience (12 minutes)
 2. Garden Activities (12 minutes)
- III. Closing (5 minutes)

KEY TERMS AND CONCEPTS

Butterfly - The adult stage of a butterfly's life cycle; an insect that is active during the day, usually feeds on nectar, and has two pairs of large wings that are covered with tiny scales

Caterpillar - The larval stage of a butterfly's (or moth's) life cycle, with a segmented body, three pairs of true legs, and several pairs of leg-like appendages

Chrysalis - The pupal stage of a butterfly's life cycle; a protective covering; a sheltered stage of growth and transformation

Egg - The beginning stage of a butterfly's life cycle, from which a tiny caterpillar will emerge

Life Cycle - The series of changes occurring in an organism between one developmental stage and the identical stage in the next generation

Metamorphosis - A profound change in form, as in the transformation of a caterpillar (larva) into a chrysalis (pupa) and then into a winged, flying butterfly (adult)

Molt - To shed or cast off the outer layer of skin

Thrive - To grow or develop vigorously, to flourish

LESSON MATERIALS



Community Supplies:

- Vermicast (about 1 cup per class)

Lesson Supplies:

- Book: *Life Cycles: Butterflies* by Melanie Mitchell
- Flower Life Cycle Sign
- Monarch Butterfly Life Cycle Sign
- Metamorphosis Sign
- Crown Flower Sign
- Garden Agreements Sign
- Student Workbook

Teaching Team To Provide:

- Caterpillar container (see Advance Preparation)
- Live Monarch caterpillar (see Advance Preparation)
- Crown flower leaves (see Advance Preparation)
- Water container (1 per class for “pond”; e.g. ceramic or plastic saucer, large shell, etc.)
- A sheet or blanket big enough for 10-12 students to sit on

School To Provide:

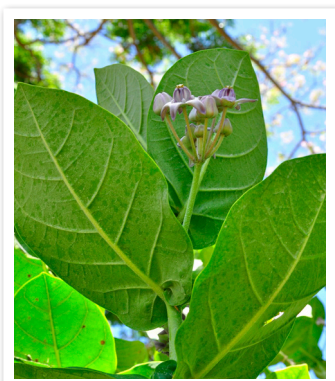
- Bucket and cups for watering

CROWN FLOWER PLANTS:

CAUTIONARY NOTE

Crown flower plants (a host plant for Monarch butterflies) have milky sap that can cause skin irritation and allergic reactions in some people. Be sure to caution students about avoiding contact with milky sap.

Thoroughly wash skin with soap and water or rinse eyes for 15 minutes if contact occurs. The danger posed by these plants is generally low, however, and they are an important host plant for the Monarch butterfly.

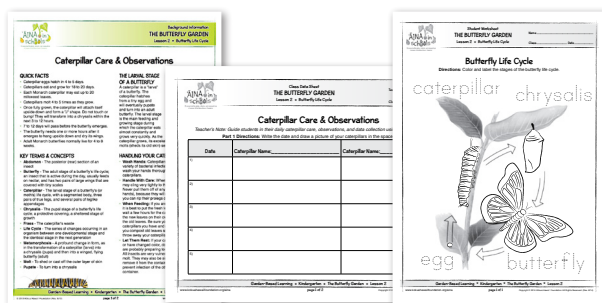


ACCOMPANYING DOCUMENTS

- Background Information: Caterpillar Care & Observations
- Class Data Sheet: Caterpillar Care & Observations
- Student Worksheet: Butterfly Life Cycle

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Review the Teacher Handout.
- Make copies of the Class Data Sheet, one per class if not using the Student Workbook.
- Make copies of the Student Worksheet, one per student if not using the Student Workbook.
- Gather and prepare caterpillar containers (1 per class, at least 8”x8”x6” in size with air holes, e.g. mixed baby salad greens container)
- Collect Monarch caterpillars (1+ per class)
- Collect crown flower leaves (10 to 20 per caterpillar depending on the size of caterpillar; keep the leaves in a plastic bag in the fridge)
- Locate the crown flower tree on campus (if one exists) and determine whether it is in a suitable location for a class visit during the Group Activities.



Accompanying Documents

INTRODUCTION

15 MINUTES

Ask students how the garden is growing and what they have observed in nature.

FLOWER LIFE CYCLE REVIEW

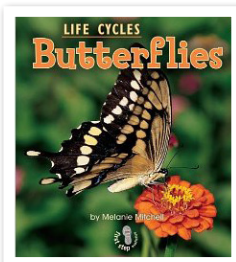
Use the Flower Life Cycle Sign to review the stages of the flower life cycle with students: Seed, sprout, flower, withering flower with seeds.



Flower Life Cycle Sign

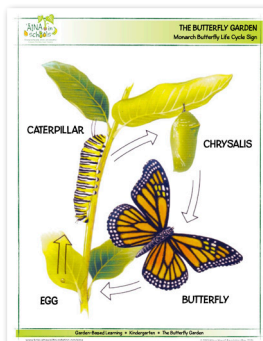
BUTTERFLY LIFE CYCLE

“Now let's take a look at the LIFE CYCLE of a butterfly!” Read *Life Cycles: Butterflies* to the students.



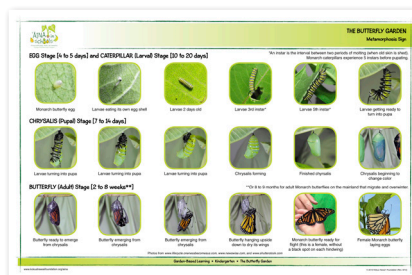
“How does the life of a butterfly begin?” Ask students to raise their hand to explain the stages and the insect's main job in each stage. Show the Monarch Butterfly Life Cycle Sign.

- **EGG:** Growing and developing
- **CATERPILLAR (Larva):** Eating, growing and MOLTING
- **CHRYSLIS (Pupa):** Changing form/transforming
- **BUTTERFLY (Adult):** Visiting flowers and laying eggs



Monarch Butterfly Life Cycle Sign

Show the METAMORPHOSIS sign and introduce the term, emphasizing the profound transformation that a butterfly undergoes in its lifetime.



Metamorphosis Sign

Act Out: Lead the students through this activity:

- Curl up into a tiny egg and close your eyes because it's dark inside!
- Hatch into a caterpillar and eat and eat and eat!
- Molt your skin (five times), eat some more, and grow bigger until you are so big and full!
- Turn into a “J” shape, then form a chrysalis where you hide and change inside.
- Hatch out into a butterfly and slowly dry your wings!
- What sound do butterflies make? They do not make any sound, so fly very quietly around the room.
- Visit flowers and drink nectar.
- Lay eggs and be seated (only female butterflies lay eggs).

WHAT DO BUTTERFLIES NEED?

“What do butterflies need to survive and THRIVE?”

- **Food:** Monarch butterflies drink nectar from colorful flowers like cosmos, marigolds and zinnias. We planted these seeds in our Butterfly Garden.
- **Water:** Butterflies need water, just like we do. They can drink from ponds or from leaves that catch the rain or morning dew.
- **Safety/Shelter:** Butterflies need safe places to rest where it is not too windy.
- **Host Plants:** Monarch butterflies can only lay their eggs on milkweed plants because Monarch caterpillars only eat milkweed leaves (crown flower plants are a type of milkweed). Show the Crown Flower Sign.

“Creating butterfly gardens is a way for us to help butterflies survive and thrive!”



Crown Flower Sign

INTRODUCTION

CONTINUED

GROUP ACTIVITIES OVERVIEW

“Do you love butterflies? Do you want to help butterflies? We need to take care of our garden so our flowers will thrive and provide food and shelter for butterflies. Today, one group will care for the garden and the other group will look at a real live Monarch caterpillar, then we will switch.”

Garden Agreements

Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



Divide the students into two groups before going outside.

GROUP ACTIVITIES

25 MINUTES

Rotate groups after 12 minutes. Regroup for closing.

CATERPILLAR EXPERIENCE (12 minutes)

Sit in a circle on a sheet or blanket with the students.

Show the Metamorphosis Sign to students as a reminder of the amazingly profound transformation process that a butterfly undergoes in its lifetime! Help students practice the key term METAMORPHOSIS.

Say Hello: Bring out the live caterpillar, caterpillar container, and leaves. “Let’s say hello to our very special friend! This is a Monarch caterpillar that has come to live in your classroom, and you will all help to take care of it until it turns into a butterfly! Let’s take turns holding the leaf that the caterpillar is on.”



Caterpillar Care, Points to Mention:

- GENTLY hold the leaf, but you may only touch the caterpillar if you have washed your hands and can give it the most gentle touch! Its body is very soft so be very gentle!
- The caterpillar is very hungry! It must be given a fresh leaf every day. Monarch caterpillars ONLY eat the leaves of milkweed plants, such as crown flower leaves. You will need to take out the old leaves when they are wilted, along with the caterpillar poop. Old leaves and caterpillar poop can be put in the compost pile outside.
- Do not touch the milky sap of crown flower leaves. Wash your hands thoroughly before and after handling the leaves and/or caterpillars.
- When it is ready to form a chrysalis, the caterpillar will attach itself to the top of the container and hang upside down in a “J” shape. Be sure not to touch the caterpillar or bump the container when the caterpillar is in a “J” shape because that is a very sensitive time for the caterpillar.



GROUP ACTIVITIES

CONTINUED

- Be sure to count and record (tally) how many days your caterpillar stays inside its chrysalis.
- When the butterfly emerges from the chrysalis is it OK to touch its wings? No! Butterfly wings have tiny scales that come off when you touch them. When the butterfly has hatched and its wings are dry, your teacher will let the butterfly climb onto his/her finger, then take it outside to the Butterfly Garden for it to be released.

Encourage students to ask questions about their caterpillar, its care, and the metamorphosis it will undergo.

Have the children name their caterpillar. You may want to take a vote among the students and between the two groups.

Optional: Visit the crown flower tree on campus and make observations about the plant. Can you find any caterpillars on the underside of the leaves? Remind students not to touch the white sap and to always wash their hands after touching the leaves.



GARDEN ACTIVITIES

(12 minutes)

Say Hello: “Let’s say hello to our garden!” Show students how to gently brush their hand over the flower seedlings. “Have you been giving your garden lots of love?”

Butterfly Garden Care: “Today we are going to create a home for butterflies. Once our flowers grow, the butterflies will have plenty of nectar to drink.”

- **Natural items:** Go on a mini scavenger hunt with students to find one or two special objects each to add to the Butterfly Garden. These may be stones, flowers, leaves, or any other form of creative decoration.
- **Pond:** Have students create a small pond for butterflies by placing the water container on an open patch of soil in the garden. They may place stones gently into the pond for butterflies to land on. Have students take turns filling the pond with water and watering the garden. Remind them to add water to the pond when it is empty.
- **Sun stone:** Look for a large smooth stone to add to the garden on which butterflies can rest in the sun.
- **Flowers:** Observe the different leaf shapes and any flower buds that are forming.
- **Vermicast:** Add about 1 cup of vermicast to the garden. If the vermicast is moist, dissolve it in water and water the soil with the nutrient-rich water. If the vermicast is dry, sprinkle it around the base of plants and gently mix it into the soil.
- **Watering:** Have students take turns watering the soil gently with their watering can or cups (like rain, not waterfalls; allowing the soil to “sip and swallow”). Add more water as needed to keep the soil evenly moist.



CLOSING

5 MINUTES

Gather all the students in the garden. Ask them to share about their experience.

Discuss with students:

- What do butterflies need in order to survive and thrive?
- What are the stages in the butterfly life cycle?
- Describe several ways that we can help our garden grow.

“Please take good care of your garden and make sure to water and visit it every day! Remember to fill the pond with water when it becomes empty. Take good care of your caterpillar every day by making sure it has fresh crown flower leaves to eat and a safe and clean home to live in.”

All students must wash their hands thoroughly with soap and water after handling crown flower leaves and working in the garden.



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Continue to have Garden Monitors and other students water and visit the garden daily.
- Garden Monitors should fill the pond with water.
- Remove weeds from in and around the garden bed.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

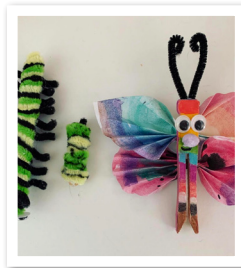
- Have students complete the Butterfly Life Cycle Student Worksheet.
- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc.
- Care for live caterpillars:
 - Read the Caterpillar Care & Observations Teacher Handout.
 - Guide students in their daily caterpillar care, observations, and data collection (drawing and tallying) using the Caterpillar Care & Observations Class Data Sheet.
- Optional: Have each student make their own drawings and observations about the class' live caterpillar(s).
- **Ensure that caterpillars are cared for during fall intercession.**
- Discuss with students:
 - How did we help butterflies today? Created a home by adding a pond and sun rock, and caring for our garden.
 - How will you take care of your caterpillar and your garden? Feed the caterpillar with a fresh crown flower leaf every day. Water and visit the garden every day.



LESSON EXTENSIONS

Butterfly Life Cycle Models
(FA.K.1.2, Patterns)

1. Watch the butterfly life cycle video: <https://bit.ly/butterflymodels>.
2. Gather pipe cleaners or other art supplies for students to create their own butterfly life cycle models.
3. Assist students in creating a model for the egg, caterpillar, chrysalis, and butterfly.
4. Students can use the models while describing the butterfly life cycle or as props for a play!



Everything Has A Cycle Of Life
(Patterns)

1. Learn about other organisms' life cycles (plants, animals, insects, people, mushrooms, etc.) and identify similarities and differences between them.
2. Compare these organisms to non-living things, and how their life cycles also are similar and different; for example, the life cycle of a rock or a piece of trash.
- 3.

Caterpillars In The Classroom

(K.RL.10, K.W.2, K.W.3, K.W.8, FA.K.1.2, Patterns)

1. Read *Robin Hill School Butterfly Garden* by Margaret McNamara with students, which describes a class that cares for caterpillars.
2. Discuss the similarities and differences between your class' caterpillar experience and the one described in the book.
3. Have students draw a picture and/or create a mini-book about their caterpillar experience.

Schoolyard Map
(FA.K.1.2)

1. Create a map of you schoolyard with students. Draw and label the gardens, trees, other natural features, and buildings, etc.
2. Use cardinal directions and other terms (left/right, near/far) to explain where things are located.

Caterpillar Care & Observations

QUICK FACTS

- Caterpillar eggs hatch in 4 to 5 days.
- Caterpillars eat and grow for 10 to 20 days.
- Each Monarch caterpillar may eat up to 20 milkweed leaves.
- Caterpillars molt 4 to 5 times as they grow.
- Once fully grown, the caterpillar will attach itself upside down and form a “J” shape. Do not touch or bump! They will transform into a chrysalis within the next 3 to 12 hours.
- 7 to 14 days will pass before the butterfly emerges.
- The butterfly needs one or more hours after it emerges to hang upside down and dry its wings.
- Adult Monarch butterflies normally live for 2 to 8 weeks.

KEY TERMS & CONCEPTS

- **Abdomen** - The posterior (rear) section of an insect
- **Butterfly** - The adult stage of a butterfly's life cycle; an insect that is active during the day, usually feeds on nectar, and has two pairs of large wings that are covered with tiny scales
- **Caterpillar** - The larval stage of a butterfly's (or moth's) life cycle, with a segmented body, three pairs of true legs, and several pairs of leglike appendages
- **Chrysalis** - The pupal stage of a butterfly's life cycle; a protective covering; a sheltered stage of growth
- **Frass** - The caterpillar's waste
- **Life Cycle** - The series of changes occurring in an organism between one developmental stage and the identical stage in the next generation
- **Metamorphosis** - A profound change in form, as in the transformation of a caterpillar (larva) into a chrysalis (pupa) and then into a winged, flying butterfly (adult)
- **Molt** - To shed or cast off the outer layer of skin
- **Pupate** - To turn into a chrysalis

THE LARVAL STAGE OF A BUTTERFLY

A caterpillar is a “larva” of a butterfly. The caterpillar hatches from a tiny egg and will eventually pupate and turn into an adult butterfly. The larval stage is the main feeding and growing stage during which the caterpillar eats almost constantly and grows very quickly. As the caterpillar grows, its exoskeleton becomes tight, so it molts (sheds its old skin) several times.



Butterfly Life Cycle

HANDLING YOUR CATERPILLARS

- **Wash Hands:** Caterpillars are very susceptible to a variety of bacterial infections, so be sure to always wash your hands thoroughly before handling the caterpillars.
- **Handle With Care:** When caterpillars move, they may cling very tightly to the surface they are on. Never pull them off of any surface (including your hands), because they will often hold so tightly that you can rip their prolegs off before they will let go.
- **When Feeding:** If you are changing their leaves, it is best to put the fresh leaves into the cage, then wait a few hours for the caterpillars to crawl onto the new leaves on their own. Then you can remove the old leaves. Be sure you know how many caterpillars you have and count them all before you compost old leaves so you do not accidentally throw away your caterpillars!
- **Let Them Rest:** If your caterpillars seem lethargic or have changed color, do not handle them. They are probably preparing to molt or form their pupa. All insects are very vulnerable as they begin to molt. They may also be sick. If a caterpillar dies, remove it from the container immediately to help prevent infection of the other caterpillars in the container.



WHAT TO FEED YOUR CATERPILLARS

Monarch butterfly caterpillars only eat milkweed plants, such as crown flowers (*Calotropis gigantea*). Caterpillars will not eat old or dry leaves. You must add one or more new crown flower leaves every day (depending on how quickly they will be eaten). Keep the leaves in the refrigerator in a closed plastic bag to keep them fresh until you are ready to use them.

HOW TO KEEP YOUR CATERPILLAR CAGE CLEAN

Caterpillars have one job in life: Eating! Because of this, they produce copious amounts of waste (known as frass). You can simply empty it out daily or every few days (OK to compost the frass). You may also line the bottom of the cage with paper towels and change often.

PREPARING TO PUPATE

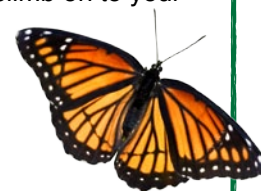
When larval growth is done, the caterpillar stops eating and empties its digestive system (leaving a small dark spot). It then looks for a sheltered, safe spot where it will pupate (turn into a chrysalis), entering the third stage of its metamorphosis. It finds a suitable place to attach itself (a twig or leaf, or the underside of its habitat container top). It attaches itself with a silken pad at the end of its abdomen. It then splits open and loses its exoskeleton (outer skin) and pupates.

FROM CATERPILLAR TO CHRYSALIS

Before the caterpillar turns into a chrysalis it will attach itself to the top of the container and hang upside down in a "J" shape. It is important that the caterpillar not be disturbed at this time. If a chrysalis falls down once it is formed, all is not lost! GENTLY glue it back up and your butterfly may survive. Be sure to handle VERY gently!

WHEN YOUR BUTTERFLIES EMERGE

When the adult butterfly emerges from the chrysalis, the wings will be wet and extremely malleable because they have been folded up to fit within the pupa. For this reason butterflies must hang upside down upon emergence from their chrysalis, normally for several hours. They need the help of gravity to pull the wings down into their natural position. If the butterfly happens to fall down, don't be afraid to let it grasp onto your finger with its legs; it will grab on to its chrysalis if you lead it there. After the wings have dried (at least 2 hours or more) and the butterfly is ready to fly, it will need to be taken out into the Butterfly Garden and released. Once the wings are fully developed, allow the butterfly to climb on to your finger, then take it outside and place it on the top of a plant (for easy flight access). Never touch the butterfly's wings! Be sure to communicate this to students. When the butterfly opens its wings, look to see whether a black spot is present on a vein on each hindwing. Males have these spots and females do not.

**SUGGESTED QUESTIONS FOR STUDENTS**

- What happened to the caterpillar as it changed into a chrysalis?
- Did it stop eating?
- Did it turn into a "J" shape? When?
- How big was the chrysalis? What color was it? Did it change color?
- What happened inside the chrysalis?
- How long did the caterpillar/butterfly stay in the chrysalis?
- How did you know when it was going to emerge?
- What did the butterfly do after it emerged?
- What is an adult butterfly's job and how do they help plants?





Class Data Sheet
THE BUTTERFLY GARDEN
 Lesson 2 * Butterfly Life Cycle

Teacher Name.....
 Class..... Date.....

Caterpillar Care & Observations

Teacher's Note: Guide students in their daily caterpillar care, observations, and data collection using the Class Data Sheet.

Part 1 Directions: Write the date and draw a picture of your caterpillars in the spaces provided.

Date	Caterpillar Name: _____	Caterpillar Name: _____
1)		
2)		
3)		
4)		
5)		

Class Data Sheet
THE BUTTERFLY GARDEN
Lesson 2 * Butterfly Life Cycle

Teacher Name.....
Class Date

Part 2 Directions: Tally the number of crown flower leaves you feed your caterpillars.

Caterpillar Name: _____	Caterpillar Name: _____
Tally:	Tally:

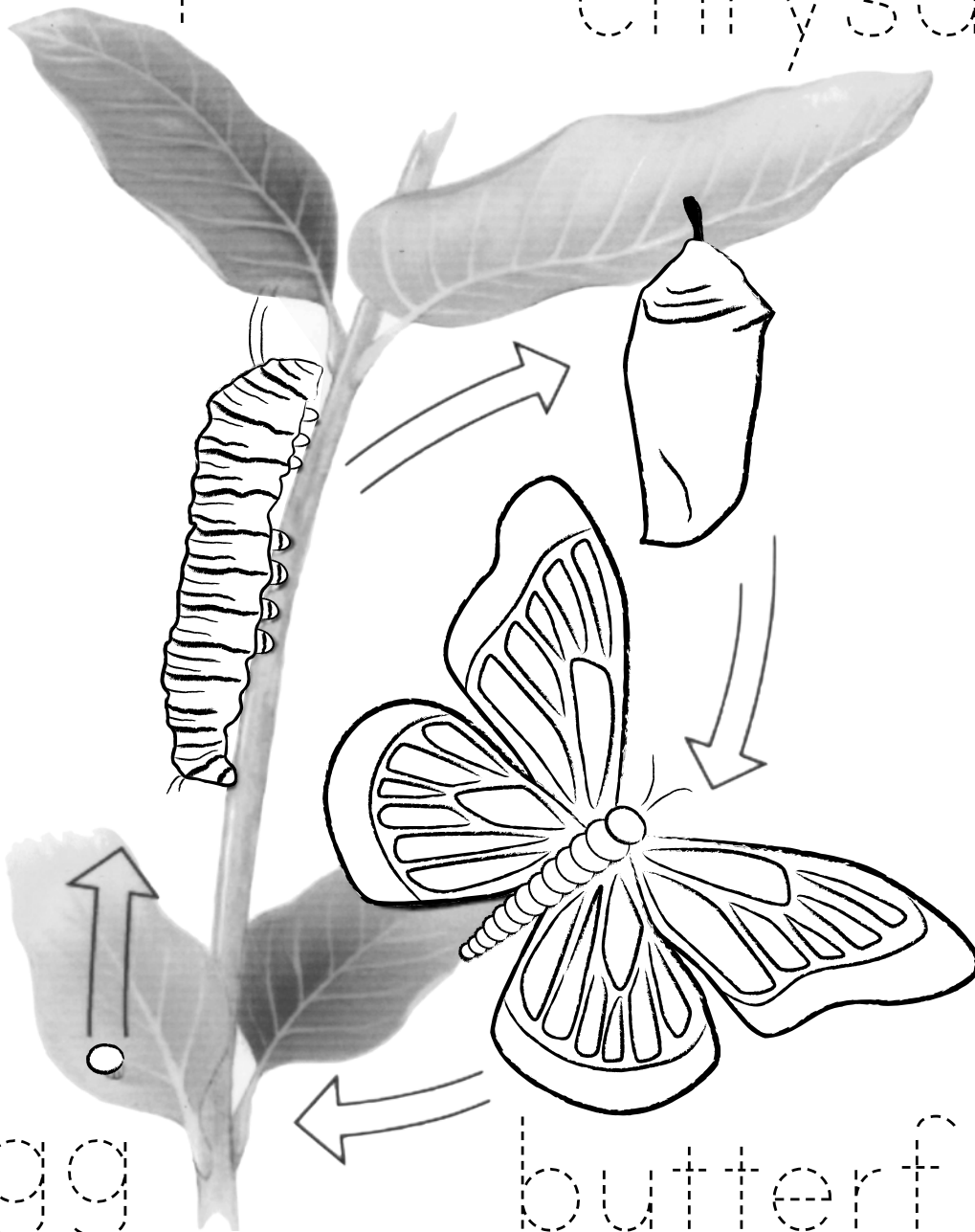
Part 3 Directions: Tally the number of days your caterpillar stays inside the chrysalis and write down the date when the butterfly emerges and flies away in the garden.

Caterpillar Name: _____	Caterpillar Name: _____
Tally:	Tally:
Date:	Date:

Butterfly Life Cycle

Part 1 Directions: Color and label the stages of the butterfly life cycle.

caterpillar chrysalis



egg

butterfly



Student Worksheet
THE BUTTERFLY GARDEN
Lesson 2 * Butterfly Life Cycle

Name

Class Date

Part 2 Directions: Draw your caterpillar in the home you made for it.

1. What is your caterpillar's name?

.....

2. What does your caterpillar like to eat?

.....

DESCRIPTION

Students will discuss their caterpillar experience and the important role of pollinators in helping plants create seeds (pollination). They will act out the life cycles of flowers and butterflies, then go out into their Butterfly Garden to draw the flowers and pollinators they see, explore the garden using magnifying glasses, and care for the garden.

TIME: 45 minutes

SUBJECTS: Fine Arts, Health, Language Arts, Science

LEARNING OBJECTIVES

After this lesson students will be able to:

- Understand that flowers and butterflies help each other.
- Understand that pollinators help plants create seeds, and that bees, butterflies, people, and other creatures can be pollinators.
- Compare the needs and life cycles of flowers and butterflies and identify their similarities and differences.

ACADEMIC STANDARDS*

CCSS, Language Arts: K.W.3, K.W.8, K.L.6

HCPS III: FA.K.1.2, FA.K.3.1, FA.K.4.2, HE.K-2.1.7

NGSS: LS1.C, ESS3.A, Obtaining, Evaluating, and Communicating Information, Analyzing and Interpreting Data, Developing and Using Models, Patterns, Systems and System Models **Lesson Extensions:** K.RL.10, FA.K.1.2, K-SS3-3, Patterns, Asking Questions and Defining Problems

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

- I. Introduction (20 minutes)
 1. Caterpillar Experience Discussion
 2. *Insect Pollinators*
 3. Pollination
 4. Group Activities Overview
- II. Group Activities (20 minutes)
 1. Drawing Activity (10 minutes)
 2. Garden Exploration & Harvest (5 minutes)
 3. Caring for the Garden (5 minutes)
- III. Closing (5 minutes)
 1. Life Cycle Act Out



KEY TERMS AND CONCEPTS

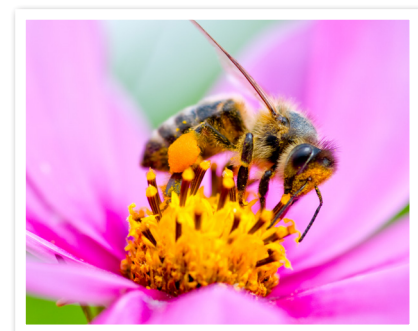
Life Cycle - The series of changes occurring in an organism between one developmental stage and the identical stage in the next generation

Metamorphosis - A profound change in form, as in the transformation of a caterpillar (larva) into a chrysalis (pupa) and then into a winged, flying butterfly (adult)

Pollen - A fine powdery substance, typically yellow, present on the “male” part of a flower

Pollination - The transferring of pollen between flower parts (from stamen to stigma); a process required for fertilization and the creation of seeds

Pollinators - Insects, animals, and people that pollinate plants



LESSON MATERIALS

Community Supplies:

- Clothespins or other clips (1 per student, to hold papers onto clipboards)
- 2 garden clippers (for adult use)
- Magnifying glasses (1 per student)
- Vermicast (about 1 cup per class)

Lesson Supplies:

- Book: *Insect Pollinators* by Jennifer Boothroyd
- Flower Life Cycle Sign
- Monarch Butterfly Life Cycle Sign
- Metamorphosis Sign
- Bee With Pollen Sign
- Pollination Sign
- Garden Agreements Sign
- Student Workbook

Teaching Team To Provide:

- Small mats or towels that fit 1-2 students each
- 2 flowers (see Advance Preparation)

School To Provide:

- Clipboards (1 per student)
- Pencils (1 per student)
- Bucket and cups for watering
- Compost (about 1/2 bucket per class)
- Mulch (about 1 bucket per class)

ACCOMPANYING DOCUMENTS

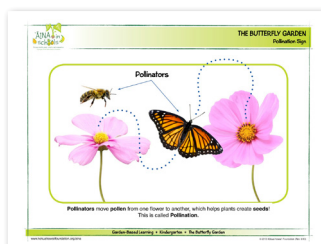
- Background Information: Pollination
- Student Worksheet: Butterfly Garden Drawing

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Review the Teacher Handout.
- Make copies of the Student Worksheet, one per student (to be used during and after the lesson) if not using the Student Workbook.
- Lay out the mats or towels in pleasant spaces throughout the garden for students to sit on during the Group Activities.
- Pick two flowers (of the same kind, with pollen) from the garden.
- Harvest compost and mulch from the school's compost and mulch piles.
- Have each student ready with a clipboard, pencil, and Student Worksheet with their name and today's date written at the top.



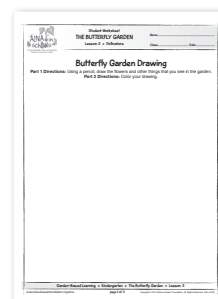
Bee With Pollen Sign



Pollination Sign



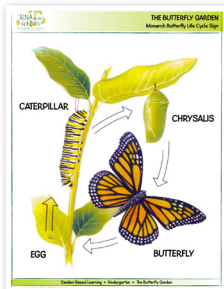
Background Information:
 Pollination



Student Worksheet:
 Butterfly Garden Drawing

INTRODUCTION

20 MINUTES



Monarch Butterfly
 Life Cycle Sign



Metamorphosis Sign

CATERPILLAR EXPERIENCE DISCUSSION

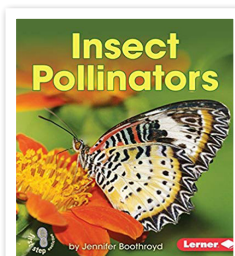
Show the Monarch Butterfly LIFE CYCLE Sign and METAMORPHOSIS Sign, and emphasize the key terms for students. Ask students to share about their experience with their live caterpillar and butterfly:

- What did the caterpillar do? What did it eat?
- What happened to the caterpillar as it changed into a chrysalis? Did it stop eating? Did it form a "J" shape? Which end was attached to the container lid?
- How big was the chrysalis? What color was it? Did it change color?
- How many days did the caterpillar/butterfly stay in its chrysalis?
- How did you know when the butterfly was going to emerge?
- What did it do after it emerged? Did you take it outside? Did you name it?
- What is an adult butterfly's job and how do they help plants? Potential answers: lay eggs, visit flowers and help plants create seeds.



INSECT POLLINATORS

"Let's read a book about how insects like butterflies help plants!"
 Read *Insect Pollination* by Jennifer Boothroyd to the students.

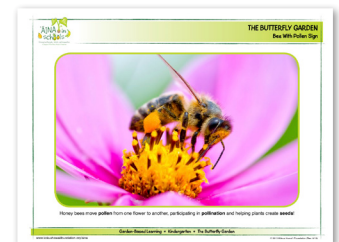


POLLINATION

"Did you know that butterflies and flowers help each other? How do flowers help butterflies?" Desired answer: Flowers provide nectar (food) for butterflies. They also provide shelter and a safe place to rest.

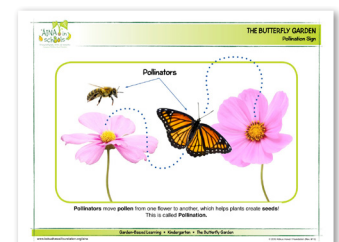
"How do butterflies help flowers?" Accept a few student answers. "Butterflies help flowers create seeds! This is called POLLINATION." Have students repeat the key term.

"When butterflies and other creatures drink nectar from flowers, they get POLLEN on their legs and bodies. Pollen is the yellow powder that can be found inside the flower." Show the Bee With Pollen Sign.



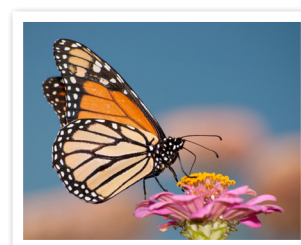
Bee With Pollen Sign

"Then they visit another flower and share and mix the pollen there. This is POLLINATION and it is how plants create seeds!" Show the Pollination Sign.



Pollination Sign

"Creatures that help plants create seeds are called POLLINATORS." Have students repeat the key term. "People can be pollinators too!" Demonstrate this by holding the two real flowers in your hand and using a finger to lightly touch the center of one flower and then the other in order to transfer the pollen.



INTRODUCTION

CONTINUED

GROUP ACTIVITIES OVERVIEW

“In the garden today we will look for pollen and pollinators. We can also be pollinators by gently moving pollen from one flower to another. We will use magnifying glasses to observe our garden plants, insects, and soil. You will be able to draw the interesting objects and shapes that you see in the garden. We will also help the garden by adding vermicast, water, compost, and mulch.”



Garden Agreements

Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



Have students bring their clipboards, pencils, and Butterfly Garden Drawing Student Worksheets to the garden if not using the student workbooks. Give each student a magnifying glass and clip/clothespin to help hold down their papers.

GROUP ACTIVITIES

20 MINUTES

All students will go out to the garden together.

DRAWING ACTIVITY

(10 minutes)

Have students be seated on the mats or towels, then draw the interesting objects and shapes that they see in the garden. Have them draw detailed flowers up close from life, as a pollinator might see them.

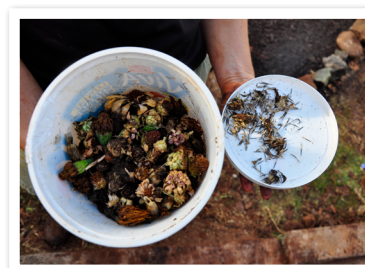


GARDEN EXPLORATION & HARVEST

(5 minutes)

Have students explore the garden, searching for pollinators and using magnifying glasses to look at leaves, flowers, insects, and soil. Help the students discover pollinators in the garden. Have students become pollinators by gently transferring pollen from one flower to another using their little finger.

Use the garden clippers (adults only) to harvest some fresh flowers, being sure to leave enough flowers for the seed harvest during Lesson 4. Have any seeds formed yet? Look for any old, dried flowers; they will be full of seeds, which can be harvested, dried, and saved for planting.



GROUP ACTIVITIES

20 MINUTES

CARING FOR THE GARDEN (5 minutes)

- **Vermicast:** Add about 1 cup of vermicast to the garden. If the vermicast is moist, dissolve it in water and water the soil with the nutrient-rich water. If the vermicast is dry, sprinkle it around the base of plants and gently mix it into the soil.
- **Watering:** Have students take turns watering the soil gently with their watering can or cups (like rain, not waterfalls; allowing the soil to “sip and swallow”). Add more water as needed to keep the soil evenly moist. Fill the pond with water.

- **Compost and Mulch:** Add compost to the soil around the base of plants and mix it in lightly. Shake it off of the leaves if necessary. Place mulch over the soil to protect it from the sun, preserve moisture, and discourage weeds.



CLOSING

5 MINUTES

Gather all the students in the garden.

LIFE CYCLE ACT OUT

Show the Flower Life Cycle Sign and the Monarch Butterfly Life Cycle Sign as a brief reminder to students. Divide the class into two groups: 1) Flowers, and 2) Butterflies. Have the first group act out the LIFE CYCLE of a flower: Seed, sprout, flower and pollination, withering flower with seeds.



Flower Life Cycle Sign

Have the first group be seated, then have the second group act out the LIFE CYCLE and METAMORPHOSIS of a butterfly: Egg, caterpillar (eating and molting), chrysalis (changing), adult butterfly (drinking nectar, pollinating, and laying eggs).



Next, have the flower group stand up again and space themselves around the room, as flowers in a garden. Then have the butterfly group act out POLLINATION by flying around and pollinating the flowers, transferring pollen from one flower to the next and helping plants make seeds!

Ask students to share about their experience.

Discuss with students:

- How do flowers help butterflies?
- How do butterflies help flowers?
- Why are pollinators important?



“Please continue to take good care of your garden and make sure to water and visit it every day!”
All students must wash their hands thoroughly with soap and water after working in the garden.

FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- Continue to have Garden Monitors and other students water and visit the garden daily.
- Garden Monitors should fill the pond with water.
- Remove weeds from in and around the garden bed.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

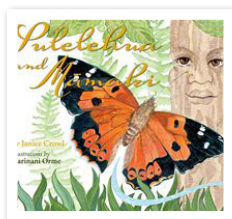
- Have students complete the Butterfly Garden Drawing Student Worksheet by finishing their drawing and using crayons, pens, or color pencils to color their drawing.
- Have students make daily or weekly garden observations and journal entries including notes, drawings, poems, stories, etc.
- Repeat the “Life Cycle Act Out” activity from the Introduction. Then have students compare the needs and life cycles of flowers and butterflies and identify their similarities and differences.

LESSON EXTENSIONS

Hawai'i's Native Butterflies

(K.RL.10, K-ESS3-3)

1. Review the Butterfly Information Teacher Handout from Lesson 1.
2. Use a map and/or globe to locate Hawai'i with students.
3. Read the book *Pulelehua and Mamaki* by Janice Crowl with students.
4. Discuss the two types of native Hawaiian butterflies, each with its own host plant:
 - The Kamehameha butterfly lays its eggs on mamaki trees.
 - The Hawaiian Blue butterfly lays its eggs on koa trees and 'a'ali'i plants.
5. Discuss ways the human designed world may negatively impact Hawai'i's native butterflies. Discuss ways we can help.
6. Have students design a drawing, sketch, or physical model that could help butterflies. Have students share to others about their model/drawing.
7. Plant a māmaki tree, koa tree, and 'a'ali'i plant at your school, with approval, in order to provide critical habitat for Hawai'i's native butterflies.
8. Citizen Science: To further engage in efforts to protect the Kamehameha Butterfly visit www.cms.ctahr.hawaii.edu/pulelehua/ for the Pulelehua Project.



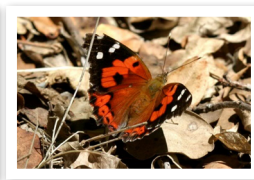
Habitat Collection

(FA.K.1.2, Obtaining, Evaluating, and Communicating Information, Asking Questions and Defining Problems)

1. Introduce the key term HABITAT to student. A habitat is a home, or the natural or artificial environment of an organism.
2. Observe habitats of animals and insects that can be found right on campus. Encourage students to ask questions about what they observe.
3. Have students and their families collect and bring in natural habitats (interesting objects such as a bird's nest, abandoned beehive/wasp nest, seedpod, etc.).
4. Have students observe the items closely by using magnifying glasses and their many senses, then create drawings of the objects.



Hawaiian Blue



Kamehameha

Pollination

WHAT IS POLLINATION?

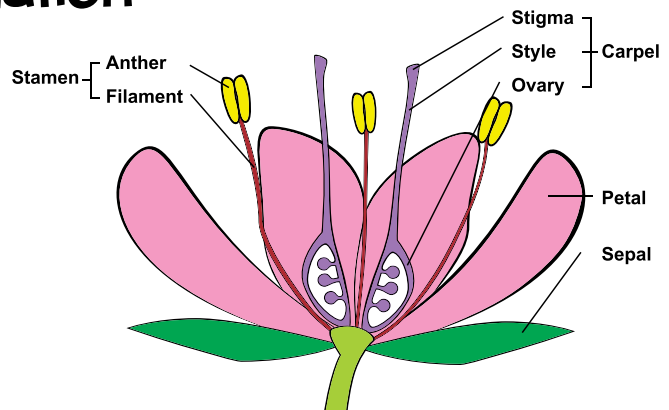
- Pollination is the transfer of pollen (“male” reproductive cells) from the stamen (“male” part) to the stigma of the “female” carpel of a flower. One or more carpels together form the pistil of a flower.
- Self-pollination occurs within the same flower or between flowers on the same plant. Cross-pollination occurs between flowers on different plants.
- Hybridization is effective pollination between flowers of different species, or between different populations, breeds, or cultivars of the same species.
- Pollination is an essential step in the reproduction of flowering plants, through which genetically diverse offspring are produced (sexual reproduction, vs. asexual reproduction where offspring are genetically identical to the parent).
- The creation of edible fruits is dependent on fertilization which is the result of pollination!

HOW ARE PLANTS POLLINATED?

- The majority of plant species (about 80%) depend on pollination by animal pollinators, including insects, mammals, birds, and even reptiles.
- When an animal participates in pollination, pollen adheres to its body as it visits a flower to feed, breed, or take shelter, and the pollen is transferred to other flowers by the movements of the pollinator.
- Some plants are pollinated by the wind (e.g., corn and most conifers), or water (aquatic plants).

WHY ARE POLLINATORS IMPORTANT?

- We depend on pollinators for the formation of many of the fruits, vegetables, nuts, and seeds that we eat and enjoy.
- Wild pollinator populations provide an important “ecological service” for gardeners and farmers.
- In the United States, millions of honey bee hives are transported each year for the purposes of pollinating large scale crops of almonds, apples, blueberries, melons, cucumbers, and more.
- Pollinators play an important role in maintaining biodiversity on Earth, due to their participation in the sexual reproduction of plants.



PROTECTING POLLINATORS

The loss of pollinators, or pollinator decline, is currently being experienced worldwide. Pollinators and other beneficial creatures are harmed by the use of toxic agricultural chemicals and the loss of habitat. Gardeners and farmers can help pollinators by planting host and nectar plants and using natural methods of gardening, as well as supporting organic agriculture. Cultivating a diversity of plants helps to maintain a healthy balance of life in the garden ecosystem.

HAWAII'S NATIVE SPECIES

In Hawai'i, about 20% of our native plants were once pollinated by native birds, with several species having co-evolved, such as the evolution of curved flowers to match the curved bills of Hawaiian honeycreepers. Currently, Hawai'i's native birds make up one third of the endangered bird species in the United States. Sadly, Hawai'i is also considered to be “The Extinction Capital of The World” with over 75% of the United States extinctions having occurred here, largely due to habitat loss.



Honeybee pollinating an apple flower



Hawai'i Mamo, *Drepanis pacifica*, extinct by 1898



Student Worksheet
THE BUTTERFLY GARDEN
Lesson 3 * Pollinators

Name

Class Date

Butterfly Garden Drawing

Part 1 Directions: Using a pencil, draw the flowers and other things that you see in the garden.

Part 2 Directions: Color your drawing.



Student Worksheet
THE BUTTERFLY GARDEN
Lesson 3 * Pollinators

Name

Class Date

Part 3 Directions: Draw a picture of your butterfly and write about what they are doing in your picture.

DESCRIPTION

Students will read *The Butterfly* book and discuss seed saving. They will make flower bouquets and harvest and study flower seeds from the garden. They will eat fruits, vegetables, and/or seeds that were created with the help of pollinators!

TIME: 45 minutes

SUBJECTS: Health, Language Arts, Science

LEARNING OBJECTIVES

After this lesson students will be able to:

- Understand that pollinators are important because they help plants create seeds.
- Understand that many of the foods we eat are made possible by pollinators.
- Harvest and save flower seeds from the garden.

ACADEMIC STANDARDS*

CCSS, Language Arts: K.RI.10, K.W.3, K.W.8, K.SL.2, K.L.6 **HCPS III:** HE.K-2.1.7, **NGSS:** LS1.C, ESS3.A, Obtaining, Evaluating, and Communicating Information, Analyzing and Interpreting Data, Patterns, Systems and System Models **Lesson Extensions:** FA.K.1.2

*A detailed list of the Academic Standards can be found in the Unit Overview document

LESSON OUTLINE

- I. Introduction (15 minutes)
 1. *The Butterfly* Book
 2. Harvesting Seeds
 3. Seed Collection
 4. Group Activities Overview
- II. Group Activities (20 minutes)
 1. Flower Harvest (10 minutes)
 2. Seed Saving (10 minutes)
- III. Closing and Snack (10 minutes)



KEY TERMS AND CONCEPTS

Habitat - The natural or artificial environment of an organism; a home

Pollination - The transferring of pollen between flower parts (from stamen to stigma); a process required for fertilization and the creation of seeds

Pollinators - Insects, animals, and people that pollinate plants

Seed Saving - The practice of harvesting, drying, and saving seeds for future planting



Zinnia Flower Seeds

LESSON MATERIALS

Community Supplies:

- 2 serving platters (for snack)
- 2 garden clippers (for adult use)
- Magnifying glasses (1 per student)
- 2-4 plastic wash bins (for seed sorting)
- Vermicast (about 1 cup per class)

Lesson Supplies:

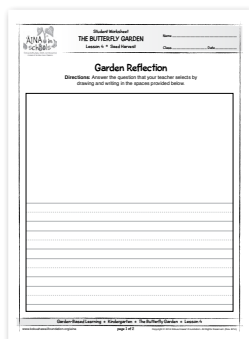
- Book: *The Butterfly* by Anna Milbourne & Cathy Shimmen
- Flowers & Seeds Sign
- Garden Agreements Sign
- Rubber bands (for flower bouquets)
- Student Workbook

Teaching Team To Provide:

- Fruits for the harvest party snack (see Advanced Preparation)
- Cutting boards and knives (for adult use only) if snack will be prepared on-site
- Fruit and vegetable seed collection (see Advanced Preparation)
- Dried flower from the garden (see Advanced Preparation)
- A sheet or blanket big enough for 10-12 students to sit on
- Newspaper for drying seeds
- Envelope for saving seeds

School to Provide:

- Bucket to collect snack waste



The image shows a thumbnail of a worksheet titled 'Garden Reflection'. At the top, it says 'THE BUTTERFLY GARDEN Lesson 4 * Seed Harvest' and includes fields for 'Name' and 'Date'. Below that, the title 'Garden Reflection' is followed by the instruction: 'Directions: Answer the questions that your teacher selects by drawing and writing in the spaces provided below.' The main body of the worksheet consists of a large rectangular box for drawing and several horizontal lines for writing.

Student Worksheet:
Garden Reflection

ACCOMPANYING DOCUMENTS

- ĀINA Post-Unit Survey
- Student Worksheet: Garden Reflection

ADVANCE PREPARATION

- Discuss lesson preparation and presentation plans with your teaching team.
- Make copies of the Post-Unit Survey and Student Worksheet, one per student if not using the Student Workbook.
- Harvest or purchase and prepare fruits, vegetables, and/or seeds for the snack (locally-grown and organic if possible; anything with seeds):
 - Fruits: Watermelon, papayas, strawberries, oranges, mangoes, mountain apples, dragon fruit, avocado, lychee
 - Fruit vegetables: Tomatoes, squash, peppers, cucumbers, eggplants
 - Seed vegetables: Green beans, peas, corn
 - Seeds: Coconut, sunflower seeds
- Create a fruit and vegetable seed collection for use during introduction (see sample list above).
- Collect a withered flower (filled with seeds) of one or more species (zinnia, cosmos, marigold) from the garden.
- Optional: Harvest all dried flower heads from the garden and have them ready at the seed saving station before the lesson.



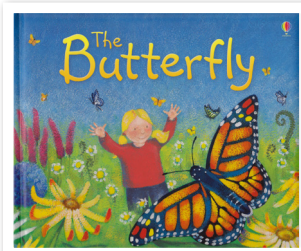
INTRODUCTION

15 MINUTES

“Today is our last garden lesson of the semester. We will go to the garden to harvest flowers and seeds, and have a snack of fresh foods that pollinators helped create!”

THE BUTTERFLY BOOK

Read *The Butterfly* book by Anna Milbourne & Cathy Shimmen to the students. Provide your own narration if desired. Briefly review with students the ways in which flowers and butterflies help each other. Introduce the key term HABITAT and point out the important elements of a butterfly's habitat as observed in the book and in the garden: Food, water, shelter, host plants (e.g. crown flower for Monarch butterflies).



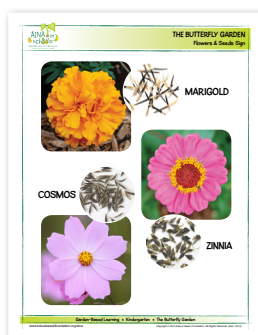
SEED COLLECTION

Show the fruit and vegetable seed collection to students and discuss the fact that pollinators (especially bees and butterflies) are very important because they help plants create fruits, vegetables, and seeds! Discuss whether or not each type of seed in the collection is eaten.

“We will also eat a healthy snack of fruits/vegetables/ seeds that have been created with the help of pollinators!”

HARVESTING SEEDS

“What kinds of POLLINATORS visited our garden?” Bees, butterflies, people, etc. “Thanks to POLLINATION, many of our plants have formed seeds. When we go to the garden, where can we find the seeds?” Desired answer: Inside the old, dry, brown, withered flowers. Show withered flower. “Is this flower alive or dead? Even though it looks dead, it is filled with life, because it is filled with seeds!”



Flowers & Seeds Sign

Open up one or more flowers to reveal the seeds inside. “Today we will collect withered flowers from your garden and harvest the seeds inside. This is called SEED SAVING. What can we do with the seeds?” Desired answers: Plant them again, or dry and save them to plant later and share with family and friends.

Show the Flowers & Seeds Sign, reminding students of the types of flowers that were planted and what each of their seeds looks like.

GROUP ACTIVITIES OVERVIEW

“In the garden today one group will harvest fresh flowers and the other group will harvest flower seeds, then we will switch.”

Garden Agreements

Have students take a deep breath, then review the Garden Agreements:

- I will be SAFE
- I will be KIND
- I will have an OPEN MIND
- I will use my TIME WELL



Divide the students into two groups before going outside. Bring the wash bins, garden clippers, rubber bands, and magnifying glasses.

GROUP ACTIVITIES

20 MINUTES

Rotate groups after 10 minutes. Regroup for closing and snack.

Students may use the magnifying glasses to look closely at seeds and explore the garden. Show students how to give respect and gratitude to the plants when harvesting.

FLOWER HARVEST (10 minutes)

Use the garden clippers (adults only) to harvest several fresh flowers for each student. Place rubber bands around each bouquet. Optional: Students may wrap the cut end of stems with a moist paper towel.

The amount of flowers that are ready to be harvested will vary. If the flower harvest is small, decide as a class who the bouquets will be gifted to. For example, if there are only enough flowers for one bouquet, it can be gifted to the office or a special teacher. If there are enough flowers for multiple bouquets, they can go home with students.

SEED SAVING (10 minutes)

Place the wash bins in the shade to create a seed saving station.

Harvesting Options: Withered flower heads from the garden may be harvested and placed at the seed saving station before the lesson. Or during the lesson, adults will use the garden clippers to cut a withered flower for each student and have them bring these to the seed saving station.



Using the wash bins to contain the harvest, have students open up their withered flowers in order to harvest the seeds inside. Show them how to separate the seeds from the rest of the flower parts (which can be mixed into the garden soil to decompose).

If seeds are moist, they will need to be dried inside the classroom by laying them out on a sheet of newspaper for several days before being put into the envelope for future planting. Be sure to label the envelope with the harvest date and type(s) of flower(s).

Use the Flowers & Seeds Sign to identify the different types of flowers and seeds, which may be kept separate or mixed together.

All students must wash their hands thoroughly with soap and water after working in the garden and before eating their snack.

CLOSING AND SNACK

10 MINUTES

Gather all the students in the garden. Ask them to share about their experience.

Discuss with students:

- What are the important elements of a butterfly's habitat?
- Why are pollinators important?
- Why is seed saving important?

After washing hands, enjoy the fruit/vegetable/seed snack with students. You may wish to have students share what they are thankful for before eating; be sure to thank the pollinators! Discuss the fact that these foods were created with the help of pollinators like bees and butterflies and these foods all came from plants and seeds!

“Thank you for taking care of the earth by planting a beautiful garden for butterflies and other pollinators, and for harvesting and saving our special flower seeds. When we take care of plants, animals, pollinators, and other people, they will take care of us too!”

Have students place snack waste in a bucket and then add it to the school's compost pile when finished.



FOLLOW UP GARDEN CARE

Follow Up Garden Care is the responsibility of the classroom teacher and students.

- This is the final lesson of the semester. Continue to have your students water and visit the garden daily to help keep the soil alive. Use mulch materials to cover the soil, protecting it from the sun, preserving moisture, and discouraging weeds.
- Continue to harvest and dry seeds from withered garden flowers. Save the seeds for future plantings or for the children to take home and start their own gardens. Plant some flower seeds in other approved areas on campus.

- Continue to cut fresh flowers for your classroom, for families, or to share with other teachers, staff, and students at your school.
- Students must wash their hands thoroughly with soap and water after working in the garden.



FOLLOW UP ACTIVITIES

Follow Up Activities are the responsibility of the classroom teacher.

- Review this semester's garden experience, including the key concepts for the unit, which are 'āina, the needs and life cycles of flowers and butterflies, planting and caring for a flower garden, metamorphosis, caring for caterpillars, pollination, habitats, and seed saving.
- Administer the 'ĀINA Post-Unit Survey immediately following the final lesson and review.
- Have students complete the Garden Reflection Student Worksheet.
- Have students create a final journal entry about their garden experience this semester. Have them share their work with the class.

- Save and submit examples of student work to Kōkua Hawai'i Foundation.
- Dry all harvested flower seeds inside the classroom by laying them out on a sheet of newspaper for several days before being put into an envelope for future planting. Be sure to label the envelope with the harvest date and type(s) of flower(s).



LESSON EXTENSIONS

Matching Plant Parts

(FA.K.1.2)

1. Have students match and draw the seed, leaf and flower from each type of flower plant in the garden.
2. Have students color and label their drawing with the name of the flower (e.g. zinnia, cosmos, marigold).



Plantable Paper

(FA.K.1.2)

1. Materials: Dried flower seeds from the garden, paper-making materials [vat/wash tub, mold and deckle, sponges, newspaper, thin rags/felts (one per paper), blender, pitcher for water, grey board (e.g. cereal boxes), rollers].
2. Process: Shred and soak the grey board, then blend it into a pulp with water. Add the pulp and water to the vat, stir, and dip the mold and deckle into the mix. Transfer the paper from the mold onto a rag. Use a roller to transfer the paper to glass (e.g. a window) where it will dry. There are a number of additional instructional resources online.
3. During the paper-making process, sprinkle flower seeds into the blended paper pulp.
4. Create cards that can be given away and planted to grow a Butterfly Garden!



Student Worksheet
THE BUTTERFLY GARDEN
Lesson 4 * Seed Harvest

Name

Class Date

For Teachers: Choose one of the following opinion questions for students, or create your own, regarding their gardening experience this semester.

**Do you like having a garden?
List three reasons why.**

**What did you enjoy most
about the garden?**

**What other types of plants would you
like to grow in the garden?**

**What is your favorite kind of
pollinator?**

**What is your favorite kind of garden
creature that lives in the soil?**

**What was your favorite kind of fruit,
vegetable, and/or seed that you tried?**

1. Draw a **circle** around the pollinator:



Flower

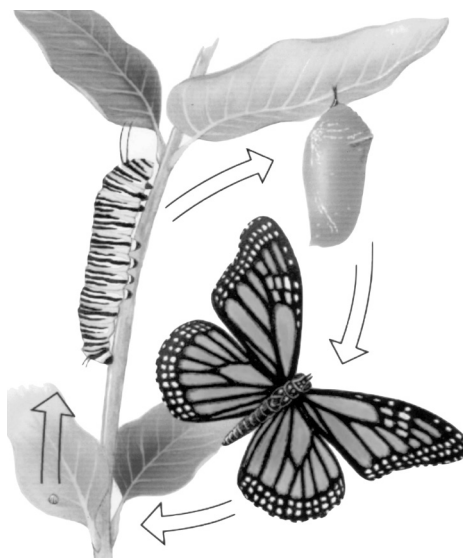


Carrot



Bee

2. Draw a **circle** around the chrysalis stage of the butterfly life cycle:



3. Draw a **circle** around what a seed grows into right after it is planted:















Sprout



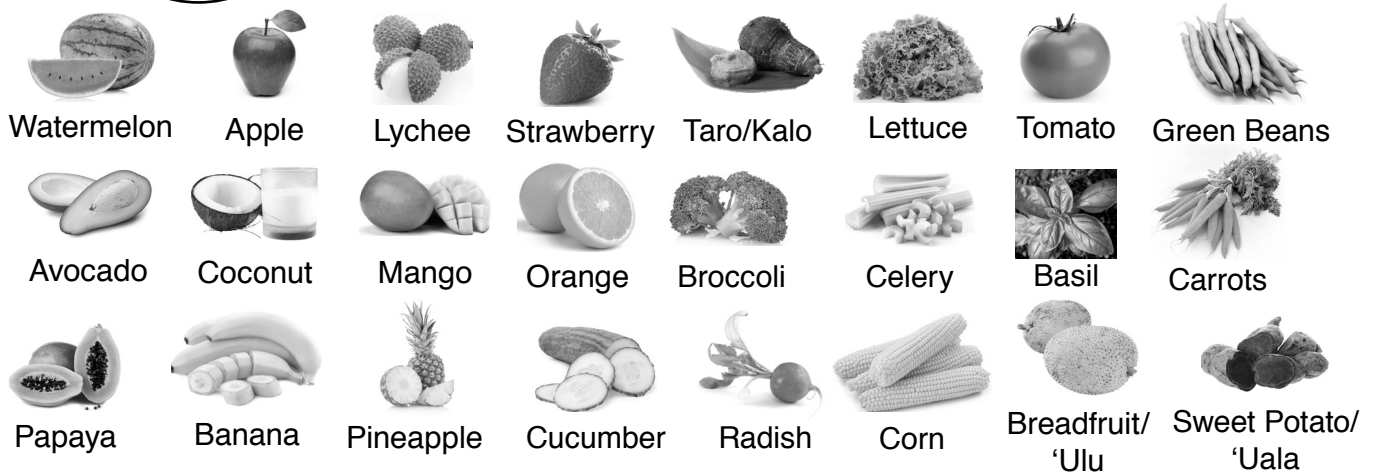
Vegetable



Flower

4. Do you like gardening? **Circle** ONE answer:  Yes  I don't know  No
5. Do you like eating fruits and vegetables? **Circle** ONE answer:  Yes  I don't know  No
6. Do you like cooking? **Circle** ONE answer:  Yes  I don't know  No
7. Do you like 'ĀINA Lessons? **Circle** ONE answer:  Yes  I don't know  No

8. Draw a **Circle** around all the fruits and vegetables you like to eat:



9. Draw a picture of what 'āina means to you.