

**Dedicated
to Reducing
Pesticides**

Unit 3 Section 1 Lesson 1: Extreme Makeover

Focus Areas: Animal Life Styles; Science, Math, Language Arts

Focus Skills: researching a topic using multiple sources, using mathematical functions, comparing and contrasting, following verbal directions

Objectives

- To understand the concept of life cycles
- To recognize that among living organisms there are similarities and differences in regard to life stages and life spans
- To increase ability in the use of mathematical data to create reasonable explanations

Essential Questions

- What is a living organism's life span?
- What are the life stages of a living organism?
- How do life stages and life spans differ among living organisms?

Essential Understandings

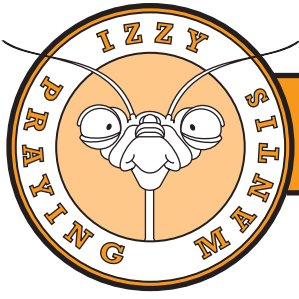
- Animals have life cycles that begin with birth and end with death.
- Animals can survive only in those environments that provide for their basic needs.
- The life spans of living things differ in length.
- Living things develop and change in a series of stages.
- The life stages differ in length from species to species.
- Mathematical computation is often needed in scientific inquiry.

Background

All living things develop in a series of stages, which begin with birth and end at death. These stages involve both growth and change. In the insect world, these stages, called metamorphosis, involve dramatic changes



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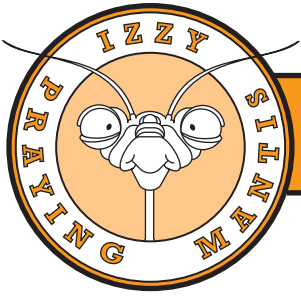
in structure and appearance. Some insects, like dragonflies, go through three stages, called incomplete metamorphosis. Others, like butterflies, experience four stages, called complete metamorphosis.



The four stages of a monarch butterfly's development are egg, larva, pupa, and adult. Eggs laid in the spring and summer by multiple generations of adult monarchs hatch in about 4 days and a caterpillar, the larval stage, emerges. For approximately two weeks, this tiny insect larva feeds on its surrounding environment, beginning with its own shell and continuing through multiple meals of the milkweed plant on which the egg was laid. The larva's size increases from 1/16 of an inch to 2 inches, and its mass by approximately 4,500 times in 9 to 14 days. As the caterpillar grows, it molts 5 times. Each molt results in a larger instar or growth stage of the caterpillar. The last molting ushers in the pupa or resting stage. The larva attaches itself head down to a sturdy twig or branch, its skin splits, and a chrysalis appears. Monumental changes then occur. Multiple legs become six, chewing mouth parts are replaced with a proboscis, and wings form. Within 8 to 13 days, a butterfly, the high fashion model of the insect world, emerges. Blood from the engorged abdomen is pumped into the flattened wings. Within approximately 30 minutes the wings become rigid, and the adult exoskeleton hardens. Because this final stage of a monarch's life span is beautiful but brief, the monarch takes flight and mates within 3 to 8 days.



Females may mate several times and lay as many as 700 eggs of the next generation over the next few weeks. Each egg is laid singularly and attached to the underside of a milkweed leaf. Even with the care that mom takes to provide a safe and tasty environment for her offspring, only a very small percentage will survive until the pupal stage, and these will be orphans. Only the final generation of adult butterflies born each year lives longer than 2 to 6 weeks after emerging from the chrysalis stage. This generation, usually the fourth in the Northeast and Canada, emerges in the late summer and early fall. Although in all appearances they look like their parents, grandparents, and even great grandparents, these monarchs are unique and have a life span measured in months, not weeks. (See Unit 3, Section 1, Lesson 2, Migration Relay for further information.)



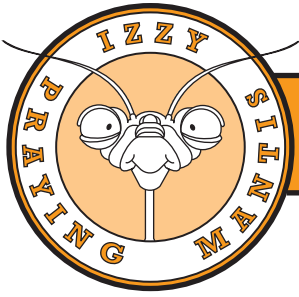
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Vocabulary



chrysalis	the inactive third stage, or pupa, in a butterfly's metamorphosis
cocoon	the case that contains the pupal stage of some insects during metamorphosis
egg	the first stage in the process of metamorphosis
generation	the time lapse between the birth of maternal parents and the birth of the first child
instar	one stage of a caterpillar's growth, beginning with one molt and ending with the next
larva	the second developmental stage of some insects (Example: caterpillar)
life span	the average time between birth and death of an organism
life stage	a period of time during which specific physiological changes occur
metamorphosis	a series of changes through which insects go from egg to adult
offspring	an immature animal resulting from the mating of two adult animals
pupa	the third stage of many insects' metamorphosis
sibling	offspring of the same parents





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Logistics

Time: two 45 minute time blocks and an additional 30 minutes for **Follow Through**

Group Size: 5 to 30

Space: an area for comfortable seating



Materials

Handout 1 “Monarch Life Cycle Research” *

Handout 1 Answer Key *

Rubric for Individual Work *

Animal Babies and Adults Picture Card Set *

black/white board or chart paper

multiple computers with Internet access or an

LCD projector

assorted print materials on monarch butterflies

* single copy provided



Preparation

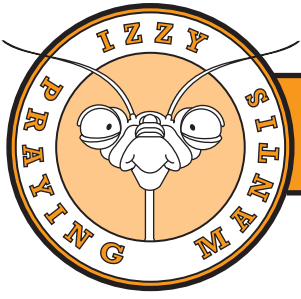


1. Read the **Background** section.
2. Make copies of Handout 1, “Monarch Life Cycle Research.”
3. Arrange time in the computer lab or procure an LCD projector.
4. Collect print material on monarch butterflies, focusing on their life cycle.
5. Preview and select monarch websites for children’s use.

Activity



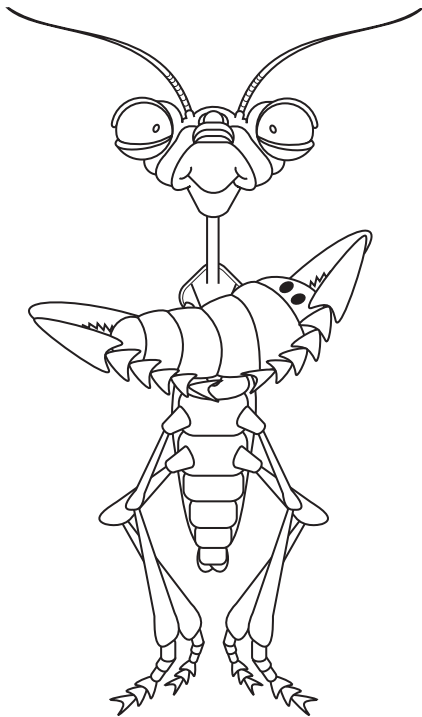
Challenge: Calculate, compare, and contrast the life spans of two organisms. (*Display for group viewing*)



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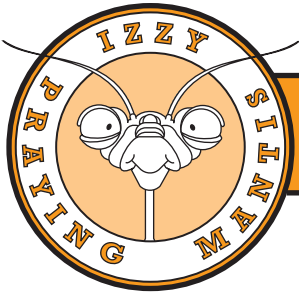
Introduction

1. Ask the children to brainstorm the words we all use to describe peoples' ages. (Examples: old, young, newborn, baby, infant, child, toddler, teenager, adolescent, young adult, adult, senior citizen) Print their responses randomly on the board/chart paper. **Note:** Children may include others like middle schooler, kindergartner, preschooler, and miss some of the terms given as examples. To save time, you may prefer to print the terms given as examples and ask the children what the words have in common. (They describe someone's age.)
2. Divide the children into pairs or triads and invite them to divide the words into four columns, putting terms for similar age groups together. **Note:** Eliminate **young** and **old**, explaining that these terms will be used later in the lesson. Ask the children to share their groupings and discuss their choices in order to reach agreement.
3. Poll the children to determine the dividing line between young and old. Print the word **birth** to the left of the first column. Ask the children what word should be put to the right of the last column. (**death**)
4. Print the words **life span** on the board and explain its meaning. (see **Vocabulary**) Explain that each column, or age group, is called a **life stage** (see **Vocabulary**), that all living things have a life span, and that they go through life stages.
5. Show the children pictures of immature and mature animals, and discuss the changes the children notice. Show the insect example and note that the changes are far more radical. Print the word **metamorphosis** on the board and explain its meaning as an extreme makeover.



Involvement

1. Ask the children to speculate on the answer to the questions and write their answers in their science notebooks:



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- a. Do all living things have the same life span? (no)
 - b. Who lives longer, a human or a butterfly? (a human)
 - c. What is the life span of a monarch butterfly? (6 to 8 weeks from egg to death)
2. Distribute Handout 1, “Monarch Life Cycle Research.”
 - a. Allow the children to research butterfly metamorphosis using computers and print material.

Recommended sites:

Journey North: www.learner.org/jnorth/monarch/index.html

Monarchs in the Classroom:

www.monarchlab.umn.edu/biology/MonarchLifeCycle.aspx

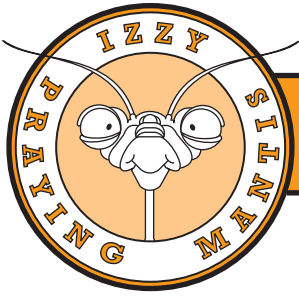
Butterflies 2000: library.thinkquest.org/C002251/index2.shtml

- b. There are many other sites from which to choose. Go online and search for “Monarch Lifecycle”.
3. Share research discoveries by reviewing Handout 1.
 4. Ask children to compute the life span of a monarch butterfly by computing the sum of each life stage recorded in Handout 1, Question #11. Share and display estimations.
 5. Refer to **Involvement** #1c and evaluate speculations.

Follow Up

Introduce the term generation (see **Vocabulary**), and tell the group they are going to compute the length of an average human generation.

1. Give the children the following directions, allowing time for mathematical computation after each step:
 - a. Subtract a grandmother’s date of birth (1940) from a mother’s date of birth (1963).
 - b. Subtract the mother’s date of birth from the mother’s oldest child’s date of birth (1987).



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- c. Add the two differences.
- d. Divide this sum by two.
2. Circulate and help those who need it.
3. Explain that this quotient represents a generation.
4. Refer back to **Involvement** #1a and #1b and compare speculations to findings.

Assessment

Evaluate the children's work using the Rubric for Individual Work, or evaluate a Compare/Contrast of humans and butterflies. Require children to list 3 points of similarity and 3 points of difference between a human and a butterfly life cycle.

Answer Key

Possible answers to Compare/Contrast:

Points of comparison: both have 4 life stages; both need a male and female parent; both need air, water, and food to survive; both grow and change from birth to death.

Points of contrast: humans' life stages are longer than the butterflies; humans get to know their ancestors; human immature stages do not differ from the adult stage to the degree that butterflies do.

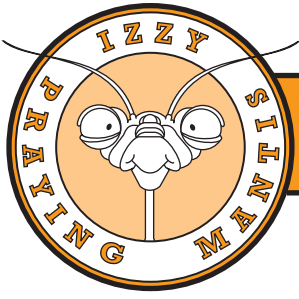


Follow Through

Additional Focus Areas: none

Additional Focus Skills: none

1. Invite the children to determine the impact of another generation on the scenario.



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2. Tell the children that the great grandmother in our average family was born in 1922.
3. Repeat the **Follow Up** activity, including the subtraction of the great grandmother's age from the grandmother's age as the starting point and dividing the final sum by 3 instead of 2.
4. Using the same categories and procedure as **Follow Up** #4, retally the results.
5. Discuss how the addition of another generation impacted the generational score.

Resources

A special thanks to the following organizations for providing background and assistance in the preparation of this lesson:

Monarch Watch

Monarch biology and conservation from the University of Kansas; with permission

www.MonarchWatch.org

Monarchs in the Classroom (Monarch Lab)

Especially for K-12 educators from an entomologist, Karen Oberhauser

www.monarchlab.umn.edu

Journey North: Monarch Butterfly Migration and biology

Features yearly migration data, activities, and project participation

www.learner.org/jnorth/

Suggested Reading

Monarch Butterfly by Gail Gibbons

Monarchs by Kathryn Lasky

See How They Grow by Kim Taylor

Butterfly by Kim Taylor

My Monarch Journal by Connie Muther