# Muse.

#### **Blossom Buddies**

In addition to being aesthetically pleasing, flowers are essential to the continuation of a bountiful life on this planet. This issue of MUSE magazine explores the Earth's valuable pollinators and will give students a new appreciation of the interconnectedness of our world.

#### CONVERSATION QUESTION

How do Earth's pollinators perpetuate life?

#### **TEACHING OBJECTIVES**

- Students will learn how flowering plants have evolved and adapted.
- Students will learn about the valuable pollinators in the syrphid fly family.
- Students will learn about the pollination behaviors of butterflies and moths.
- Students will examine the biological process of pollination.
- Students will demonstrate an understanding of the life cycle of syrphids.
- Students will compare and contrast butterflies and moths using a Venn diagram.
- Students will study the history of the term 'Flower Power'.
- Students will have the opportunity to become part of the Great Sunflower Project.
- Students will create a class book that focuses on the strategies society is employing to reduce negative human impact on Earth.



In addition to supplemental materials focused on core STEAM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and crosscurricular activities.

#### SELECTIONS

Flower Power
 Expository Nonfiction, ~1100L
 Super Syrphids
 Expository Nonfiction, ~1100L
 Butterflies & Moths

Expository Nonfiction, ~1100L

#### Flower Power

**pp. 10-13, Expository Nonfiction** This article explores the process of pollination and the importance of Earth's flowering plants. Students will learn how flowers are not only

beautiful, but essential to the wellbeing of the inhabitants of our planet.



#### RESOURCES

**Biological Process** 

#### OBJECTIVES

- Students will learn how flowering plants have evolved and adapted.
- Students will examine the biological process of pollination.
- Students will study the history of the term 'Flower Power'.

#### **KEY VOCABULARY**

- ovules (p. 12) the female parts of the plant that are fertilized by pollen to become seeds
- *pollen* (p. 12) a fine powder produced by flowers that is needed for fertilization
- angiosperm (p. 12) flowering seed plants
- gymnosperm (p. 12) non-flowering seed plants

#### ENGAGE

Conversation Question: How do Earth's pollinators perpetuate life?

The first sentence of the article asks, "What would life be like without flowers?" Pose this question to the students and allow a few minutes for brainstorming. Have students share their thinking and post responses on the board. Revisit the list after reading the article and discuss the more surprising revelations.

#### INTRODUCE VOCABULARY

Post the key vocabulary terms and meanings and instruct students to read through the definitions. Which two words are opposites? (*angiosperm/gymnosperm*) Have students explain the relationship between the words *ovules* and *pollen*.

#### **READ & DISCUSS**

Read the article aloud with the class. Have students reread the article in small groups to answer the questions below. Share responses.

- 1. The article states, "A flower is more than just a pretty face". Explain that sentence.
- 2. What is the difference between the seeds in flowering plants and non-flowering plants?
- 3. How does pollination occur in flowering plants?
- 4. How does technology help scientists to learn about plant evolution?
- 5. Explain the co-evolution of flowers and insects.
- 6. What is the 'great radiation'?

# SKILL FOCUS: Process of Pollination

**INSTRUCT:** This article presents the reader with detailed information regarding the many ways that the process of pollination occurs in nature. Present the *Pollination Variation* graphic organizer and tell students that they will be recording details about the various methods. They will need to consult the article to gather accurate information that relates to the processes outlined in the article.

**ASSESS**: The objective of this lesson is to help students learn about pollination by examining the various ways that the process is accomplished. Review graphic organizers to measure their success with the task.

#### EXTEND

**Social Studies** Explain that poet Allen Ginsberg originally coined the expression 'Flower Power'. It was a slogan used by the American counterculture movement in the 1960s that advocated peace and love over militarism and materialism. Challenge students to learn more about that culture. What did flowers represent in this movement and how were they displayed? Is there a modern-day version of this movement?

#### **Pollination Variation**

**Biological Process** Reread the article and underline sentences that detail the methods of different pollination processes. Explain four different ways that plants can be pollinated.



#### Super Syrphids

#### pp. 26-28, Expository Nonfiction

If it looks like a bee and sounds like a bee...it's *not* necessarily a bee! Students will learn about the industrious 'flower flies' of the syrphidae family.



#### RESOURCES

Life Cycle

#### OBJECTIVES

- Students will learn about the valuable pollinators in the syrphid fly family.
- Students will demonstrate an understanding of the life cycle of syrphids.
- Students will have the opportunity to become part of the Great Sunflower Project.

# **KEY VOCABULARY**

- aphids (p. 27) very small insects which live on plants and suck their sap
- molts (p. 28) a periodic shedding of hair, feathers, shell, horns, or an outer layer

#### ENGAGE

Conversation Question: How do Earth's pollinators perpetuate life?

Display the cover page of the article that includes the title, "Super Syrphids" and a large photograph of the insect. Most students will assume from its appearance that it is a type of bee. Explain that this mighty pollinator is actually a fly, and that there are 6,000 species of syrphids flies worldwide. Pose the question: If only 900 of these species live in North America, what percent of the syrphid fly family lives outside of North America? (Answer: 85%)

#### INTRODUCE VOCABULARY

Post the key terms and discuss the definitions. Then display the following questions and have students supply the correct answers:

- What word refers to a transformative process? (molts)
  What animals go through this process?
- What word refers to tiny insects that feed on plants? (aphids) What other creatures get their nourishment from plants?

# READ & DISCUSS

Reinforce comprehension of the concepts in the article by using the following prompts to direct discussion.

- 1. Why are syrphids sometimes called 'hoverflies'?
- 2. What are the similarities between syrphids and bees?
- 3. Where should you look if you want to find a syrphid egg?
- 4. How do syrphid larvae help to control pest populations on crops?
- 5. Why are syrphids and other flies considered valuable pollinators worldwide?
- 6. Which plants do syrphids pollinate?

# SKILL FOCUS: Life Cycle

**INSTRUCT:** Review the article and guide students to notice the description of the syrphid life cycle on pages 27-28. Distribute the *Wanna-Bees* graphic organizer and instruct students to explain the defining characteristics of each phase (egg, larvae, pupa, adult) of the syrphid's life cycle.

**ASSESS**: Circulate as students are working on their charts and have students retell the life cycle process in their own words. Collect the *Wanna-Bees* organizer and evaluate.

# EXTEND

**Science** The last paragraph of the article suggests that students become citizen scientists for the Great Sunflower Project (scistarter.org/the-great-sunflower-project). The programs focus on identifying where pollinators are declining and subsequently, working to improve the habitat. The program offers students the opportunity to observe the environment, track and submit findings, and help scientists to gather information about pollinators in their region. Becoming part of this project is free and appropriate for all grade levels. "BEE" proactive!

# Wanna-Bees

**Life Cycle** Refer to the article to identify the four stages of the syrphid life cycle (egg, larvae, pupa, adult). Explain the characteristics of each stage and make a drawing that shows the appearance of the insect in each phase.



#### Butterflies & Moths

**pp. 38-40, Expository Nonfiction** Spring brings warmer days and nights and fills the air with flying insects. Take flight and learn how butterflies and moths are important pollinators of crops and native wild plants.



#### RESOURCES

**Compare and Contrast** 

#### OBJECTIVES

- Students will learn about the pollination behaviors of butterflies and moths.
- Students will compare and contrast butterflies and moths using a Venn diagram.
- Students will create a class book that focuses on how humans are taking steps to reduce negative human impact on the Earth.

#### **KEY VOCABULARY**

*lepidoptera* (p. 39) an order of insects that includes butterflies and moths; 'scaled wings'

# ENGAGE

Conversation Question: How do Earth's pollinators perpetuate life?

Poll the students to find out if they think that there are more species of butterflies or moths in the world. Then read aloud the following sentence from the text box on page 39 that says there are over 180.000 named species in the insect order, lepidoptera. Butterflies (and a small group called 'skippers') make up only 10% of the lepidopterans; the rest are moths. Have students calculate 10% of 180,000. How many are moths? (Answer: 162,000 are moths, 18,000 are butterflies)

#### INTRODUCE VOCABULARY

Post the key vocabulary word and definition. Inform students that -ptera is a Greek suffix meaning 'wing'. The beginning of the word, 'lepido' translates as the Greek word for flaky or scaly. List the six largest orders of insects on the board: coleoptera, lepidoptera, hymenoptera, diptera, hemiptera, orthoptera. What do these words have in common? (All contain -ptera, therefore all have wings.) Challenge students to find out what the other prefixes mean.

# **READ & DISCUSS**

Post and discuss the questions prior to reading. Read the article aloud, pausing when answers to the questions are revealed and encourage students to elaborate.

- 1. How do butterflies and moths help rare plants?
- 2. What important crops do butterflies and moths help to pollinate?
- 3. Explain how flowers attract pollinators with these 3 attributes: size, color and scent.
- 4. What happens to a plant that loses its pollinator?
- 5. How are humans threatening the existence of butterflies and moths?

# SKILL FOCUS: Compare and Contrast

**INSTRUCT:** Students will compare and contrast the anatomy and habits of butterflies and moths. Instruct pairs of students to revisit the text and to underline information that will be helpful for this purpose. Introduce the graphic organizer, *Wings & Things*, and have the partners record the data on the Venn diagram.

**ASSESS**: Reconvene and review the *Wings & Things* worksheet with the class. Have students use the information gathered on the Venn diagram to write a 3-paragraph essay that demonstrates the differences and similarities.

# EXTEND

**Environmental Science** It is undisputable that humans are responsible for many problems that are occurring in the natural world. This article mentions that many pesticides have the unintended effect of harming pollinators. Have students create a class book focusing on how humans are trying to right their wrongs and protect the earth. (Direct students to reread the text box on page 40.) Share the book with other classes.

# Wings & Things

**Compare and Contrast** Use information from the article to compare butterflies and moths. Consider the following: physical appearance, behaviors/habits, pollination strategies, predators.

