OVERVIEW
INSECTS

GOALS

The **Insects Module** provides experiences that heighten students' awareness of the diversity of animal forms. They come to know firsthand the life sequences of a number of insects. In each investigation an insect is introduced, and students observe structures and behaviors, discuss their findings, and ask questions. Students observe life cycles of insects and compare the stages of metamorphosis exhibited by each species.

FOSS EXPECTS STUDENTS TO

- Develop a curiosity and interest in insects and a respect for them as living things.
- Experience some of the great diversity of forms in the animal kingdom.
- Become familiar with some of the life sequences that different types of insects exhibit (simple and complete metamorphosis).
- Observe the similarities and differences in the larvae, pupae, and adults of insects that go through complete metamorphosis.
- Observe the behaviors of insects at different stages of their life cycle.
- Provide for the needs of insects (air, water, food, and space).
- Acquire the vocabulary associated with insect life.

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INSECTS MODULE MATRIX

SYNOPSIS	SCIENCE CONTENT	THINKING PROCESSES
1. MEALWORMS		
Each student receives two larval mealworms in a vial to care for and observe. Over 10 weeks students observe the larvae grow, molt, pupate, and turn into beetles (adults), which mate, lay eggs, and die.	• Insects need air, food, water, and space. • Insects have characteristic structures and behaviors. • The life cycle of the beetle is egg, larva, pupa, and adult, which produces eggs.	• Observe mealworm larvae, pupae, and adults over time. • Describe and record changes in mealworm structure and behavior over time.
2. WAXWORMS		
Students observe waxworms progress through their life cycle. They compare the complete metamorphosis of the wax moth to that of the mealworm beetle.	• Insects have similar structures and behaviors. • Larvae produce silk.	• Observe waxworm larvae and compare them to mealworm larvae. • Describe and record changes over time.
3. MILKWEED BUGS		
Groups of students receive vials of milkweed bug eggs. Each group prepares a habitat for the bugs, providing air, space, food, and water. They observe structure, pattern, and behavior as the insects advance through simple metamorphosis.	• Insects hatch from eggs. • Insects have three body parts: head, thorax, and abdomen. • Insects have different structures for eating different kinds of food. • Some insects go through simple metamorphosis (egg, nymph, adult).	• Observe the sequence of changes that bugs go through as they mature into adults. • Observe, describe, and communicate the structures, patterns, and behaviors of insects.
4. SILKWORMS		
Students observe the life history of one of the most commercially successful insects. They start with eggs and observe the growth and changes to larvae, pupae, and adults who produce eggs. Students study the structure of a moth larva.	• Insect larvae have structures in common. • Insect adults have structures in common. • Male and female insects mate, and the female lays eggs. • Moths pupate in silk cocoons.	• Observe and compare the structures of an insect larva and adult. • Compare different insects' structures and behaviors. • Describe and record changes over time.
5. BUTTERFLIES		
The class observes the painted lady larvae grow, pupate, and emerge as adults. Students experience the stages of complete metamorphosis and compare the behaviors of moths and butterflies.	• Insect larvae and adults have structures in common. • The life cycle of the butterfly is egg, larva, pupa, and adult, which produces eggs.	• Observe structures and behavior of a butterfly. • Compare the structures and behavior of the butterfly to other insects. • Describe and record changes over time.
6. OTHER INSECTS		
The class sets up habitats and observes the structures and behaviors of house crickets, ants, and aquatic insects.	• Insects can live underground, above ground, and in water.	• Observe crickets, ants, and other insects in classroom habitats. • Compare the structures and lifestyles of insects.

INTERDISCIPLINARY EXTENSIONS	FOSS SCIENCE STORIES	HOME/SCHOOL CONNECTION
Language Extension • Read *Lifetimes.* **Math Extensions** • Two problems to solve. **Science Extensions** • Bring insects to class. • Start a time line. • Guess when the larvae will pupate. • Investigate ladybugs.	• *So Many Kinds, So Many Places*	The student sheet called *News Flash!* has students introducing their new classroom insects as they come into the class and writing three observations or facts they have discovered.
Language Extension • Use waxworms for paragraph topics. **Math Extension** • Use a Venn diagram. **Science Extensions** • Start a waxworm time line. • Look for moths.		Students provide the second installment of *News Flash!* and keep families updated on their insects' lives.
Art Extension • Color pictures of bugs. **Math Extensions** • Two problems to solve. **Science Extensions** • Start a milkweed bug time line. • Discuss life cycle. • Look for milkweed bugs in the wild.	• *Insect Shapes and Colors*	Students search for insects in the local environment. Suggestions for safely collecting, caring for, and observing insects found in the wild are provided.
Math Extension • One problem to solve. **Science Extensions** • Start a silkworm time line. • Look inside a cocoon.	• *What Makes an Insect an Insect?*	Students look for evidence of insects and other small animals (spider webs, holes in a plant leaf, and so forth).
Art Extension • Reconstruct a butterfly. **Math Extensions** • Two symmetry problems to solve. • Use a Venn diagram. **Science Extensions** • Hold a butterfly. • Start a painted lady time line. • Raise local larvae.	• *Insect Life Cycles* • *Life Goes Around*	Students create an imaginary insect with craft materials. They create the life history of their unique insect species.
Math Extension • One graphing problem to solve. **Science Extensions** • Observe ladybugs. • Observe mantids. • Raise fruit flies. • Take a field trip.	• *Same But Different* • *Environment* • *Variation*	Students take home instructions for a simple, homemade ant farm for small black or carpenter ants.

FOSS AND NATIONAL STANDARDS

The **Insects Module** emphasizes the development of observation and description skills and the sense of respect for living organisms. This module supports the following National Science Education Standards.

SCIENCE AS INQUIRY

Develop students' abilities to do and understand scientific inquiry.

- Ask and answer questions.
- Plan and conduct simple investigations.
- Employ tools and techniques to gather data.
- Use data to construct reasonable explanations.
- Communicate investigations and explanations.
- Understand that scientists use different kinds of investigations and tools to develop explanations using evidence and knowledge.

CONTENT: LIFE SCIENCE

Develop students' understanding of the characteristics of organisms.

- Organisms have basic needs. Animals need air, water, and food. Organisms can survive only in environments in which their needs can be met. The world has many different environments that support different kinds of organisms.
- Animals have different structures that serve different functions in growth, survival, and reproduction.
- The behavior of organisms is influenced by internal cues (such as hunger) and by external cues (such as change in the environment).

Develop students' understanding of the life cycles of organisms.

- Animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.
- Animals resemble their parents.

Develop students' understanding of organisms and environments.

- All organisms cause changes in the environments where they live. Some of these changes are detrimental to the organisms or other organisms, whereas others are beneficial.

SCIENCE AND TECHNOLOGY

Develop students' understandings about science and technology.

- Tools help scientists make better observations.