



Metamorphosis Rock, Paper, Scissors

Teacher Lesson Plan

Animal Life Cycles Pre-Visit Lesson

Duration: 30-40 minutes

**Minnesota State
Science Standard**

Correlations:

3.4.3.2.1.

**Wisconsin State
Science Standard**

Correlations:

C.4.1, C.4.2, F 4.3

Supplies:

- 1) Smart Board or Dry Erase Board with Markers
- 2) Pictures of Complete and Incomplete Metamorphosis (found in this lesson)

Overview

Students will learn the stages of complete and incomplete metamorphosis by playing a version of Rock, Paper, Scissors.

Objectives

- 1) Students will be able to describe the process of incomplete and complete metamorphosis.
- 2) Students will be able to explain that animals go through the same life cycle as their parents.

Background

In order to grow, many animals have different processes they must undergo. Reptiles, mammals, and birds are all born looking like miniature adults. Amphibians hatch looking nothing like their adult form and must undergo metamorphosis, the process of transforming from one life stage to the next. Insects also undergo metamorphosis, but different species of insects will develop by two different types of metamorphosis: complete and incomplete. Complete metamorphosis has 4 steps, egg-larva-pupa-adult, and can be found in butterflies, beetles, mosquitoes and many other insects. In complete metamorphosis, young are born looking nothing like the adults. Incomplete metamorphosis has 3 steps, egg-nymph-adult, and can be found in cicadas, grasshoppers, cockroaches and many other insects. In incomplete metamorphosis, young are born looking like adults but must shed their exoskeleton many times in order to grow.

Metamorphosis Rock, Paper, Scissors

Procedure

- 1) Ask the students if they know what a life cycle is and explain all animals have a different life cycle. Some animals like birds, reptiles, mammals, and fish are born looking like miniature adults and grow up without changing their shape, while insects and amphibians must go through metamorphosis. Then ask the students if they know what metamorphosis is and to name some animals that go through metamorphosis.
- 2) Explain metamorphosis and insect metamorphosis in particular. List some insects that undergo complete and incomplete metamorphosis (see Important Terms). Show the pictures (in this lesson plan) of the stages of complete and incomplete metamorphosis on the Smart Board and keep them up so students can see the stages during the game.
- 3) Start the game with the complete metamorphosis of a butterfly, explain the directions, and demonstrate the actions. Review the actions by having the students practice them before the game begins. Actions:

Egg - crouched down on ground

Larva (Caterpillar) - Standing with arms at side and wiggling

Pupa (Chrysalis) - Standing with arms crossed and not wiggling

Adult (Butterfly) - Flapping wings

Directions:

- a) Each student will start the game as an egg (crouched down on ground). They will then play rock, paper, scissors with their partner and whoever wins will become a larva (caterpillar) and the other student stays an egg. The larva must stand/walk and wiggle while finding another larva to play against; the egg stays crouched and finds another egg to play against.
 - b) Students may only play against another student on their same level of metamorphosis. If they win they move up a level (egg to larva, larva to pupa, pupa to butterfly) and if they lose they must stay at their current level until they win.
 - c) Once students have reached the butterfly level and won against another "butterfly," they stand on the sidelines and watch. You can explain that these students have completed the life cycle.
 - d) You can play a silent game where the students can only find each other by doing the actions and not talking (if you play inside, this works well).
- 4) Start the game by having the students stand and spread out in the room with a partner.
 - 5) Play until the last person has no one to play against. You can also put a time limit on the game if you have limited time.
 - 6) Repeat the game using incomplete metamorphosis as a grasshopper and have the students go from egg-nymph-adult. Actions:

Egg - crouched down on ground

Nymph - Standing and wiggling

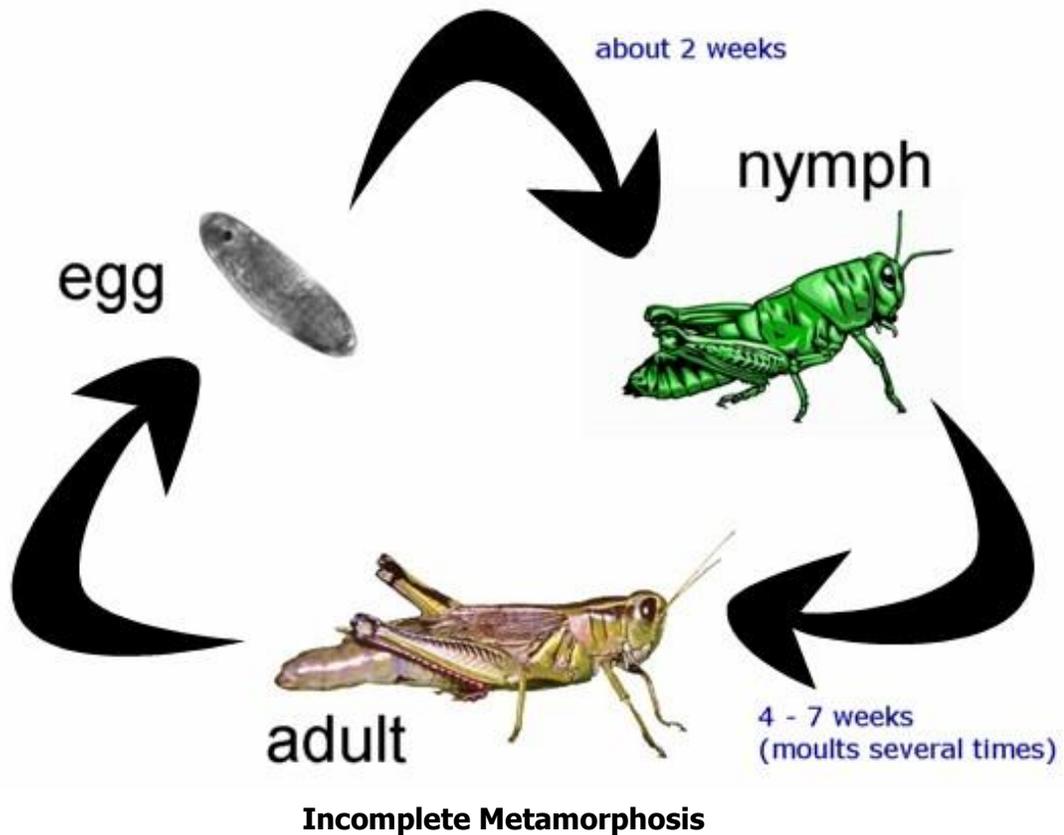
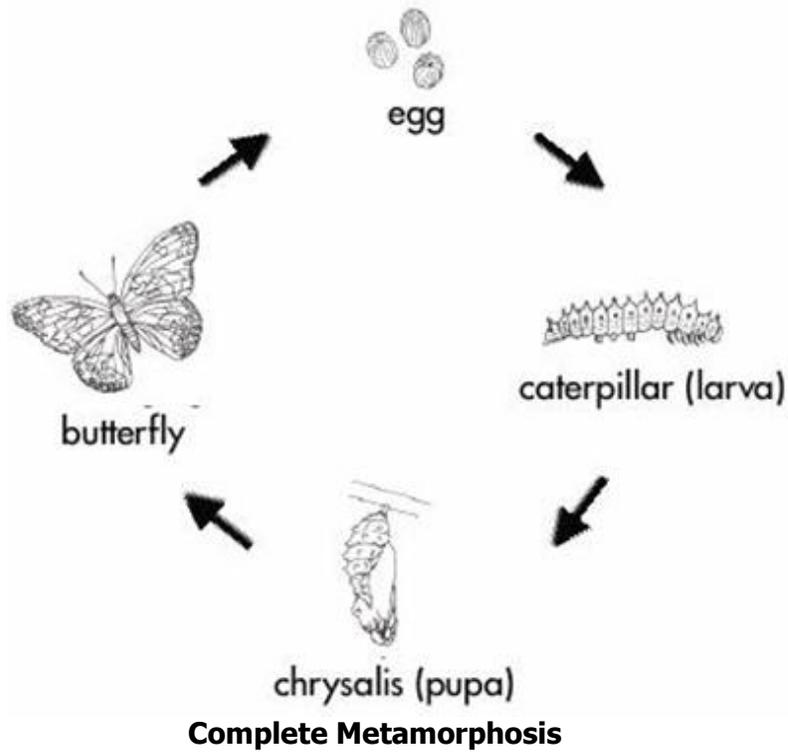
Adult (Grasshopper) - Jumping up and down

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Assessment

- 1) What is metamorphosis? *The process of transforming from one life stage to the next.*
- 2) What types of animals go through metamorphosis? *Amphibians and insects.*
- 3) What are the two types of insect metamorphosis? *Complete and incomplete.*
- 4) What are the stages of complete metamorphosis and name two insects that undergo this process?
Egg-Larva-Pupa-Adult. Butterfly, mosquito, beetle.
- 5) What are the stages of incomplete metamorphosis and name two insects that undergo this process?
Egg-Nymph-Adult. Grasshoppers, cicada, cockroach.

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Important Terms

Adaptation- Changes made by living things in response to their environment (where they live).

Amphibian- A cold-blooded (ectotherm), vertebrate animal that lays many soft, jelly-like eggs which allow for water and air to enter. Young are born with gills and metamorphose into an adult animal that can breathe through their skin. This group includes frogs, toads, salamanders and newts.

Bird- A warm-blooded (endotherm), vertebrate animal that lays hard-shelled eggs, is covered in feathers, has wings, and breathes through lungs. This group includes raptors, penguins, water fowl and songbirds.

Complete Metamorphosis- Type of metamorphosis found in insects. The insect goes through 4 stages of growth: Egg-Larva-Pupa-Adult. Insects that undergo complete metamorphosis include butterflies, ants, bees, and mosquitoes.

Ectotherm (cold-blooded)- Animals that rely on outside temperature for their body heat. They may raise their body temperature by moving to a sunny spot or lower their body temperature by moving to a cool spot.

Endotherm (warm-blooded)- Animals that generate their own body heat. They are able to raise their body temperature by shivering or eating to increase energy or lower their body temperature by sweating or panting.

Fish- A cold-blooded (ectotherm), aquatic, vertebrate animal that lays many soft-sided, jelly-like eggs which allow water to enter. They are covered in scales, breathe through gills and have fins. This group includes, sturgeon, lamprey, and carp.

Gills- Respiratory organ of fish and some amphibians where oxygen is extracted from water flowing over their gills.

Larva- The active form of an immature insect that is born not looking like its' adult form. Found in complete metamorphosis.

Life cycle- The changes an organism goes through to progress from one life stage to the next.

Incomplete Metamorphosis - Type of metamorphosis found in insects. The insect goes through 3 stages of growth: Egg-Nymph-Adult. Insects that undergo incomplete metamorphosis include grasshoppers, cicadas, cockroaches, and lice.

Insect- An invertebrate animal with 6 legs and an exoskeleton. They breathe through holes in their exoskeleton and reproduce by laying eggs which then undergo either complete or incomplete metamorphosis until they reach adulthood.

Invertebrate- An animal without a backbone.

Keratin- A hard protein found in hair, fingernails, shells. The outer layer of skin is also made from keratin.

Life cycle- The changes an organism goes through to progress from one life stage to the next.

Metamorphosis Rock, Paper, Scissors

Mammal- A warm-blooded (endotherm), vertebrate animal with fur/hair that gives birth to live young, feeds their young milk, and breathes through lungs. This group includes dogs, cats, bears and cows.

Metamorphosis- The process of transferring from one life stage to the next (e.g. egg to tadpole to froglet to frog). This process is found in insects and amphibians.

Neotenic- Retaining larval features into adulthood. An adult salamander with gills is considered neotenic.

Nymph- An immature insect that looks similar to its' adult form. In order to grow it molts its' exoskeleton and has several growth stages called instars. If the adult form has wings, the nymph will grow the wings gradually with each instar. Found in incomplete metamorphosis.

Pupa- An immature insect in its' inactive form between the larval and adult states, e.g. a chrysalis. Found in complete metamorphosis.

Reptile- A cold-blooded (ectotherm), vertebrate animal that is covered in scales, lays soft shelled eggs, and breathes through lungs. This group includes turtles, snakes, lizards and crocodilians.

Vertebrate- An animal with a backbone.