TOWER GARDEN BY JUICE PLUS+

PLANT LESSON

LEARNING ABOUT PARTS OF PLANTS

Grade 2 and up

Science

Pollination: Flowers

1 Purpose and Content of Lesson:

Angiosperms (flowering plants) are the largest, most successful plant group on Earth. Angiosperms are also the youngest plant group, evolving 125 million years ago.[1] Almost all crop plants are angiosperms.

What is the purpose of a flower?

What is the flower's special job? image[2]

This lesson begins the exploration of how flowers make seeds and develop fruit by focusing on pollination.

Terms and definitions simplified for elementary students:

pollination: pollen grains on the anther of the stamen land on the stigma of the pistil

cross-pollination: when pollen is transferred to the stigma of another plant

self-pollination: when pollen is transferred to the stigma of the same plant

pollen: microscopic grains formed on a part of the flower called stamens that are needed to make a seed

pollinators: animals such as bees, wasps, flies, butterflies, bats, and birds that move pollen from anthers to stigmas. Wind also helps pollinate flowers.

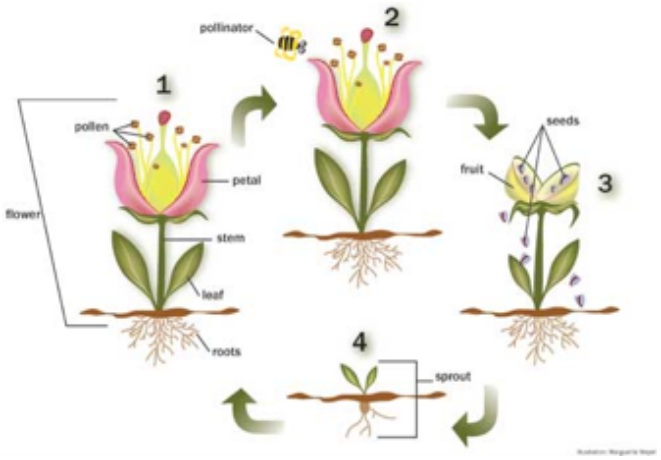
stamen: male flower part that contains an anther with pollen

anther: part of the stamen that holds pollen

pistil: female flower part with a stigma on top and an ovary where seeds are formed

stigma: sticky top part of pistil where the pollen from the anthers must land in the seed-making process

See: PowerPoint Slideshow on POLLINATION to be used with this lesson.



2 Next Generation Science Standards (NGSS):

http://www.nextgenscience.org/search-standards

Disciplinary Core Ideas

LS1.A: Structure and Function

All organisms have external parts. Plants have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (Grades K-2)

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (Grades 3-5)

LS1.D: Information Processing

Plants respond to some external inputs. (Grades K-2)

3 Common misconceptions about stems:

Many children believe the function of flowers is to smell nice and look beautiful. Even after instruction, it is hard for them to think of flowers as being responsible for generating seeds and fruit. Due to the complex vocabulary in the process of pollination and fertilization, younger students can learn about pollination and pollinators with a lesser focus on the process of fertilization. Fertilization will be the topic of the second lesson on flowers.

Developed by: Debra Zinicola, Ed.D., Seton Hall University, Chair, Department of Educational Studies, and Marian Glenn, Ph.D., Seton Hall University, Professor, Department of Biological Sciences

4 Lesson Objective:

Learners will explain how flowers are pollinated using the terms anther, stamen, pistil, stigma, and pollen and identify at least four types of pollinators on an exit slip.

5 Lesson Procedure— THE LEARNING CYCLE: The Five Es

ENGAGE

Review the function of other parts of plants that have been learned — seeds, roots, and stems. Ask students what they know about flowers and what they do for the plant. Clear up misconceptions and explain that the flower's special job is to make seed(s).

Project this introductory video showing the following pollinators: hummingbirds, bees, butterflies, and bats. (4 min.)

The Beauty of Pollination: **http://video.disney.com/watch/the-beauty-of-pollination-wings-of-life-4da84833e06fd54fff590f49**

Show the video at the beginning as an introduction, then again at the end of the lesson so at different points it can be stopped for students to describe the process that is occurring using the terms taught in this lesson. Tell them pollen grains grow on stamens and need to get to another flower part called the pistil so the flower can make fruit and seeds. If the pollen does not get to the pistil, no fruit or seeds will be made.

What will happen to a farmer's tomato plants if the flowers do not get pollinated?

Pollinators are extremely important; without them, we would not be able to grow plants as food. Honeybees are important pollinators because they visit many flowers, depositing pollen onto many pistils.

EXPLAIN

Show PowerPoint slideshow on Pollination. The content and images explain what pollination is and how it happens. (In the "notes" section of each slide are the web addresses of the sources of the content and images.)

EXPLORE

Key Questions — *What is pollination and why is it important? Which flower parts are involved in pollination? How do flowers get pollinated?*

Students use 4-slide view of printed copies of PowerPoint presentation to create skits in groups of 3. They must depict a concept about pollination and incorporate at least three vocabulary words into each skit. Provide about ten minutes for them to prepare their skits and write, on paper, what concept they are enacting and which vocabulary words they are incorporating. After each skit is presented, the class will determine what vocabulary words and definitions apply and summarize what they saw in each skit.

EXPAND

Flower observation:

Have two or three different flowers for students to observe, draw, and label. If there is any student with a pollen allergy, encase each bloom in a plastic bag that is puffed with air and rubber banded at the stem. Have one of each kind of flower for each group. Daisies, lilies, tulips or whatever seasonal varieties can be found will provide students with the diversity of flower representations to observe key parts: petals, stamens, anthers, pistil, and stigma.

EVALUATE

Have all key vocabulary terms written on the board without definitions.

On an exit slip, students will write:

1) What is pollination? (using at least three vocabulary words from the lesson)
2) How does pollination happen in at least two different ways?
3) Four pollinators

6 Web Resources and Materials

[1]Grades 6-8 Flower investigation, vocabulary, discussion questions, full lesson plan: Discovery Education **http://www.discoveryeducation.com/teachers/free-lesson-plans/plant-pollination.cfm**

Image[2] **http://pollinator.org/beeissues.htm**

Flowers: How seeds are made (process, vocabulary) Great Plant Escape **http://extension.illinois.edu/gpe/case4/c4brief.html**

Pollination: Diagram, facts, video: Biology of Plants **http://www.mbgnet.net/bioplants/pollination.html**

Flower Dissection: **https://www.desertmuseum.org/center/edu/docs/k-5_DesertGardeners_flowerDissection.pdf**

Pollinators images, video: **http://www.newtonsapple.org.uk/plant-pollinators/**

Materials:

One per group:

- Tray to hold flowers
- Three or four different types of flowers on the tray for students to observe, draw, and label

One for each student:

- Paper plate
- Printout of 4-slide view of PowerPoint presentation
- Hand lens
- Science journals

7 Appendices

PowerPoint slide show titled “POLLINATION”

How flowers make seeds and fruit
Part 1: Pollination

DEVELOPED BY:

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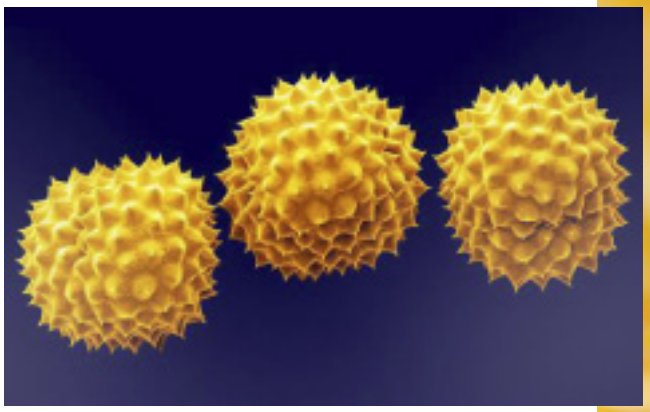
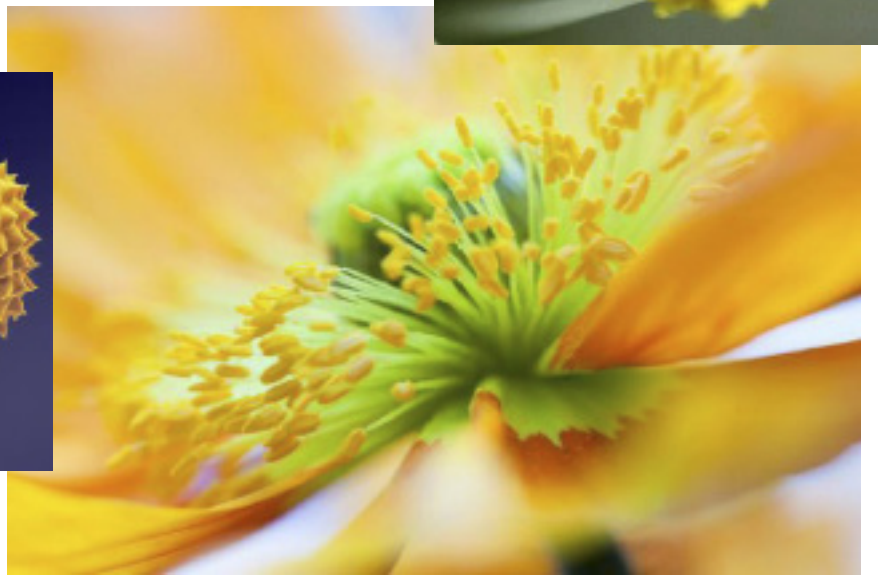
What is Pollen?

Tiny pollen grains are formed on a part of the flower called **stamens** and are needed to make a seed.





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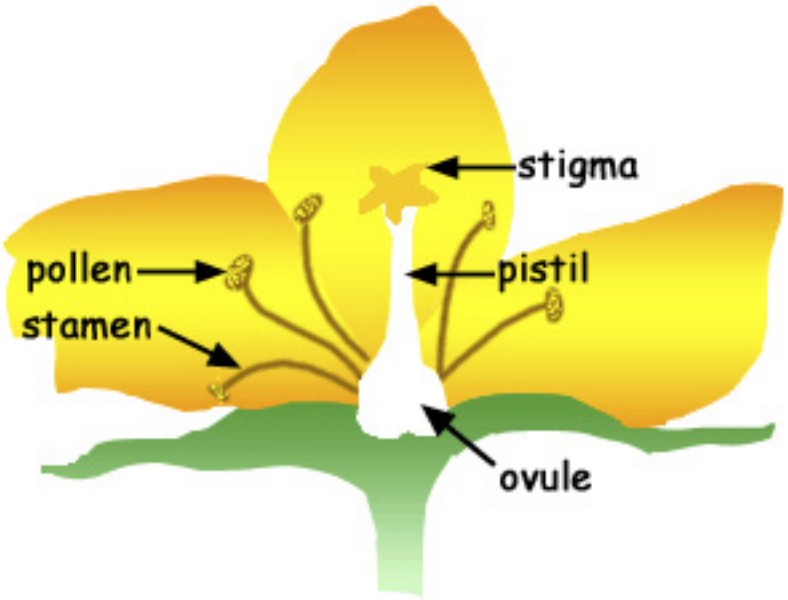
What is Pollination?

Pollination is the first step in the seed making process. In this step, pollen is moved to where it is needed.

Pollen grains on the anther of the stamen need to land on the stigma of the pistil.



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What is Pollination?

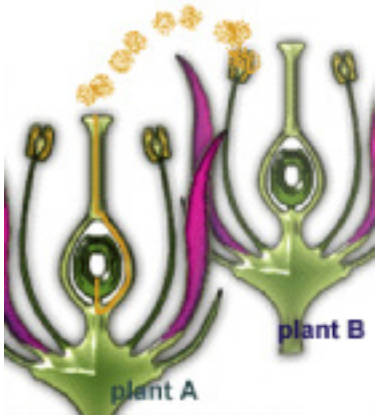
When pollen is transferred to the stigma of the same plant it is called **self-pollination**.

When pollen is transferred to the stigma of a different plant it is called **cross-pollination**.

Usually plants rely on animals or the wind to pollinate them.

Question:

How would indoor Tower Garden flowers get pollinated?



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Pollination by Insects

Flowers pollinated by insects are colored and scented. Why do you think that is so?

When **pollinators** suck up nectar in the pistil, they brush against the **anthers** and get pollen on their bodies.

When they land on a flower, the pollen rubs off their bodies onto the **stigma** of the **pistil**.

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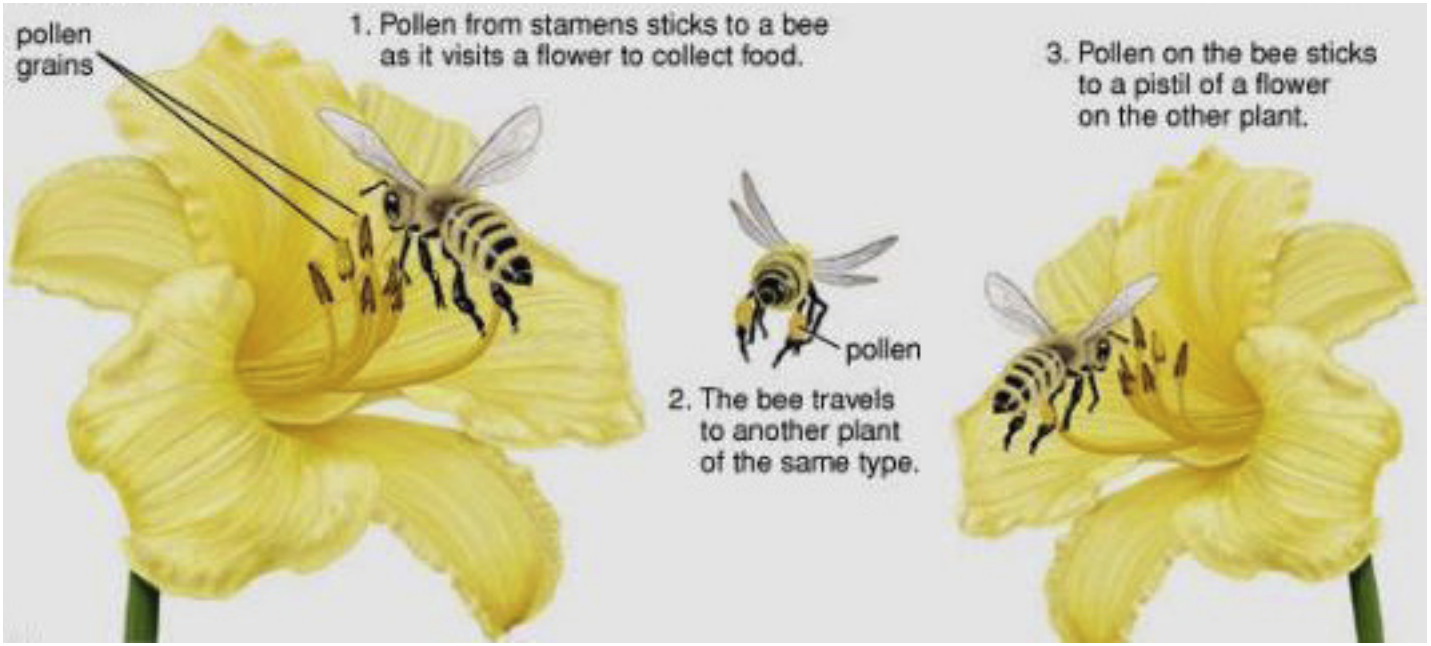
Pollination by Insects

Cross-pollination:



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Other Pollinators

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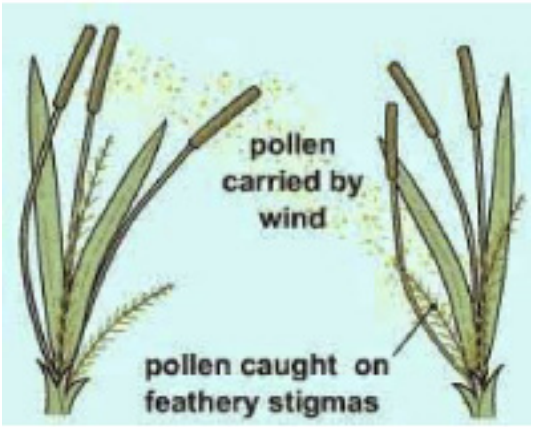
Pollination by Wind

Wind-pollinated flowers usually have small petals, dull colors and no scent.

Why do you think this is so?

Their anthers usually hang out of the flowers so that the pollen grains can be blown by the wind more easily and have a higher chance of landing on a distant, large, feathery stigma.

Why do the stigmas of wind-pollinated flowers look this way?



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Artificial Pollination

In Tower Garden Cucumbers:

When plants are grown indoors without wind or animal pollinators, the flowers need help to move pollen.

A person needs to transfer the pollen from the anthers onto the stigma of the female flower.

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Artificial Pollination

In Tower Garden Cucumbers:

Cucumber plants produce two kinds of flowers.

One kind of flower produces pollen (male). The other kind has a pistil and produces fruit and seeds (female).

Look behind the blossom to see if there is a miniature cucumber. If so, that is the flower with the stigma and pistil.

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Artificial Pollination

In Tower Garden Cucumbers:

A cucumber flower being pollinated by hand.

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Artificial Pollination

In Tower Garden Cucumbers:

1. Use a small Q-tip to collect pollen from several anthers on the stamens of male flowers.
2. Brush pollen onto the stigmas of the flowers with the miniature cucumbers.
3. Watch the size of the little cucumber for a week after you pollinate the flower. What do you think will happen?

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Artificial Pollination

In Tower Garden Cucumbers:

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Artificial Pollination

In Tower Garden Tomatoes:

Tomato flowers produce both pollen and a pistil on the same flower.

But the pollen is held in a little cage, and without pollinators, a person is needed to help release it.

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Artificial Pollination

In Tower Garden Tomatoes:

So, to pollinate tomatoes,
just shake the plants … gently.

Where do you hope the pollen will land?

What will you be able to observe in the next few weeks if you were successful?

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Artificial Pollination

In Tower Garden Tomatoes:

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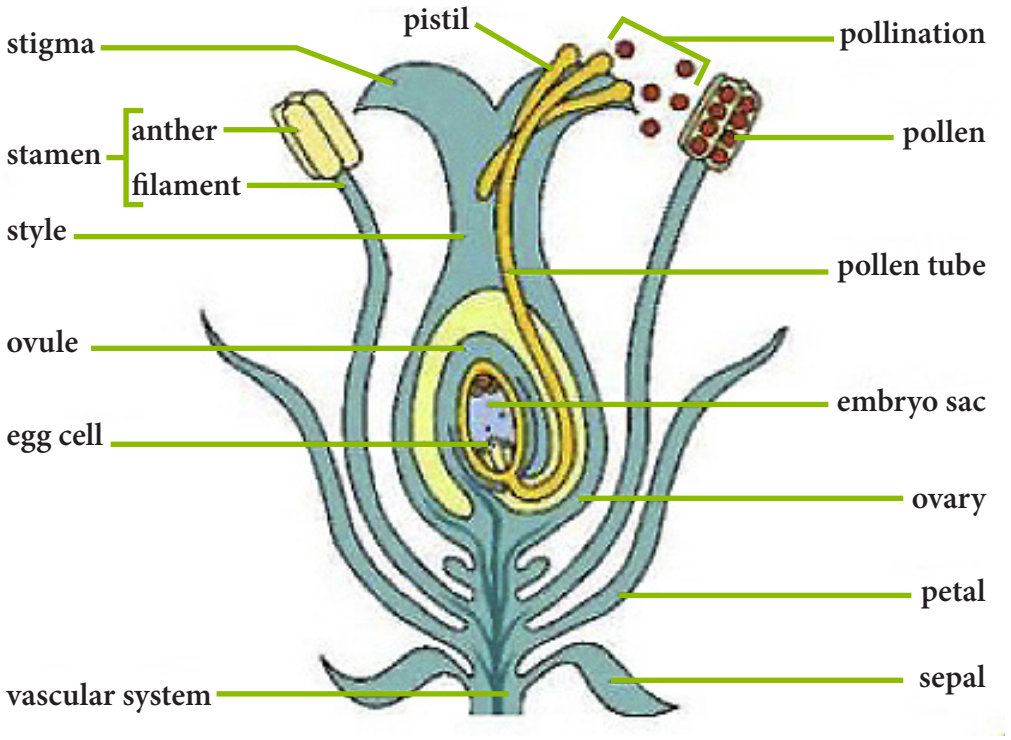
Fertilization

What happens after pollination?

How fertilization takes place



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Pollination: Terms and Definitions

- **pollination**–pollen grains on the anther of the stamen land on the stigma of the pistil
- **cross-pollination**–when pollen is transferred to the stigma of another plant
- **self-pollination**–when pollen is transferred to the stigma of the same plant
- **pollen**–microscopic grains that are needed to make seeds are formed on a part of the flower called stamens
- **pollinators**–animals such as bees, wasps, flies, butterflies, bats, and birds that move pollen from anthers to stigmas. Wind also helps pollinate flowers.
- **stamen**–male flower part that contains an anther with pollen
- **anther**–part of the stamen that holds pollen
- **pistil**–female flower part with a stigma on top and an ovary on bottom where seeds are formed
- **stigma**–sticky top part of pistil where the pollen from the anthers must land in the seed making process

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