

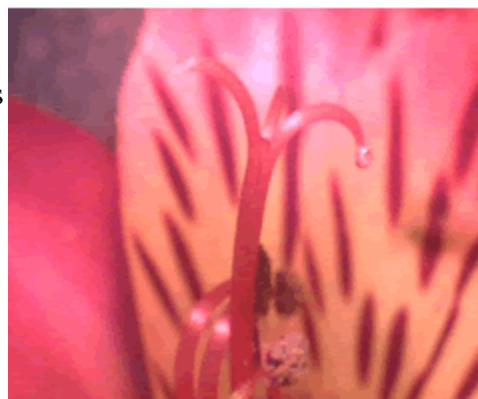


Exploring Flowers With the Digital Microscope

Activity Overview

Studying flowers and plants is an ideal way to address National Science Education Standards for life science in grades K-4. Elementary children enjoy observing changes in seeds as they germinate and grow into tall healthy plants, but how do you create an exciting and innovative study of flowers for your students? New technologies have the potential of making the investigation of flowers an exciting event.

In this activity students explore flower structures using a the QX3 digital microscope. Students will make observations using the microscope to formulate their ideas of the function of each part and take snapshots of their structures to create a pictorial library of flowers and analyze similarities and differences in flower structures of several species.



Grades 4-10

Advantages of Technology

Digital microscopy can add a new dimension of exploration for young students. Advances in technology have made digital microscopes an affordable possibility in elementary and middle school science. These microscopes use the computer screen as the microscope eyepiece, making focusing specimens easier for children and providing them opportunities to share images with other students and save images for later analysis. Using the digital microscope students can conduct an inquiry investigation to discover the form and function of flower structures.

Educational Standards

This activity addresses the following Virginia Standards of Learning (SOLs):

Fourth Grade

4.1: The student will plan and conduct investigations in which distinctions are made among observations, conclusions, inferences, and predictions;

4.4: The student will investigate and understand basic plant anatomy and life processes. Key concepts include

- the structures of typical plants (leaves, stems, roots, and flowers);
- processes and structures involved with reproduction (pollination, stamen, pistil, sepal, embryo, spore, and seed)

4.5: The student will investigate and understand how plants and animals in an ecosystem interact with one another and the nonliving environment. Key concepts include structural adaptations

Life Science 5

The student will investigate and understand how organisms can be classified. Key concepts include distinguishing characteristics of major plant phyla and the characteristics of the species.

Life Science 10

The student will investigate and understand how organisms adapt to biotic and abiotic factors in an ecosystem. Key concepts include adaptations that enable organisms to survive within a specific ecosystem.

Materials

Technology:

- QX3 digital microscope* (or other digital microscope with snapshot capability)
- Computer (PC with Windows 98 or higher)
- Floppy disk or other storage device
- Color printer (optional)



Other Supplies:

Variety of simple flowers with easily identifiable structures (lilies, daffodils, *Alstroemeria*)

Note: Alstroemeria are used in this lesson

*QX3 microscopes currently may be purchased from the following websites:

www.CompuVisor.com (\$47.95)

www.neosci.com (\$159.95--includes teacher resources and software compatible for both PC and Mac platforms)

Procedure 1

NOTE TO TEACHERS:

These procedures are written to show you how you might use these technologies to teach science concepts. Suggested questions, approaches, and expected answers are all provided. Therefore, these activity descriptions should be used as a guide for your instructional planning, rather than as step-by-step directions for students.

Prerequisite Skills

Before beginning this activity, students should have had some experience using the QX3 microscope. They will need to know how to focus the microscope, change magnification power, use the snapshot feature of the software program, and export images to a disk or other storage unit. The screen shot shows the live view of the QX3 with which students can focus on an object placed on the microscope stage, choose top and/or bottom lighting, vary the amount of light, and take snapshots or video images.



Figure 1. Screenshot of QX3 live view screen.

Getting Started

Teacher note: This activity works well with groups of two or four students to one microscope.

Elementary science curriculum often includes learning the parts of the flower, but this activity is also ideal for exploring the relationship between the structure and function of flower parts.

What are the parts of a flower?

To answer this question, begin by making careful observations of an *Alstroemeria* flower. Notice the designs on the petals and the stalk-like structures inside the flower. Make a sketch of your flower on the Flower Lab Sheet.

Does your flower have patterns on the petals? What color is it?

What do the structures inside the flower look like?

Write your observations on your lab sheet.

Exploring the Parts of the Flower

What do the stalk-like structures do?

To explore this question further, you will need to open the QX3 microscope software and set it to Live View. The microscope should be set to 10X power.

Carefully remove the petals from a simple flower leaving the inside stalks exposed.



Reproductive parts of the flower

Remove one of stalk-like pieces with a rounded tip and place it under the microscope.



Male reproductive structure

Take a snapshot of the tip of the stalk at 10X, 60X, and 200X.



Tip of male structure (60X)

What do you notice on the stalk?

Can you find any light colored rice-like pieces on the tip of the stalk?

What job do you think this structure does for the flower?

Observe the images of the structure you have taken at 10X, 60X, and 200X power.

What do you notice on the top of the structure?

Insert the 60X picture into the Flower Lab Sheet. Note any observations you can make about the stalk.

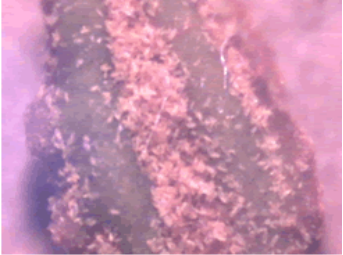
What color is it? How big is it?

Do you notice anything on the tip of the stalk?

How many of these stalks can you find in your flower?

Record your observations on the Flower Lab Sheet. After you have made careful observations, develop a hypothesis that describes the function of this flower part. Record your hypothesis on the sheet.

To insert an image of the flower in to the record sheet. Create a folder on a floppy disk and label it Flower Parts. Export the 60X flower part image from the QX3 microscope to the folder. Remember to name your picture "Stalk 1" so you can find it later. Then insert the picture into the Flower Lab Sheet. The picture may need resized to fit in the table. To do this, simply click and drag a corner of the picture in towards the center of the picture until it is the correct size.

Parts Are Parts: What Is the Function of Each Part of the Flower?		
Image of Flower Structure	Observations	Prediction of Structure's Job
	Green bumpy surface. Brownish rice-like pieces covering stalk. Tip of stalk has fold all the way down the rounded seat.	Produces pollen for the flower.

Identifying these structures can be tricky, since they do not mature at the same rate. Below are several images of similar male parts in the plant.



Undeveloped and developed male parts of flower.

Do all the flower parts look alike?

Can you find any other parts that look different from these? Now that you have observed the male parts of the flower, carefully remove them from the flower, leaving only the central stalk with the round green base.



Female parts of the flower.

Place the central stalk under the microscope.

What do you notice?

Take a snapshot of the tip of the stalk at 10X, 60X and 200X.


What do you see on the surface of the tip at 60X?


What do they look like?

Record your observations on the Flower Lab Sheet.

Export the 60X and 200X image to your Flower Image folder, then insert the best of the two images into your lab sheet document.

After completing your observations, create a hypothesis describing what this part might do for the flower. Record your hypothesis on the Flower Lab Sheet.

Image of Flower Structure	Supporting Observations	Hypothesis of Function
	<ul style="list-style-type: none"> - Green bumpy surface. - Brownish rice-like. pieces covering stalk - Tip of stalk has fold all the way down the rounded seat. 	<p>Produces pollen for the flower.</p>

	<ul style="list-style-type: none"> - Pink in color. - Has a T shape with drooping ends. - Glistening droplets of liquid on tips. - Hair-like pieces on edges. 	<p>Captures pollen.</p>
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What is inside the base of the flower?

Carefully split the base of the flower open lengthwise with your fingernails.

Do you see anything inside?

Place one half of the base, open side up, under the microscope at 10X.

What do you see?

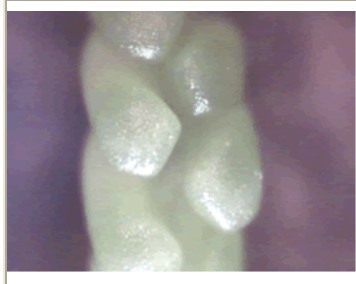
Change the power to 60X. Record your observations on your Flower Lab Sheet.

Take a snapshot at 10X, 60X, and 200X and export the best images to your flower image folder. Insert the 60X photo into the Flower Lab Sheet.

Use your observations to develop a hypothesis of what these things are in the flower. Record your ideas on your lab sheet.

What do you think these are?

What might they do for the flower?

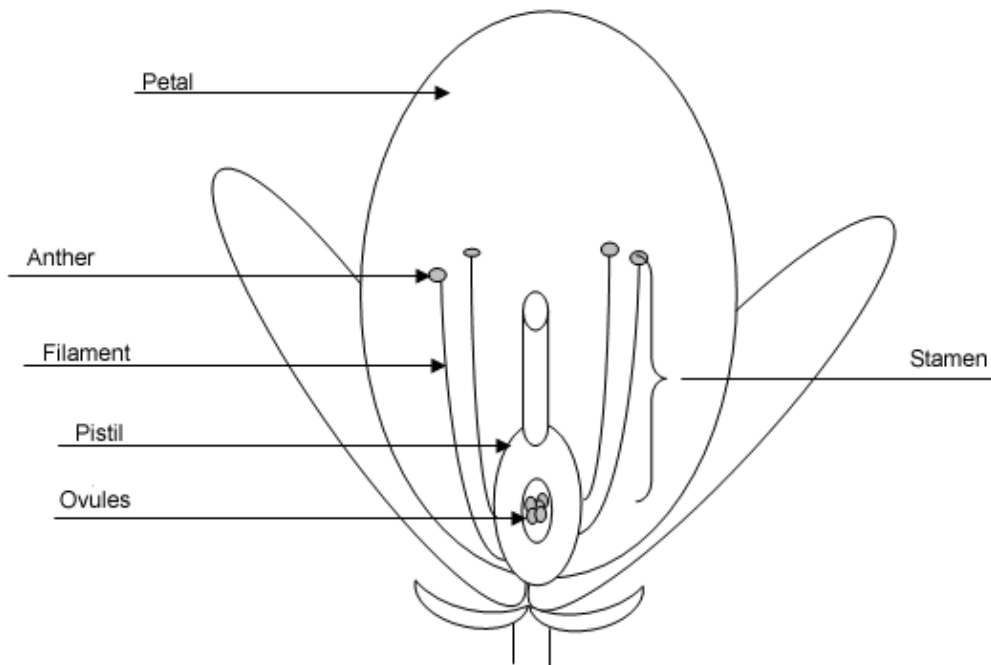
Image of Flower Structure	Supporting Observations	Hypothesis of Function
	<ul style="list-style-type: none"> - Light green in color. - Looks like bunch of green round bananas. - Bumpy surface (at 200X). 	

Putting It All Together

After collecting your data, print out a Flower Lab Sheet for each group. Hold a class discussion about the function of each part of the flower observed under the microscope. Each group should be able to support their ideas with observations they made.

The diagram below shows the names of each of the parts of a flower. Try to match the labeled parts in the diagram to the parts you examined in your flower. Then, go back and label each of the flower parts snapshots you inserted in the Flower Lab Sheet.

Parts of the Flower Diagram



Extensions

Once students have identified the basic parts of the flower, they can now compare and contrast different flowers. Provide them a variety of flowers to dissect. Each group can study a different flower, taking images of the pistil, anther, and ovules, and petals. Have students describe similarities and differences between the plants. The class could make a website to illustrate what they have learned about flowers.

Flowers come in a variety of shapes, sizes, colors, and scents to attract different pollinators. After students have learned the parts of the flower, they could conducting an investigation to learn more about patterns some flowers have to attract pollinators.

Another extension can include planning and growing a flower garden to attract pollinators, particularly pollinators such as bees, hummingbirds, and butterflies. See the [Resources](#) section for possible web sites to learn more about planning and planting a garden.

Modifications

As this activity is written, it is expected that pairs or small groups of students share a computer and go through each step of the activity. This activity can also be adapted to a whole class setting, using a projection device to allow all students to see the screen. This would be good to do during a class discussion as well, to allow the class to observe each flower structure as they discuss its hypothesized function.

Assessment Strategies

Provide students a handout with microscope snapshots of each of the structures identified in the lesson. Have students provide a description of the function of each structure and support their ideas with observations they made during their investigation.

Other assessment ideas include the following:

- Provide students another type of flower and ask them to find and identify the same structures identified earlier. Have them take a snapshot of each structure and export the images to a word processing document, where they must provide a description of each structure, including its appropriate name and function.
- Have students create an electronic presentation or web page of five flowers, showing their structures with appropriate identification. Each slide should represent one of the structures and include the an image of each flower's structure, along with a brief description of the function of the structure and any difference or similarities they observed between the structures. Older students should be able to add the pollinators for each flower.

You may also want to download a version of the [Parts of the Flower](#) diagram without the labels.

Resources

For more ideas on the topic of flowers, pollination, and seed dispersal check out the following URL's:

Molecular Expressions: Science, Optics, and You.

<http://micro.magnet.fsu.edu/optics/intelplay/index.html>

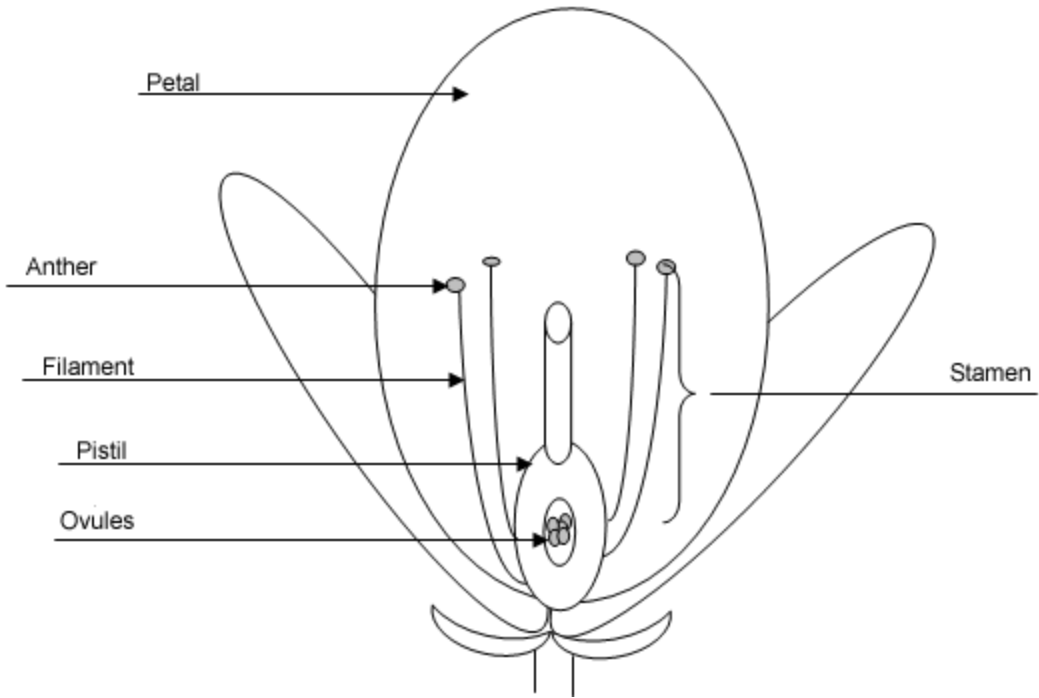
This is a comprehensive site on the QX3 digital microscope including tutorials, a snap shot gallery, the science behind the optics of the QX3 and more.

The Great Plant Escape

<http://www.urbanext.uiuc.edu/gpe/index.html>

University of Illinois Extension designed this site for fourth and fifth grade students to explore plant science and learn about growing of food. Five interdisciplinary lessons are designed as detective cases integrating math, science, social studies and language arts. Topics covered include: parts of the flower, seeds, soil, plant reproduction, and more.

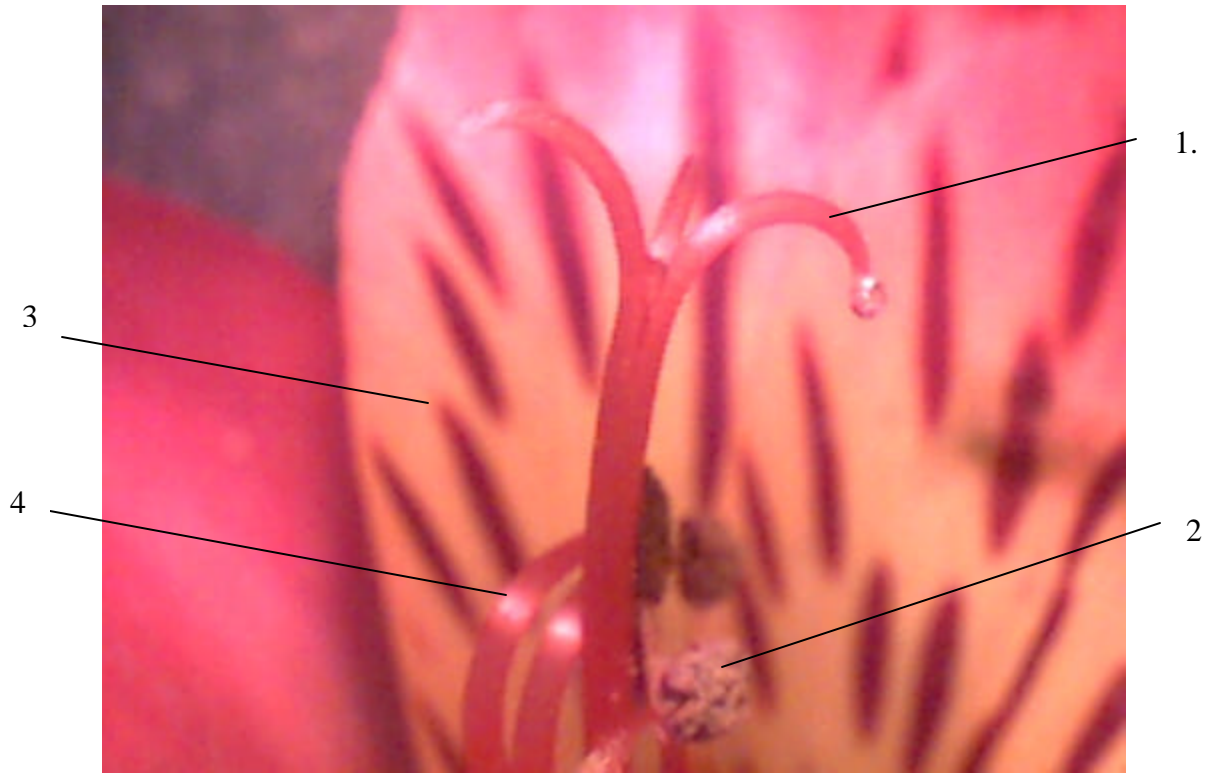
Parts of a Flower



Name: _____

Date: _____

Can You Name the Parts of the Flower in the Picture?



Write the name of each part of the flower and explain what that part does for the flower.

Flower Part	Function
1.	
2.	
3.	
4.	