Exploring Seed Dispersal Mechanisms

Activity Overview

Plants have created numerous seed dispersal adaptations to ensure the spread of seeds to other areas. In most classes, however, students do not have the opportunity to study these mechanisms, but instead memorize the parts of the seed. In this activity, students use the QX3 digital microscope to make more detailed observations of different seed adaptations and then are challenged to match the adaptations to the type of seed dispersal.

Advantages of Technology

Seeds and plants are common topics covered in the elementary science curriculum. Most of the time, students learn about parts of the plant and seeds through reading and worksheet activities. Even with hands-on exploration, students cannot see small structures on seeds that help with their dispersal. Using the digital microscope, such as the IntelPlay QX3, students can observe tiny structures on seed casing that are invisible to the naked eye. They can use their observations to categorize how seeds are transplanted from the host plant to a new site.

Educational Standards

Virginia Science Standards of Learning addressed in this activity:

4.4 The student will investigate and understand basic plant anatomy and life processes. Key concepts include the processes and structures involved with reproduction (pollination, stamen, pistil, sepal, embryo, spore, and seed and dormancy.

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 behavioral and 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 time lapse capability
- Computer (PC with Windows 98 or higher)

Other Supplies:

A variety of seeds including:

- Seeds found in fruits (apple, peach, tomato, cherry, etc.)
- Wildflower seeds with barbs and/or hooks on the seed case (burdock, dandelion, asters, beggar ticks, tick clover, tick trefoil, etc.)*
- Winged fruits (seeds from maple trees, poplar trees, pine or hemlock seeds)
- Hand lenses (per student)
- 5-6 cm^2 dark sheet of construction paper (optional, for color contrast)

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

www.CompuVisor.com ($47.95)

www.neosci.com ($159.95--includes teacher resources and software for Mac computers)

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.

Getting Started

How are seeds dispersed in the environment?

You might be surprised how easily seeds can move from place to place. From spring to fall an open lot can go from bare land to a sea of dandelions and other wildflowers. Taking a closer look at different seeds will help you develop an answer for this question.

Do all seeds look the same?

Get a variety of seeds and observe them closely. Separate the seeds into groups, so that each group shares a common characteristic. For example, sugar maple and red maple seeds could be placed in the same group because their seeds are winged.

Once the seeds are placed in groups, think about why you decided to make these groups.

What characteristics do these seeds share?

Use your observations to help develop hypotheses to explain how each group of seeds are transported from the parent plant to a new area. Think about the environment where these plants are found.

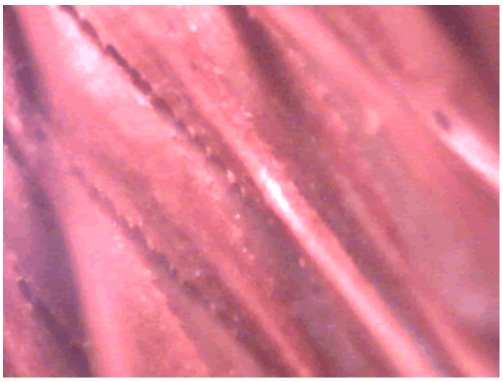
Is it dry or wet?

Do other organisms live there?

As you consider these questions, use the structure of the seed to help you develop your hypotheses. Create a Seed Record Sheet like the one below and record your ideas.

Seed Group	**Common Characteristics**	**How Seeds Are Dispersed**
Winged seeds	Seeds have wing structures	Wind
Seeds in fruits	Seeds surrounded by fruit	Animals eat fruit or carry away
Seeds with fluffy tuffs	White fluffy pieces on one end of seed	Wind

A Closer Examination



Scientists use instruments to help them make better observations. Since your eyes cannot always see small details on such small objects as seeds, using a digital microscope will magnify the seeds so you can make better observations.

Open the QX3 microscope to Live View. Adjust the lighting so you can see the seed on the computer screen. It will probably work best using top lighting. Use the dimmer slider to increase or decrease the brightness. For this activity, only the snapshot feature will be used.

Many of the seeds may have additional adaptations not easily visible to the unaided eye. Begin with the burdock seed. Place it under the QX3 and focus the seed at 10X first, then increase the power. Take a snapshot when the details of the seed are clear – at 60X or 200X. You may want to use the Paint feature in the QX3 program to label each picture.

Look at the seeds from each group.

Can you find any structures that would aid in carrying the seed away from the plant?

Are there similarities between the seeds in your group?

As you explore the seeds, refer to the record sheet.

Would you change anything you wrote there?

After making careful observations of each seed, take a moment to check over the original groups. Rearrange any seeds that need to change from one another.

Once you have taken snapshots of each of the seeds at 60X or 200X, create a folder on a floppy disk to store your pictures for later use. As you export each snapshot, make sure it is named something you will remember, such as "serrated edges," "hooks," or "wingtips."

To export a snapshot, scroll through the image files until you find the one you want. Then select the OK check mark. This will return you to the main menu showing the snapshot to be exported.

Image collection files with snapshot selected.

Now select Export. When the message box appears, be sure to name the snapshot and place the file in the appropriate folder. Save all snapshots as JPG files. Then click OK. Repeat these step for each of the snapshots to be exported.

Putting It All Together

How are seeds dispersed in the environment?

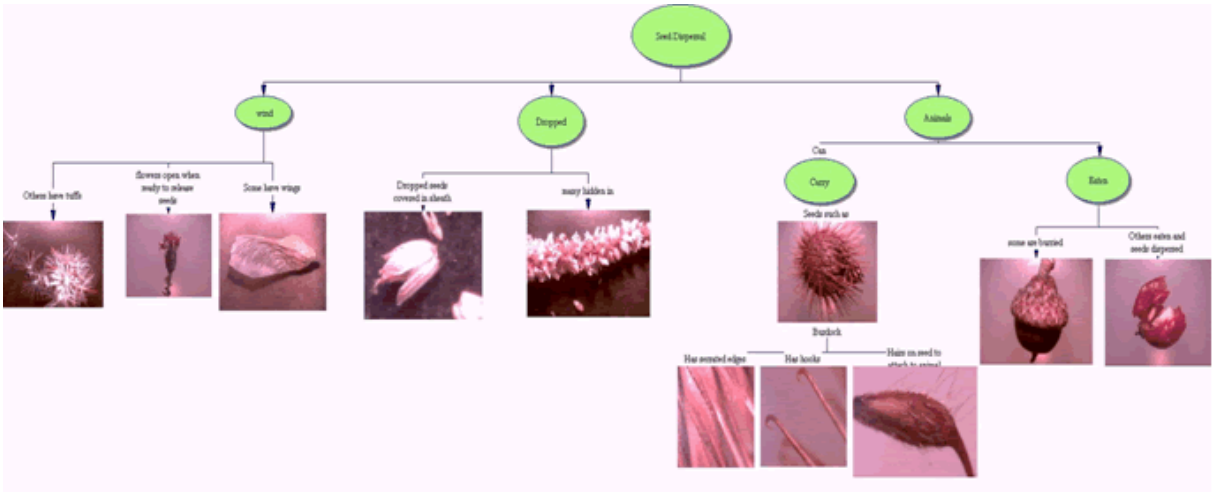
What characteristics did you choose for each group?

Do all of the seed share similar shapes or structures?

How do you think each group of seeds is carried to a new location?

Concept maps are a great way to organize your thoughts. To put your ideas together, open the software program Inspiration and label the main idea, "Seed Dispersal." Create a map using each of the seed groups you developed to name the way seeds are transported from the plant. Insert the snapshots you saved to a file to provide examples for each of the dispersal groups.

Inserting snapshots into an Inspiration program is easy. Simply click on Edit and select insert image. Then resize the image after it is inserted. Your final concept map should show your answer to the above question.



Compare your answers with other members of your class. Together you should come up with the main transport modes as wind, water, and animals. See the QX3 Seed PowerPoint for a review of the adaptations seeds have developed so they can be transported away from the parent plant.

Assessment Strategies

- Using QX3 snapshots of other seeds not included in the initial investigation, have students describe how each seed will be dispersed using seed structures to support their reasoning.

- Have students create a class website depicting mechanisms for seed dispersal with an example of each using snapshots of the QX3 microscope.

- Give students another selection of seeds and have them put them in groups according to how they are dispersed, taking pictures of each to illustrate structures that help them move from the maternal plant.

Resources

Great Plant Escape
http://www.urbanext.uiuc.edu/gpe/
This site developed by the University of Illinois Extension Service is designed for 4th and 5th grade students to support exploration in plants. It includes five plant mystery cases that include information about plants that student use to solve each mystery. Hands-on activity ideas accompany each mystery.

Dragonfly
http://www.units.muohio.edu/dragonfly/index.htmlx
This website is a product of a partnership between Miami University of Ohio and the National Science Teachers Association. The site was developed to provide teachers inquiry resources for teaching K-8 science. The site includes topics on seed dispersal, tree shapes, and plants and people along with many other science topics.

Blowing In The Wind: Seeds & Fruits Dispersed By Wind
http://waynesword.palomar.edu/plfeb99.htm#flutter
Site located on Wayne's Word with many examples of wind dispersed seeds from around the world. Provides clear photographs and descriptions of various seeds. The Wayne's Word site (http://waynesword.palomar.edu/wayne.htm) provides many more examples of seeds and information on plants, flowers, etc.