



OVERVIEW

About the Workshop

This workshop focuses on Journey North's investigation of plants and the seasons. Students track the greening of spring across the Northern Hemisphere by observing their own gardens and sharing their observations with other schools around the globe. The workshop activities take the participants through the process of selecting the proper location to plant an Official Journey North Garden, according to a consistent, scientific protocol. Participants review the importance of controlling variables in an experiment and consider ways students can design their own Experimental Gardens to test different variables. The video follows the plants investigation in several schools and shows how teachers have used this investigation with a variety of students.

Objectives/Outcomes

After going through this workshop, participants will be able to:

- describe the basic elements of Journey North's investigation of plants and the seasons,
- explain the difference between an Official Journey North Garden and an "Experimental" Garden,
- explain how to locate and plant a garden based on a specific set of instructions (scientific protocol), and
- demonstrate an understanding of controls and variables in experiments.

Materials You May Need

For the facilitator:

- VCR and television monitor
- overhead projector, transparencies, and markers
- flip chart and markers
- computer with Internet connection (optional)

For the participants (handouts are provided as blackline masters within this guide):

- paper and pens or markers
- Planting Instructions handout (pp. 36-37)
- tulip bulbs if available, or modeling clay
- tape measure
- metric scale or balance



NOTE: BEFORE GOING THROUGH THIS WORKSHOP, PARTICIPANTS SHOULD HAVE WATCHED VIDEO MODULE ONE—INTRODUCTION TO JOURNEY NORTH.

Key Concepts for the Facilitator

The plants investigation provides a unique opportunity for students and teachers to take part in an international scientific study. Classes can participate in the international study by planting an Official Journey North Garden. Classes can then contribute data to the study, which follows the coming of spring to the Northern Hemisphere as shown by the emergence and blooming of tulips. Through the Internet, classes share and access information about other Official Gardens in the international Journey North community.

Only "Official Gardens" are part of the international tulip study. Official Gardens adhere to a protocol that specifies the type of plants to be used (Red Emperor tulips), exactly how garden plots are to be chosen, and how bulbs are to be planted. The garden's location must accurately reflect the climate of the geographic region in order for the results to be valid. Following the planting protocol controls the variables in the study so that *location* becomes the variable studied. Classes only report information about their Official Gardens to Journey North.

In addition to participating in the international tulip study, students have the opportunity to plant their own Experimental Gardens, which are not part of the international study. Experimental Gardens allow students to design experiments and test different variables about plant growth. The Experimental Garden investigations provide an additional opportunity for inquiry-based learning.

Before doing experiments on their own, students should understand the importance of establishing and following a scientific protocol. Students learn about variables, controls, and important process skills by following Journey North's protocol for planting an Official Garden. After they have learned about variables and controls, students can explore their own questions and design appropriate experiments to find answers.

Planting an Official Garden from year to year has added value because students can compare the timing of spring's arrival from one year to the next. Teachers can keep yearly records of their Official Gardens and share the information with their students. Students can examine reasons for changes and look for patterns and trends.



PLANTS AND THE SEASONS

Tulip Gardens

Here's an Idea



You may want to begin this workshop with the activity "How Do You Know When It's Spring?" (page 2), if you didn't use it with the Introduction to Journey North module.

What If It's Raining?



If you can't go outside, participants can make a map of their school grounds showing where they would locate their garden. The map should include locations of buildings, pavement, other vegetation, sunlight, shade, slope of the land, and any other variables that they think might affect the choice of location.

BEFORE WATCHING THE VIDEO

Begin the workshop by describing the Journey North investigation about plants and the seasons. Explain that Journey North uses plant growth—specifically tulips—to explore and observe how spring comes to the Northern Hemisphere. Explain that Journey North provides an opportunity for students to participate in an international study by planting an Official Garden to the specific protocol provided by Journey North. In addition, students have the opportunity to investigate plant growth and the seasons by devising and conducting their own experiments.

ACTIVITY A – Exploring Where To Plant a Garden To Indicate Spring's Arrival

Have participants imagine that they will use tulips as indicators of spring's arrival in their part of the world. Pose the question, "Where would be the proper place to plant a tulip garden so that the tulips can indicate spring's arrival here?"

Separate participants into small groups and send them outside to actually select the best location for such a garden. During the process ask them to think about, discuss, and record all the variables they consider when they are looking for a garden site.

Have groups come back together and describe where they would plant their gardens. Ask what variables they considered. List all the variables participants identified. If questions arise about potential variables, list those too.

Tell participants that they will follow up on this activity after watching the video.

OPTIONAL ACTIVITIES – Tulips As Tools

Separate participants into small groups and provide each person or group with a tulip bulb. Because tulip bulbs are only available in late summer and fall, you may not have them at the time you do your workshop. If this is the case, begin this activity by having participants mold a tulip bulb from clay. Have them work from memory, without discussion or looking at the work of a partner. They should try to make the bulb as realistic as they can, in size, shape, texture, etc. If you're using the clay bulbs, have participants exchange their sculpted bulbs. Remind participants that if they do this activity with their class in the fall before planting a garden, their students will have real tulip bulbs.

Have groups write descriptive observations about the bulbs, then compare bulbs. What similarities and differences do they see between two bulbs? Point out that these bulbs are to be used as tools to indicate spring's arrival. Might these differences be important? If so, why? Elicit other variables from the group, focusing on variables that have to do with the actual tulip bulb—the size, shape, mass (weight), etc.

Bring groups back together and have them share their observations. What variables did they come up with? Add these variables to the list generated in Activity A.

If time allows, you might have participants do one or more of the following activities from the "Tulips As Tools" lesson from the Journey North Web site.

- dissect a bulb
- draw a scientific illustration
- write descriptive observations
- weigh and measure a bulb
- compare bulbs with other groups and graph masses, circumferences, etc.

Wrap up the activity by pointing out that student inquiry should begin with an observable phenomenon. For example, this Journey North activity began with observing an object—a tulip bulb—and all the other activities came directly out of that observable phenomenon.

Workshop Tip



You may want to have participants jot down answers to the questions before discussing them. This allows participants to reflect on their answers and provides an opportunity for those who don't always respond quickly to questions.

Available on the Web



You may want participants to do activities from the "Tulips As Tools" lesson.

Go to:



the "How to Use Journey North" icon on any page



select the "Classroom Lessons" icon

select the lessons specifically for "Tulip Gardens"

select "Tulips as Tools (Dissection & Observations)"



Hubert Dyasi

In the video, Dr. Hubert Dyasi says, "Once you have an expectation, you gain an interest in the whole thing you are doing, because you want to know if your expectations are going to come true or not. And if they are met, yes you get excited and so on. And then somebody might ask you, 'What made it meet your expectations? What did you know that made you predict this' (Or) it might not meet your expectations. In other words your predictions might not come true. Then you go, 'Oh my goodness, what happened?'"

WATCHING THE VIDEO

What You'll Be Watching

Video Module Three—Plants and the Seasons: Tulip Gardens (running time approx. 12 min.)

The video follows a number of classrooms around the United States as they explore the Journey North plant investigations found on the Journey North Web site. From their initial exposure to tulip bulbs, through planting and winter, to the blossoms of spring, students become deeply engaged in scientific exploration and discovery. Students learn how to conduct a controlled experiment by participating in an international tulip study that looks at how the growth of tulips reflects the arrival of spring across the Northern Hemisphere. Following a specific protocol, classes plant Official Gardens to participate in the Journey North international study. In addition, students can plant Experimental Gardens where they can test their hypotheses about variables that might affect tulip growth.

Interviews with Journey North teachers provide an overview of the activities and how they can transform a classroom. Experts on inquiry-based teaching such as Dr. Hubert Dyasi and Lee Schmitt discuss how Journey North models good science teaching. Students of all ages exhibit their enthusiastic approval of Journey North and the tulip activities.

After watching the video, participants will have an excellent overview of the plant investigations and an understanding of how they can be used in the classroom.

Suggestions for Watching the Video

Before showing the video, you may want to suggest things for the participants to look for as they watch. This will focus their viewing and help generate discussion afterward. For instance:

- Watch for the different ways that teachers and students work with "Official" and "Experimental" Gardens.
- Watch for examples of teachers functioning as facilitators for student learning.
- Watch for ways teachers help students formulate good or "testable" questions.
- Watch for classroom and/or project management techniques that teachers demonstrate in the video.

After participants have watched the video, you can discuss some of the things that participants watched for, and you may want to use some of the following questions to generate additional discussion. You will want to pick and choose questions based on your particular audience.

- What are some of the valuable things that students can learn from being involved in an international study?
- In the video, Gayle Kloewer asks her students about "testable questions." What are some of the characteristics of testable questions? (Responses will vary. Testable questions are questions that can be answered through experiments or tests that generate observable or measurable data.)

- Dr. Hubert Dyasi talks about how students become motivated if they make predictions and develop expectations. Share any experiences you may have had with your students' reaction to making and testing predictions.
- What examples did you see of teachers acting as coaches or facilitators (as opposed to just giving out information)?
- When students plant an Official Garden they have to follow specific protocols. Why is this important? (In order for the data from a variety of gardens to be compared and remain valid, the gardens must be planted in a way that eliminates variables. In the Journey North international tulip study the only variable that is being tested is the geographic location of the garden.)
- In the video, Journey North teacher Holly Cerullo says that she sometimes has to hold back information from students. In what situations do you think this is appropriate? When is it not?
- What are some of the advantages you see in running an experiment over an extended period of time?
- What was the most interesting thing you saw in the video?
- Which activities that you saw in the video do you think you'd like to try with your students? Anything you wouldn't want to do? Why not?
- How could you assess student learning during the tulip garden investigations? What would you expect students to be able to understand and do?

AFTER WATCHING THE VIDEO

ACTIVITY B – Good Experiments Need Good Protocol

Briefly review how participants worked to choose a location for their tulip garden in Activity A. They came up with a list of variables about things that might affect plant growth at the garden's location. Then they chose their location to control those variables. What would happen if they wanted to compare tulip growth in their garden with tulip growth in a garden 800 miles away? What variables would they have to take into account? How would they control those variables?

Hand out copies of the Planting Instructions (pp. 36-37). Explain that this is the protocol for the international tulip study. (You may want to mention that you purposely withheld the protocol in Activity A. Point out that this is an instructional strategy that allows learners to recognize the need to control variables.)



A BLACKLINE MASTER FOR THE PLANTING INSTRUCTIONS HANDOUT CAN BE FOUND ON PAGES 36 and 37.

Compare their chosen garden locations to the Planting Instructions (protocol). How were they alike and different? Why would following the protocol precisely be important? Use participants' comments to guide the group to the understanding that you have to control and limit the number of variables involved in order for a broad, multi-site study to be valid. Lead participants to the understanding that *geographic location* is the only variable that is being tested in the Official Journey North study.

Available on the Web



For a more in-depth discussion about the variables involved in selecting a garden location, you may want to use an activity from the Journey North Web site called "A Matter of Degrees: Understanding Microclimates."

Go to:



the "How to Use Journey North" icon on any page



select the "Classroom Lessons" icon

select the lessons specifically for "Tulip Gardens"

select "A Matter of Degrees: Understanding Microclimates."

Available on the Web



Planting Instructions can also be found on the Journey North Web site, along with a sample rubric for evaluating a garden location.

Go to:



the "How to Use Journey North" icon on any page



select the "Classroom Lessons" icon

select the lessons specifically for "Tulip Gardens"

select "Deciding Where to Plant the Garden (Planting Rubric)"



PLANTS AND THE SEASONS

Tulip Gardens

For Discussion



Ask more-experienced participants to share their experiences with the plants investigation. Have they used the activities exactly as they are on the Journey North site, or have participants made adjustments? If so, what adjustments have they made?

Remind participants that only data from Official Gardens is submitted over the Internet to Journey North. Data from students' Experimental Gardens must not be submitted because these gardens are intentionally not planted according to Journey North protocol.

Classroom Tip



Sketch or take photographs of your garden at regular intervals. Include the drawings or photos with journal entries about the growth and development of the plants and garden.

Students need to understand that a protocol must be established for all experiments whether they are large like the international tulip study or smaller, like their own Experimental Gardens.

Close the session with a discussion of how this activity demonstrates that many of the key questions are generated by students. They look at variables, formulate criteria, test their criteria, and evaluate their results. The Official Garden investigations teach important process skills and the Experimental Garden investigations provide an excellent opportunity for student-directed inquiry.

ACTIVITY C – “What If...?” Time To Experiment!

Remind participants about the part of the video where students were coming up with “what if” questions. For example, “What if you planted a tulip bulb upside down?” These are the kinds of questions to test in an Experimental Garden.

Have participants take two or three minutes to jot down as many “what if” questions that they can about selecting a site for a garden and planting/growing tulips. Remind them of the many variables they thought about when selecting a garden site, and the variables between individual bulbs. After participants have written their questions, have them pair up with a partner to share and compare questions.

Have pairs choose their “best” question and make predictions as to what would happen if they tested the specific variable. Have pairs answer these questions:

- How would they set up an experiment to test their predictions?
- What data would they generate?
- How would they gather and analyze the data? (Have teachers make a sample data sheet.)

Bring the entire group back together and have partners share their questions, predictions, experimental designs, and data sheets.

Discuss how the questions they developed mostly deal with variables. How do we teach students the concept of variables? How do we encourage students to ask questions?

Lead a discussion about how the Journey North Experimental Garden investigations are an example of an inquiry model, where students make observations, develop testable questions, set up experiments, gather/analyze data, and come to conclusions. Point out that younger students will probably need more guidance than older students, but that in most situations teachers can function as coaches or guides. Have participants recall some of the teachers in the video and how they facilitated student learning.

OPTIONAL ACTIVITY – Helping Students Select an “Official” Garden Site

Have participants recall their experience in selecting a place for their Official Gardens in Activity A. Separate participants into small groups. They should come up with six to 10 practical ideas for helping their students through the process of choosing a location for their garden. The ideas can include suggestions for classroom management, teaching process skills, facilitating student inquiry, following a protocol, etc.

In real life, safety considerations, foot traffic, custodian’s rules, etc. may force students to plant gardens in places that do not meet all of the criteria for an Official Garden. In this case, classes should use the best site possible, and then explain when reporting results what variables they are not able to control. This helps Journey North staff to interpret results more accurately.

After groups have finished brainstorming ideas, bring the entire group together again and have groups share their strategies.



Available on the Web

Here are two complementary activities that you may want to include in your workshop.

When does spring arrive in Texas, California, Michigan, and Alaska? The lesson “Predicting the Arrival of Spring” provides practice in refining predictions while building knowledge about geography and climate.

Go to:



the “How to Use Journey North” icon on any page



select the “Classroom Lessons” icon

select the lessons specifically for “Tulip Gardens”

select “Predicting the Arrival of Spring (Global Challenge)”

Challenge participants to predict when tulips emerge and bloom in their home area. Record the dates participants predict. Ask why they chose those dates. Then consult the archive of historical data on the Journey North Web site.

Go to:



the “Report Your Sightings” icon on any page

select “Visit the Journey North Archives” at the lower left-hand side of the screen

WRAPPING UP

Learning Log

Provide time for participants to write for a few minutes about what they learned in the workshop and how they plan to apply it in their classrooms. If time allows, participants may wish to share their logs with the group.

KWL

Revisit the KWL chart from the introductory workshop (see page 4). What additions can you make to the chart? Have any questions been answered? Have any new questions arisen? Add to the chart as required.



PLANTING INSTRUCTIONS



CAUTION: If you live in a warm region (Zone 8-11) you will need to use special planting instructions, available on the Journey North Web site. *

Welcome to the Journey North Garden Study

The instructions below must be followed carefully so that all Journey North gardens are planted in the same way. Remember, when your tulips bloom you will proclaim the arrival of spring in your community. Therefore, your garden must be planted in a place that best represents the general climate of your region.

What Kind of Tulips To Plant

All Journey North gardens must be planted with the same variety of tulips, the Red Emperor variety. This is because different tulip varieties bloom at different times in the spring. They are categorized as “early,” “mid-season,” and “late” blooming varieties. Since Journey North classrooms will announce the first tulips to bloom in the spring, an “early” blooming variety was needed. Red Emperor tulips are an “early” blooming variety. They were selected because they are easy to find in most areas and are easy to grow.

When To Plant Your Tulips

Planting must take place before deep frost hardens the ground. As a rule of thumb, tulips should be planted several weeks before the first hard frost.

Where To Plant Your Garden

Exposure: For consistency, Journey North tulip gardens must NOT be planted near the foundation of a building, in heavy shade, or on steeply sloped ground. This is because areas near buildings or on south-facing slopes warm up more quickly than do the surrounding areas. This would cause your bulbs to bloom earlier than they should in your region. Similarly, north-facing or heavily shaded areas would cause a delay in blooming. Tulip bulbs can be planted in full sun or partial shade, but should not be planted in heavily shaded areas.

Drainage: Bulbs need good drainage because they will rot if they sit in moisture. Therefore, plant them in well-drained soil and/or on slightly sloped ground. As a rule of thumb, avoid planting bulbs where water stands after a rain. A good loam soil is best. If the soil is heavy clay, add organic matter such as compost or peat moss to loosen it.

How To Plant Your Bulbs

For simplicity, tulip bulbs can be planted in a bed rather than individually. The entire bed should be planted at the proper depth, as specified below. It is a good idea to fertilize bulbs by adding bone meal and mixing it well with the soil. If you choose to plant bulbs individually, either a garden trowel or a bulb-planting tool can be used.

Depth and Spacing: Bulbs in all Journey North gardens should be buried so that the base of each bulb is exactly 7 inches underground. (Blooming time can vary by a week or two if bulbs are not planted at the same depth. In fact, gardeners who want to prolong blooming time will intentionally plant their bulbs at varying depths.) Bulbs should be spaced 4 inches apart.

PLANTING INSTRUCTIONS CONTINUED



Placement of Bulbs: Set bulbs firmly in place with the POINTED END UP. The hole should be flat on the bottom so that the FLAT BASE of the bulb is in contact with the ground. Cover with soil and water thoroughly. Moisture is necessary for the bulbs to take root before winter. If dry weather persists after planting, water thoroughly and deeply. However, do not keep the soil soggy or the bulbs could rot. After the ground freezes, apply about a six-inch mulch of clean straw or leaves. Do not cover the bulbs before the ground freezes. The wet mulch could cause the bulbs to rot, and the mulch could also delay the freezing of the ground.

Predator Control: Squirrels are the most common tulip bulb predators in urban and suburban areas. They are attracted to the smell of fresh bulbs and are most likely to destroy gardens within the first weeks after planting. For inexpensive and effective protection, cover your newly planted bulbs immediately with chicken wire. Secure the edges with wire hangers that have been cut, formed into a U shape, and driven into the ground. Alternatively, bulbs can be covered with a board or with the saucer of a flowerpot.

Spring and Summer Care

Remove the winter mulch as soon as the shoots are 1 to 2 inches high. Otherwise, the stems and leaves may be weak. Remove blooms as soon as they are faded in order to conserve energy for next year's flowers. Do not cut the leaves until they turn yellow and wither. These leaves are needed to produce the nutrition for next year's tulips. Bulbs may be fertilized after the blooms fade. This is the critical time in which they make the most use of the fertilizer. Liquid applications of a 10-10-10 fertilizer can be applied as long as the leaves appear green and vigorous.

May We Use This Year's Bulbs Again Next Year?

Unfortunately, no! New bulbs must be planted each year for the Journey North study. This is because too many variables affect tulip growth in the second year for the experiment to be dependable.

However, you can save your bulbs for experimental purposes! Students can compare the growth of the experimental bulbs from year to year and vary such things as the amount of sun, heat, water, and fertilizer received, the effect of cutting the leaves, etc. Next fall, purchase at least a dozen or more new bulbs for your "Official" Journey North Garden. Then dig up this year's bulbs prior to planting your new bulbs. Have students weigh and inspect them before replanting. Remember, however, for the Journey North experiment you may only report on the growth and blooming of the new, "Official" bulbs.

* Planting Instructions can also be found on the Journey North Web site:

Go to www.learner.org/jnorth; select the "How to Use Journey North" icon; select the "Classroom Lessons" icon; select the lessons specifically for "Tulip Gardens"; select "Deciding Where to Plant the Garden (Planting Rubric)"

