

## *Professional Development Program*



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## Who's Who in the Video

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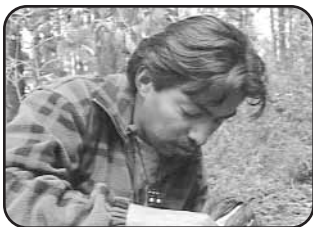
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# Overview of the Journey North Workshops

These professional development workshops were created to provide a way to learn about Journey North while exploring science inquiry and other standards-based teaching and learning strategies. The activities in this guide can be used with the four Journey North videos to provide a series of inservice workshops. Facilitators can choose activities to tailor the workshops to focus on different aspects of science teaching including:

- providing an overview of the Journey North investigations,
- exploring best practices in science teaching,
- expanding the use of inquiry-based instruction, and
- incorporating the National Science Education Content Standards into the curriculum.

## Workshop/Video Module 1

### Introduction to Journey North

The video looks at the three sets of investigations that comprise the Journey North program. Using the video as a springboard, this workshop looks at some of the basic concepts behind the Journey North investigations and explores topics that are important to science teachers.

#### Suggested and Optional Activities

- How Do You Know It's Spring?
- Using KWL
- Journaling and Using the Challenge Questions
- Reviewing the Standards
- What Is Inquiry?
- Dealing With Wrong Answers
- Tour of Journey North Web Site

## Workshop/Video Module 2

### Seasonal Migrations: Monarch Butterflies

Although the Journey North program provides opportunities for exploring dozens of different animal migrations, the video focuses on the most popular migration—that of monarch butterflies. Participants use some of the lessons from the Journey North program to learn more about studying migrations, using prediction as an inquiry tool, exploring the Journey North Web site, and correlating the Journey North migrations investigation with their life science curriculum.

#### Suggested and Optional Activities

- What Do You Know About Monarchs and Migration?
- Predicting the Monarch's Spring Migration Route
- Mapping and Analyzing Monarch Migration Data
- The Annual Cycle, Life Cycle, and Migration of the Monarch
- Correlating to Your Standards
- Migrations Scavenger Hunt
- Journey North Implementation Plan

## Workshop/Video Module 3

### Plants and the Seasons: Tulip Gardens

The video follows several classes around the country as they explore plant growth and seasonal change through Journey North's International Tulip Study and individual student investigations on plant growth. Participants learn how Journey North integrates process skills into inquiry-based activities and the importance of following a protocol when performing experiments.

#### Suggested and Optional Activities

- Exploring Where To Plant a Garden To Indicate Spring's Arrival
- Following a Protocol To Control Experiments
- Examining Variables
- Tulips As Tools
- Helping Students Choose a Garden Location

## Workshop/Video Module 4

### Sunlight and the Seasons: Mystery Class

Journey North's investigation of Sunlight and the Seasons involves students in an 11-week-long hunt known as Mystery Class. The video chronicles students as they track and analyze changes in sunlight in locations north and south of the equator and follow a series of clues to locate the 10 Journey North "Mystery Classes" around the world. Participants learn about this investigation first-hand by taking part in a simulation of the student investigation.

#### Suggested and Optional Activities

- Thinking About Daylight and the Seasons
- Mystery Class Simulation
- Seeing the Light: What Really Shapes the Web of Life?
- How Do You Teach the Concept of Seasonal Change?

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## What Is Inquiry?

Much of the research about “best practices” in science education has focused on inquiry-based science instruction. The following essay, from the Exploratorium in San Francisco, provides a clear, concise description of inquiry-based teaching and learning.

### A Description of Inquiry

At the Exploratorium Institute for Inquiry, our work in science education is deeply rooted in the belief that human beings are natural inquirers and that inquiry is at the heart of all learning. The work that we do with educators is designed to give them an opportunity to personally experience the process of learning science through inquiry. Our hope is that this experience will stimulate their thinking about how to create classrooms that are supportive environments for children’s inquiry.

Inquiry is an approach to learning that involves a process of exploring the natural or material world, that leads to asking questions and making discoveries in the search for new understandings. Inquiry, as it relates to science education, should mirror as closely as possible the enterprise of doing real science.

The inquiry process is driven by one’s own curiosity, wonder, interest, or passion to understand an observation or solve a problem.

The process begins by the learner noticing something that intrigues, surprises, or stimulates a question. What is observed often does not make sense in relationship to the learner’s previous experience or current understanding.

Action is then taken through continued observing, raising questions, making predictions, testing hypotheses, and creating theories and conceptual models. The learner must find their own idiosyncratic pathway through this process; it is hardly ever a linear progression, but rather more of a back and forth or cyclical series of events.

As the process unfolds, more observations and questions emerge, giving occasion for deeper interaction and relationship with the phenomena—and greater potential for further development of understanding.

Along the way, the inquirer is collecting and recording data, making representations of results and explanations, drawing upon other resources such as books, videos, and colleagues.

Making meaning from the experience requires intermittent reflection, conversations and comparison of findings with others, interpretation of data and observations, and applying new conceptions to other contexts as one attempts to construct new mental frameworks of the world.

Teaching science using the inquiry process requires a fundamental re-examination of the relationship between the teacher and the learner, whereby the teacher becomes a facilitator or guide for the learner’s own process of discovery and creating understanding of the world.

Used by permission of the Exploratorium.

*For additional information, contact:*

Exploratorium  
3601 Lyon Street  
San Francisco, CA 94123  
[www.exploratorium.edu/IFI/index.html](http://www.exploratorium.edu/IFI/index.html)



**Watching the Video** has a summary of the video module, some ideas to help participants focus their viewing, and a list of possible discussion questions about the video. Choose questions that are appropriate for the participants.

VIDEO  
MODULE 2

WATCHING THE VIDEO

**What You'll Be Watching**  
Video Module Two—Seasonal Migration: Monarch Butterflies (running time approx. 18 min.)

Although Journey North provides the opportunity for students to track the migration of about a dozen animal species, the video focuses on the migration of monarch butterflies.

Although not part of the Journey North activities, many teachers have integrated raising monarchs into their curriculum. The butterflies are tagged and released, beginning their long journey to Mexico. Some students also explore monarch biology through experiments that they derive from questions that they have generated.

Another way for students to learn about the monarch's migration is through Journey North's "Simulate Monarch Migration." Students make paper monarch butterflies and send them, as postcards, to the children of Mexico. The students in Mexico prepare the butterflies for the winter and return them in the spring. Personal letters are exchanged between the students.

Millions of monarchs cover every inch of the skies in Mexico where the insects spend their winter. Students experience the beauty and excitement of the winter monsoon through reports from monarch experts that are filed on the Journey North Web site.

The video follows how teachers and classes track the migration, report their own sightings, and analyze data. Interviews with teachers and educational experts provide insight into the philosophy behind the Journey North program.

**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 specific activities that engage students.
- Watch for interdisciplinary aspects of the monarch migration activity.
- Watch for examples of teacher functioning as facilitators for student learning.
- Watch for examples of classes working with Challenge Questions.

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**After Watching the Video** presents additional workshop activities. Some are extensions or continuations of activities begun before watching the video. Again, the lettered activities are recommended, but optional activities may also meet your needs.

VIDEO  
MODULE 4

AFTER WATCHING THE VIDEO

**ACTIVITY B – Mystery Class Simulation**

Explain that participants are going to be involved in a Mystery Class investigation of their own. Explain that they are going to follow the same steps as students follow during their 11-week Mystery Class investigation:

- Calculate photoperiods (length of daylight) for the different sites each week.
- Graph photoperiods from week to week.
- Compare the change in photoperiod from week to week.
- Use interdisciplinary clues to narrow the search for the Mystery Class sites.

**Calculating Photoperiods**  
Hand out Mystery Class Data Sheets (p. 40). Separate participants into three groups.

Each group should calculate the photoperiods for a single Mystery Class location and the workshop location. (For the purpose of this activity, Mystery Class #1, #4, and #9 from the Spring 2000 activity were used.) Groups should record the photoperiods on the data sheet. Do not give groups the photoperiods; let them figure out how to calculate them themselves.

Class #	Site/lat	Summer	Winter	Photoperiod	Longitude
MC #1	Feb. 7	6:20	19:56	13 hr. 36 min.	58.45°W
	Feb. 14	6:27	19:49	13 hr. 22 min.	
	Feb. 21	6:33	19:41	13 hr. 8 min.	
MC #4	Feb. 7	6:24	18:32	12 hr. 8 min.	78.50°W
	Feb. 14	6:25	18:32	12 hr. 7 min.	
	Feb. 21	6:25	18:32	12 hr. 7 min.	
MC #9	Feb. 7	8:11	17:46	9 hr. 35 min.	43.93°E
	Feb. 14	7:59	17:59	10 hr.	
	Feb. 21	7:46	18:11	10 hr. 25 min.	

**Graphing Photoperiods**  
After groups have calculated photoperiods, the data for their Mystery Class location and the workshop location should be graphed on the Mystery Class Graph (p. 40).

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**Wrapping Up** gives suggestions for closing the workshop. Often, these activities help participants reflect on what they've learned and how to apply the workshop activities in their own classrooms.

VIDEO  
MODULE 2

WRAPPING UP

**Journey North Implementation Plan**  
Separate participants into groups of three to five people. Their task is to come up with a plan for implementing Journey North into their current curriculum. If all teachers in the group have used Journey North, then their task should be to devise a plan for expanding the use of the program—doing additional activities, expanding the number of regions, including other subject area teachers, etc. The action plan should include specific steps that the participants can follow when implementing Journey North.

After groups have been given sufficient time, bring the entire group back together to present their ideas to the larger group. List key points on an overhead.

**KWL Revisited**  
Revisit the KWL poster from the introductory workshop. What additions can you make to the chart? Have any questions been answered? Have any new questions arisen? Add to the chart as required.

**OPTIONAL ACTIVITY – Correlating to Your Standards**  
Many school districts, states, and provinces have a set of very specific science standards and curriculum frameworks that determine what address or fulfill. The activities that comprise the Journey North program fit well with most standards and frameworks, but because each district, state, or province is somewhat different in its requirements, it can be helpful for teachers, curriculum specialists, and administrators to create a correlation that shows how Journey North meets their own requirements.

Separate participants into groups from the same school or district. Using their own standards, groups should create a correlation grid that shows which Journey North activity addresses a specific standard. Participants should focus on the activities from a single Journey North topic, such as Seasonal Migration, Flare and the Seasons, or Sunrise and the Seasons. Depending on your workshop schedule, groups may begin the process during the workshop and finish it later.

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## Workshop Tips

Experienced Journey North teachers and staff development professionals provided the following tips to help make your workshops more successful.

**TIP:** If you have a fairly large number of participants, you may want to have them discuss the video in smaller groups. Provide groups with a list of questions to discuss and a specific time period in which to work. After groups have had time to discuss the questions, bring everyone back together and have each group present highlights of their discussion.

**TIP:** Pairing experienced teachers with less-experienced teachers can be helpful. Experienced teachers can act as mentors.

**TIP:** Encourage participants who have used Journey North to share their experiences. They can provide valuable information and tips to participants who are new to the program.

**TIP:** If you are presenting a workshop that lasts two or more hours, don't forget to include some break time.

**TIP:** Choose a variety of activities to engage participants. Mix active, hands-on activities with discussions.

**TIP:** Vary the size and composition of groups so that the same people aren't working together all the time.

**TIP:** If you are doing a series of workshops with the same participants, keep flip chart/overhead information generated in earlier workshops for reference.

**TIP:** If you are using technology of any kind—TVs, VCRs, computers, projectors—test the equipment before the workshop to make sure it is set up correctly and works.

**TIP:** If you are using an Internet connection, bookmark the Web pages you will be using to provide quick access. Depending on which Internet browser you are using, you may also be able to save the pages that you want to use on your computer's hard drive, so you can display them without being connected to the Internet.

**TIP:** Do any hands-on activities yourself before the workshop so that you know any problems that participants might encounter.

**TIP:** Preview the video and cue it to the right place before the workshop.

**TIP:** The icon, right, indicates that the workshop handouts are included as blackline masters in this guide. Copy enough handouts so that each participant gets one, even when working in pairs or small groups.



A BLACKLINE MASTER OF  
THIS HANDOUT CAN BE  
FOUND ON PAGE XX.

**TIP:** Copy each handout on *both* sides of the paper. After participants have filled in one side, they will have a blank that they can use as a blackline master for their students.

# Correlation to the National Science Education Standards

The following standards are addressed by the Journey North professional development workshops:

Teaching Standards	Module 1 Introduction to Journey North	Module 2 Seasonal Migrations	Module 3 Plants and the Seasons	Module 4 Sunlight and the Seasons
Standard A: Plan an inquiry-based science program	●		●	
Standard B: Facilitate learning	●	●	●	●
Standard C: Engage in ongoing assessment of teaching and student learning	●	●	●	●
Standard D: Design and manage learning environments that provide students with the time, space, and resources needed for learning science	●	●	●	●
Standard E: Develop communities of science learners	●	●	●	●
<b>Professional Development Standards</b>				
Standard A: Learning essential science content through the perspectives and methods of inquiry	●	●	●	●
Standard B: Integrating knowledge of science, learning, pedagogy, and students; applying that knowledge to science teaching	●	●	●	●
<b>Content Standards</b>				
Standard A: Develop abilities to do scientific inquiry	●	●	●	●
Standard B: Develop an understanding of properties of objects and materials, heat and light	●	●	●	●
Standard C: Develop an understanding of the characteristics of organisms, life cycles in organisms, organisms and environments	●	●	●	●
Standard D: Develop an understanding of the properties of earth materials, changes in earth and sky	●	●	●	●
Standard E: Develop an understanding about science and technology	●	●	●	●
Standard F: Develop an understanding of populations, resources, and environments	●	●	●	●
Standard G: Develop an understanding of science as a human endeavor and the nature of science	●	●	●	●



## OVERVIEW

### What Is Journey North?

Journey North is a free, web-based science program that provides sets of investigations that encourage students to explore the concept of seasonal change. Students become involved in a global study of wildlife migration and the changing seasons. Using the Internet, students track the coming of spring through the migration patterns of butterflies, birds, and mammals; the budding of plants; the changing of daylight; and other clues in their local environment. The interdisciplinary activities are tied to science, math, social studies, and language arts. By sharing field observations with students across the continent through Journey North, students come to see their own backyards as part of a global ecological system.

### About the Workshop

This workshop introduces the three sets of Journey North investigations—Seasonal Migrations (Monarch Butterflies), Plants and the Seasons (Tulip Gardens), and Sunlight and the Seasons (Mystery Class). The workshop involves participants in an exploration of spring's arrival through activities from Journey North. The introductory video gives a brief glimpse of the program and encourages participants to learn more. Participants also explore inquiry-based teaching and learning and share information about their experiences with Journey North.

### Objectives/Outcomes

After completing this workshop, participants will be able to:

- describe the three sets of Journey North investigations,
- explain how to use the Internet with the Journey North program,
- examine how Journey North can be integrated into their science curriculum, and
- discuss the basic concepts of inquiry-based teaching and learning.

### Materials You May Need

*For the facilitator:*

- VCR and television monitor
- overhead projector, blank transparencies, and markers
- flip chart or large sheets of paper and markers
- computer with Internet connection (optional)

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

- How Do You Define Spring? handout (p. 10)
- Results of the Spring Survey handout (p. 11)
- A Description of Inquiry handout (p. 12)
- Journey North Tour handout (p. 13)

Have the participants bring a spiral notebook and pencil or pen to each workshop.

### Key Concepts for the Facilitator

**The Journey North program is free to teachers who wish to use it.** It is comprised of three sets of investigations, each containing a variety of topics, lessons, and activities. The investigations are Seasonal Migrations, Plants and the Seasons, and Sunlight and the Seasons.

**Seasonal Migrations—Journey North is a global study of wildlife migration and seasonal change.** The migration investigations include a dozen different species, such as monarch butterflies, eagles, hummingbirds, robins, orioles, manatees, and whales. Each engages students as active participants, observing the grand rhythms and delicate balances of nature. Students can contribute observations from their own backyards and receive observations from career scientists studying migration. The classroom receives weekly migration updates with current news, authentic data, challenges for students, lessons, activities, and interdisciplinary content centered in real-world issues.

**Plants and the Seasons—In Journey North's investigation of plants and the seasons, students track the greening of spring across the Northern Hemisphere as they watch plants in their own gardens respond to the changing season.** In the fall, tulip bulbs are carefully planted according to scientific protocol, so that geographic location is the variable being studied in gardens across the Hemisphere. The following spring, as the tulips grow and bloom at each location, students proclaim the arrival of spring in their communities. In addition, students can conduct their own investigations by designing and planting a second "Experimental" Garden. Here they alter the planting protocol and design their own experiments to answer questions they have generated themselves, i.e., "What would happen if..."

**Sunlight and the Seasons—The Mystery Class investigation is an 11-week hunt in which students try to find 10 secret "mystery classes" hiding around the globe.** Changing sunlight at each site is the central clue. Students first determine if the latitudes of the locations are above or below the equator, and later calculate the longitude of each location. Finally, interdisciplinary clues require students to use problem-solving and research skills to pinpoint each location. Students take an inspiring journey from knowing only the sunrise and sunset times (photoperiods), to discovering the exact locations of the 10 Mystery Classes. This investigation demonstrates that, as spring sweeps across the Northern Hemisphere, day length changes everywhere on earth. Students see that these dramatic seasonal changes in sunlight affect the entire web of life.

**Journey North employs "Challenge Questions" throughout all its investigations.** The Challenge Questions are posed at appropriate points in each of the investigations and model the types of questions that scientists ask themselves. The questions help students understand the importance of continually questioning one's assumptions and data.

**The teacher's job in Journey North and in inquiry-based instruction is to facilitate.** Teachers probe student thinking, ask for explanations, encourage new trains of thought, provide guidance, and demonstrate process skills.

**The Internet provides a unique opportunity for students and teachers to interact with other classrooms around the world who are involved in Journey North investigations.** The Internet becomes a valuable extension of classroom activities by providing comparative information from classes in different climates and different cultures. However, it is not necessary for a teacher to have Internet access at school in order to participate in Journey North.



## INTRODUCTION TO *Journey North*



**BLACKLINE MASTERS FOR  
THESE HANDOUTS CAN BE  
FOUND ON PAGES 10 AND 11.**

### Accepting All Answers



In an inquiry activity, as with brainstorming, it is important to accept all answers, correct or not. In an inquiry-based setting, students will explore their answers and eventually determine on their own if an answer is correct or not. Often “wrong” answers lead to interesting questions to investigate.

## BEFORE WATCHING THE VIDEO

### **ACTIVITY A – How Do You Know When It’s Spring?**

Separate participants into small groups and provide them with copies of the How Do You Define Spring? survey (p. 10). Ask participants to brainstorm the answers to the questions and come up with as many responses as possible.

When groups have had sufficient time to complete the task, bring them back together again and begin listing their responses on an overhead or flip chart. After you’ve listed the responses, pass out the Results of the Spring Survey handout (p. 11). Point out that all of their responses can be divided into three categories—animal signs (including human activities), plant signs, and astronomical/meteorological signs. Go through the list and put responses into categories.

Ask “Suppose someone in Texas were filling out the survey or someone from Alaska or Canada. How would their responses be different? Would they give the same date for a certain phenomenon?”

To know how the signs of spring move across the continent, you would have to have data from hundreds of different sites in different locations. This is exactly what Journey North does, using the Internet. The project gives students the opportunity to share their own observations and access data from classmates across the continent through three sets of investigations—Seasonal Migrations, Plants and the Seasons, and Sunlight and the Seasons.

Explain that participants are going to watch a video that introduces the Journey North investigations. Following the video, they will discuss some of the instructional strategies that can be used with the program, strategies that involve important science process skills and inquiry-based instruction that are part of a standards-based science curriculum.

### **OPTIONAL ACTIVITY – Reviewing the Standards**

Provide participants with a list of your state, provincial, or district science curriculum standards. Briefly review key points of the standards. Explain that participants can refer to this list as they move through the workshops. When participants find a Journey North activity that applies to one or more of the standards, they can make a note of it on the list. After completing all the workshops, participants will have a working correlation between their own curriculum standards and the Journey North program.

## WATCHING THE VIDEO

### What You'll Be Watching

Video Module One—Introduction to Journey North (running time approx. 11 min.)

The video shows eight Journey North teachers from around the United States who share their insights and experiences with Journey North. Elizabeth Howard, the founder of Journey North, discusses how the program engages students and teachers alike in authentic science learning. Science education experts Hubert Dyasi, a professor at City University of New York's School of Education, and Lee Schmitt, from the Science Museum of Minnesota, provide insight into the process and power of inquiry-based learning. Lee Schmitt believes that Journey North is "an excellent medium for that process."

The video provides a glimpse of each of the three sets of Journey North investigations—Seasonal Migrations (Monarch Butterflies), Plants and the Seasons (Tulip Gardens), and Sunlight and the Seasons (Mystery Class). Excited students explore their environments and use the Internet to share observations and examine data from other classrooms in other states, provinces, and countries. Students learn that their portion of the world is part of a larger ecological system and that science is interconnected in ways that they have never imagined.

Journey North is rich and complex and can sometimes be overwhelming to a newcomer. Experienced teachers suggest how to start small, pick and choose activities, and then expand use of the program over time. Journey North teachers tell how the program has transformed the way they teach. Like their students, the teachers have become excited partners in learning.

### 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 examples of self-directed students engaged in learning.
- Watch for examples of teachers functioning as facilitators for student learning.
- Watch for interdisciplinary aspects of the Journey North program.
- Make notes about things in Journey North or the video that you would like more information about.

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.

- Which of the Journey North investigations—Seasonal Migrations (Monarch Butterflies), Plants and the Seasons (Tulip Gardens), and Sunlight and the Seasons (Mystery Class)—do you find most interesting? Why?



### History of Journey North

Journey North was founded in 1994 by Elizabeth Howard. Inspired by the early Internet-based projects in which school children tracked human expeditions (e.g., across the Arctic by dogsled or Africa by bicycle), she saw a clear and exciting parallel between these expeditions and the wildlife migrations that cross the globe with the seasons. Both were the ultimate survival stories. The same challenges encountered on a remote expedition—changing weather, lack of food, insufficient time—have always faced migratory species as they travel across the globe or pass through our own backyards.

With a background in environmental education and natural history, she saw migration as a compelling vehicle to engage students in a study of nature and science. She realized the Internet would make it possible to collect first-hand observations from people who were spread across the continent. Elizabeth Howard and associate director Julie Brophy have developed Journey North over the years into the premier Internet-based, "citizen science" project that it is today, providing an authentic and powerful science education experience for children. "What's most rewarding," says Julie Brophy, "is to hear that children are actually outside, looking closely at the natural world. So often they tell us they're looking for the first time."



# INTRODUCTION TO *Journey North*



## About Hubert Dyasi

Dr. Hubert Dyasi is a professor at City University of New York's School of Education. He has researched and written extensively in the area of inquiry-based science education. In the video, Dr. Dyasi says, "Inquiry is the way science has always been, and it's the way science is. And if we are going to present science to children, or learning opportunities about science to children, the most authentic way to do that is to engage them in science inquiry."

## Available on the Web



Journey North has a lesson for students on using KWL. You may find it useful background information when doing this activity.

### Go to:



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



select the "Classroom Lessons" icon

select "What Do You Know? Encouraging Inquiry-Based Research"

- Journey North uses actual data and activities based on phenomena that are occurring around the students. What place does a science textbook have in the Journey North activities? Explain. (This question is meant to generate discussion. Some teachers use textbooks as reference tools; others use them to teach concepts that students may need to know in order to more fully appreciate the science behind supplemental activities. Journey North complements textbook-based science instruction.)
- What are some examples of programs or activities that you have done that have energized your teaching? How did this affect your students?
- To the more-experienced Journey North teachers in the group: If you could begin again from day one, what would you do differently in implementing the program?
- How do you view Hubert Dyasi's comments about inquiry-based teaching and learning in connection to Journey North?
- How do you address the U.S. National Science Education Standards in your classroom? Your state or provincial standards? Your district standards?
- How do you teach the "interconnectedness" of science? How do you see Journey North as a tool for teaching this concept?
- What is one of your personal goals for your science students? How do you think Journey North could be used to reach those goals?
- What would you like to get out of this series of workshops?

## AFTER WATCHING THE VIDEO

### ACTIVITY B – Using KWL

Ask participants if they are familiar with KWL. If not, explain that KWL can be a kind of graphic organizer that can be used with an inquiry-based activity. *K* stands for the information that you already *know*. *W* stands for what you *want to know* written in the form of a question. *L* stands for what you've *learned*. Display an example of a blank KWL chart.

K	W	L
<i>Know</i>	<i>Want To Know</i>	<i>Learned</i>
What do you know or think you know about a topic?	What questions do you have?	What have you learned?

Explain that you are going to start a set of KWL charts that are going to be used throughout the series of Journey North workshops. Using a flip chart or large sheets of paper, make four KWL charts. Head the four charts “Seasonal Migrations,” “Plants and the Seasons,” “Sunlight and the Seasons,” and “Characteristics of Inquiry-Based Science.” Attach these charts to the walls around the room, provide markers, and have participants fill in the K and W columns. Encourage participants to fill in questions in the W column and to start adding information to the L column as the workshops progress. Participants may have other KWL charts that they might recommend such as KWHL, where *H* stands for *how* could we find the answer to this question. Add additional charts as needed.

### **ACTIVITY C – Journaling and Using Journey North Challenge Questions**

Ask the participants to share their experiences of having students keep science journals. What are some of the advantages they have discovered? Participants may suggest that science journaling is a way for students and teachers to communicate, that journaling helps students “think through” science concepts, that science journals can be used to assess student progress, etc.

Explain that throughout these Journey North workshops, you would like participants to keep their own journals. Suggest that they use a spiral notebook and divide it into three sections. One section can be used for taking notes, another for Journey North Challenge Questions, and a third section for a Learning Log, where they can keep a journal about what they’ve learned.

Explain that Journey North provides a series of “Challenge Questions” for each of the investigations. Challenge Questions are based on authentic data and are posed at key points throughout each of the investigations. They model good science and the thinking/questioning process that scientists use in their work. Because of this, the questions are very relevant to the students’ work. Explain that the participants will be answering Challenge Questions in the workshop so that they can better understand how the questions are used with the students.

Challenge Questions are often open-ended and provide students with examples of the types of questions they should be asking themselves. The questions are excellent models of questions students ask in an inquiry setting. As students move through each of the investigations, they build knowledge of the changing seasons and how sunlight affects the entire web of life.



#### **Workshop Tip**



The KWL activity can be useful in helping you, the facilitator, to determine what activities to choose and what information to emphasize as you progress through the other workshops. You can plan your workshops, in part, based on the questions and responses participants list on the KWL charts. As you move through the workshops, you will also be able to track participants’ progress.

#### **Learning From Mistakes**



It is important to allow students the freedom to make mistakes. Some of the greatest scientific discoveries were the result of experiments that “failed.” When students give answers, it is important to let the students discover if their answers are “right” or “wrong.” This is a part of the learning process. Teachers can challenge students to prove or disprove their answers or hypotheses. The teacher should provide activities that help students explore the concepts that lead to appropriate conclusions and answers.



## INTRODUCTION TO *Journey North*



### Holly Cerrulo

*Holly Cerrulo, a teacher at Joyce Middle School in Woburn, Massachusetts, has this to say about Challenge Questions:*

“A single Challenge Question will get your students thinking in ways they rarely do during the entire school year. If you did just one Challenge Question—and nothing else—you’d experience what I mean. Our entire class enjoyed the question about why owls nest in February, when it’s so cold outside. As a class, we all shared our ideas for possible reasons. Now remember, I didn’t know the answer even though I’m ‘the teacher.’ But this is what I love, this is where *Journey North* comes through. The discussion of the question comes the next week, so you don’t have to know the answer—you learn right along with the students. And what’s so great is that we could see that each of us had part of the answer in our thinking. As a class, we’d put our minds together and come up with ideas none of us—including the teacher—could have alone. Throughout the year, the students’ understanding of nature grows. So does the thinking they exhibit in answering questions. They’re making connections.”

Students are encouraged to keep a Challenge Question Journal, in which they write about the questions from *Journey North*. Many teachers use these journals as a tool for ongoing assessment of student progress. Explain that throughout the workshops, participants will be presented with Challenge Questions to answer in their journals. And their first one is:

#### CHALLENGE QUESTION:

“Why do you think hummingbirds commonly migrate at mid-day, rather than during the morning, later afternoon, or evening?”

Allow participants time to explore the question in their journals before discussing their answers. Point out that there are many ways to use the Challenge Questions, and that journaling is a way for students to begin the process. Challenge Questions provide an excellent opportunity for teachers to function as coaches or facilitators of student learning.

#### ANSWER:

*Hummingbirds are so tiny and have such a fast metabolism that they lose a lot of heat and body weight during the night when they can’t eat. Therefore, when they wake up in the morning, they must spend a lot of time feeding to replenish the energy they burned during the previous night. In the late afternoon and evening, they must rest and feed to store up enough energy to be able to survive the coming night. Thus mid-day is the best window of time to expend the energy migration requires.*

### **OPTIONAL ACTIVITY – Dealing With Wrong Answers**

Ask participants how they address student answers or responses that are way off-base. In addition, how do participants deal with student misconceptions? Have participants work in pairs or small groups and share the strategies they use when they encounter these situations.

Bring the group back together to share successful techniques they have for addressing “wrong” answers—for example, rewording or clarifying the question, asking the student to explain the process he/she used to find the answer, having the student provide data that supports the answer, etc.

## OPTIONAL ACTIVITY – What Is Inquiry?

Review the comments about inquiry that were given by Hubert Dyasi and Lee Schmitt in the video. What do participants think?

Discuss elements of inquiry that were shown or discussed in the video. Read Lee Schmitt's comments (right) and discuss participants' reactions.

Pass out copies of the handout called A Description of Inquiry (p. 12). Allow participants to read through the article and then discuss their reactions. Explain that this is the "definition" of inquiry-based science that will be used throughout the series of workshops.



A BLACKLINE MASTER OF THIS HANDOUT, A DESCRIPTION OF INQUIRY, CAN BE FOUND ON PAGE 12.

Ask participants to share their own experiences with using inquiry. Prompt them with questions like:

- How did you get started?
- Did you just jump in full-blown or did you gradually add more and more inquiry to your teaching?
- What has been the most interesting thing that's happened since you began using an inquiry approach?
- How have your students reacted?
- What differences do you see in your students?
- What positives and negatives have you experienced?
- What role does prediction play in your inquiry process?

Encourage participants to share specific strategies and techniques that they have found to be especially helpful or effective.

## Different Kinds of Inquiry



Two levels of inquiry are described in the National Science Education Content Standards: "In a full inquiry, students begin with a question, design an investigation, gather evidence, formulate an answer to the original question, and communicate the investigative process and results. In partial inquiries, they develop abilities and understanding of selected aspects of the inquiry process."



## About Lee Schmitt

Lee Schmitt is the director of teacher education for the Minnesota Science Museum. He is considered an expert in inquiry-based teaching strategies and has presented numerous workshops on the topic.

In the early part of the video, he says, "The biggest surprise, I think, that teachers have is that they can learn so much and internalize and retain so much information through the inquiry process."

Later Mr. Schmitt says, "Inquiry takes time. It is not intended to be a substitute for the content that needs to be presented in the curriculum. But for the deep understanding of science concepts, there is no better process that allows a student to internalize it, to understand it, and to apply it than by using inquiry methods in the classroom."



# INTRODUCTION TO *Journey North*



A BLACKLINE MASTER OF THE JOURNEY NORTH TOUR HANDOUT CAN BE FOUND ON PAGE 13.

## ***OPTIONAL ACTIVITY – Tour of Journey North Web Site***

For this activity, it is ideal to have a computer lab with Internet access where individuals or small groups can go to the Journey North Web site themselves.

The ability to access the Internet is a key element in Journey North. Participants should become familiar with navigating the Web site and some of its features. In this activity, you will be giving participants a list of items that they are to find on the Journey North Web site.

Provide each group with a copy of the Journey North Tour handout (p. 13).

Allow participants time to complete their tour, then bring participants back together to discuss what they've discovered. If there are experienced Journey North teachers among the group, elicit tips or ideas they might have about effectively using the Journey North Web site.

## **Report Your Sightings**



You may want to have participants practice reporting a sighting. Click on the owl icon on any page of the Journey North Web site and follow the directions.



## **Accessing the Internet**



It is not necessary for teachers to have Internet access in their classrooms or schools to be part of Journey North. Many Journey North teachers successfully use the program without Internet access in their schools. Teachers can access the Journey North Web site from any computer connected to the Internet. For example, teacher Holly Cerullo, who appears on the video, does not have access to the Internet from her school. She downloads and prints the information on her home computer and brings it to school to share with her students.

## WRAPPING UP

### Learning Log

Provide participants some time to write in the Learning Log section of their notebook. Have them write about something they've learned about science teaching in the workshop and something about Journey North that they'd like to explore in greater detail.

### Looking Back/Looking Ahead

Remind participants of Journey North's three sets of investigations—Seasonal Migrations, Plants and the Seasons, and Sunlight and the Seasons. Each investigation has a specific focus, but all explore changes in natural systems. All of the investigations are interrelated. Each of the investigations provides opportunities for inquiry-based instruction and learning.

Explain that the three remaining workshops will focus on each of the three main Journey North investigations. They will also provide opportunities to further explore the use of inquiry-based instruction and other instructional strategies.





# RESULTS OF THE SPRING SURVEY



**Signs of Spring**

**Date (*estimated*)**

Animal Signs (*including human activities*)

Plant Signs

Meteorological and Astronomical Signs

# A DESCRIPTION OF INQUIRY



At the Exploratorium Institute for Inquiry, our work in science education is deeply rooted in the belief that human beings are natural inquirers and that inquiry is at the heart of all learning. The work that we do with educators is designed to give them an opportunity to personally experience the process of learning science through inquiry. Our hope is that this experience will stimulate their thinking about how to create classrooms that are supportive environments for children's inquiry.

Inquiry is an approach to learning that involves a process of exploring the natural or material world, that leads to asking questions and making discoveries in the search for new understandings. Inquiry, as it relates to science education, should mirror as closely as possible the enterprise of doing real science.

The inquiry process is driven by one's own curiosity, wonder, interest, or passion to understand an observation or solve a problem.

The process begins by the learner noticing something that intrigues, surprises, or stimulates a question. What is observed often does not make sense in relationship to the learner's previous experience or current understanding.

Action is then taken through continued observing, raising questions, making predictions, testing hypotheses, and creating theories and conceptual models. The learner must find their own idiosyncratic pathway through this process; it is hardly ever a linear progression, but rather more of a back and forth or cyclical series of events.

As the process unfolds, more observations and questions emerge, giving occasion for deeper interaction and relationship with the phenomena—and greater potential for further development of understanding.

Along the way, the inquirer is collecting and recording data, making representations of results and explanations, drawing upon other resources such as books, videos, and colleagues.

Making meaning from the experience requires intermittent reflection, conversations and comparison of findings with others, interpretation of data and observations, and applying new conceptions to other contexts as one attempts to construct new mental frameworks of the world.

Teaching science using the inquiry process requires a fundamental re-examination of the relationship between the teacher and the learner, whereby the teacher becomes a facilitator or guide for the learner's own process of discovery and creating understanding of the world.

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*For additional information, contact:*

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3601 Lyon Street  
San Francisco, CA 94123  
[www.exploratorium.edu/IFI/index.html](http://www.exploratorium.edu/IFI/index.html)

# JOURNEY NORTH TOUR



Take a tour of the Journey North Web site at [www.learner.org/jnorth](http://www.learner.org/jnorth)

## *Today's News*



Here you'll find quick links to the latest news and information. This is the best page to bookmark and visit each day during the season. The Today's News page also includes links to the Journey North Archives, where you can access content from all past seasons.

## *What's Happening This Season?*

Depending on the season you tour the Web site, you will find either:

### *Spring's Journey North*

In the **spring**, this button takes you to the "hub" of the Journey North spring season. Here you'll find links to all of the migrations (or spring events) featured. The spring activities begin in February and last until June, but direct access to the spring section is available from January through July.



### *Fall's Journey South*

In the **fall**, this button changes directions and it links to the fall migrations and studies. The fall activities begin in September and last until December, but direct access to the fall section is available from August through December.



In both spring and fall, each of the featured species (or spring/fall events) has its own "home page." There you'll find a calendar showing when Journey North News will be posted, as well as links to background information, Challenge Questions, Ask the Expert, and Related Lessons and Resources.

## *Report Your Sightings*



This button links to the Field Report form that observers use to report sightings. Try submitting a Practice Report so you can see how the system works. Afterward, follow the instructions to access the database and see the sightings you and others have recently reported. (For quality control purposes, Journey North only accepts observations that are sent from registered email addresses. Registration is free.)

## *How To Use Journey North*



This branch of the Web site is designed specifically for teachers. It links to all online Classroom Lessons, an Orientation, a Teacher Discussion, and Teacher Tips.

## *Search Journey North*



This button takes you to the search engine. Use it to search the site for all information posted since 1995. To simplify student research, many links are also available and organized by species and topics.





## OVERVIEW

### About the Workshop

The Journey North migration investigations provide an exciting way for students to explore the changing seasons through observing animal migrations. Through this workshop, participants will learn to use the migration investigation for monarch butterflies. By learning about one of Journey North's featured migrations in detail, participants will be able to adapt activities for other migrations. The video gives an overview of the various migrations activities and shows how some experienced Journey North teachers use the program. Participants will take part in a hands-on simulation that models activities for students.

### Objectives/Outcomes

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

- describe the basic elements of the Journey North migrations and monarch butterfly investigations,
- implement the migrations activities at their schools,
- demonstrate how prediction can be used as an important part of science teaching and learning, and
- match Journey North activities to district, state, or provincial standards.

### Materials You May Need

*For the facilitator:*

- VCR and television monitor
- overhead projector, blank transparencies, and markers
- flip chart and markers
- extra paper
- computer with Internet connection (optional)
- large photo or drawing of a monarch butterfly (could be slide, overhead transparency, or poster)

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

- map of North America with states, provinces, latitude and longitude lines, and a distance-scale bar (p. 25)
- Migration Route Prediction Chart handout (p. 24)
- Sample Monarch Migration Data handout (p. 26)
- Migrations Scavenger Hunt handout (p. 27)
- string or thread (for measuring on map)
- atlases or political maps of North America



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

### Key Concepts for the Facilitator

Although this workshop focuses on monarch butterflies, Journey North follows the annual migrations of about a dozen animals including robins, bald eagles, hummingbirds, manatees, and three species of whales. In a unique partnership, classes can join other students and scientists to gather and analyze data about these fascinating migrations. The workshop activities can be implemented with any of the Journey North migrations, not just monarch butterflies.

**Every spring, millions of monarch butterflies re-populate eastern North America after surviving the winter in the high mountains west of Mexico City.** The monarchs fly up to 2,500 miles to get to Mexico in the fall and spend the winter living off their fat reserves. In March, with just a few weeks to live, the butterflies leave Mexico to produce the next generation. From March to September, there are four to five short-lived monarch generations. In the fall, by instinct alone, the great-great-great grandchildren of the previous fall's butterflies migrate to the very same mountain sanctuaries in Mexico. The information for this incredible journey is somehow passed from generation to generation so that miraculously, the butterflies find a place they've never seen before.

**The monarch migration is an endangered phenomenon.** It is a classic conservation dilemma seen the world over: growth of the human population and the increasing use of resources degrades and destroys the habitat of other species. Through their participation in Journey North, students are motivated to learn more about the complexities surrounding many endangered species and phenomena like the monarch migration.

**Prediction, an important science skill, is one of the key elements of the migration investigations.** Students learn to make predictions, gather data, analyze it, look for trends or patterns, and then adjust their predictions. Through this continuing cycle, students learn to make more accurate predictions and develop hypotheses based on scientific data.

**Challenge Questions are central in the migrations studies as with all other Journey North investigations.** (See discussion of Challenge Questions in the workshop activity "Journaling and Using Journey North Challenge Questions" on page 5.)

**The monarch activities are interdisciplinary and can be used by self-contained elementary classroom teachers or by specialists who teach single subjects.** Science, math, geography, language arts, and art are all part of the Journey North investigations.



## SEASONAL MIGRATIONS *Monarch Butterflies*

### Available on the Web



There are two Web sites where you can find more information about raising and tagging monarchs, and about classroom investigations with monarchs:

#### Go to:

**Monarchs in the Classroom**

[www.monarchlab.umn.edu](http://www.monarchlab.umn.edu)

and

**Monarch Watch**

[www.MonarchWatch.org](http://www.MonarchWatch.org)

## BEFORE WATCHING THE VIDEO



### **ACTIVITY A – What Do You Know About Monarchs and Migration?**

The inquiry cycle starts with observation of a phenomenon. Thus, if at all possible, teachers should start the investigation of monarchs by giving students an experience with live monarch butterflies, in the classroom or in the field. Teachers would instruct students on the proper handling of monarchs, pass them out to the students, have the students make observations, and then ask the students to formulate questions. In primary classrooms, the teacher would simply write down the questions heard during the students' observation activity.

If possible, start this activity by first recording observations of live monarchs (or of another species of adult butterfly, a caterpillar, a chrysalis, a butterfly wing, etc.). When participants have finished, ask them to take a minute or two to jot down as many questions about monarchs as they can. Then have them share their questions. List them on the board or on an overhead. Examples of questions might be:

- What do monarch butterflies eat?
- How far north can monarch butterflies be found?
- What happens to monarchs in winter?
- What is the life span of a monarch butterfly?
- How far can a monarch fly in a week? A month? A lifetime?

Have participants break into small groups and discuss their questions. Which questions could be answered by doing an experiment? Which could be answered by analyzing data? Which could be researched? After a few minutes, bring the group back together and ask groups to share their ideas. You may want to categorize the list of questions that were generated earlier in the activity.

Point out to participants this type of activity can be used with students in a number of ways:

- Student-generated questions based on natural phenomena are an important step in the inquiry process.
- The questions students ask can help teachers establish a baseline of students' prior knowledge.
- The questions can help teachers identify misconceptions students might have.

Have participants share any techniques or strategies they use to generate student questions and to determine students' prior knowledge.

### **ACTIVITY B – Predicting the Monarch's Spring Migration Route**

Hand out maps of North America and Migration Route Prediction Charts (pp. 24 and 25) to all participants, but have them work in pairs for this activity.

Tell participants that their task is to predict the route of the monarch migration from Mexico, as the butterflies enter the United States in March. They can mark the route on the map if they wish. Have partners list the states by order of arrival on the left side of the Migration Route Prediction Chart. (The prediction chart has spaces for predicting the arrival in 15 states. If you are pressed for time, 10 states are sufficient for participants to see the pattern.) While working, participants should think about and then answer:

#### **CHALLENGE QUESTION #1:**

“Why do you think the monarch migration will arrive in the states in the order you predicted?”

After pairs have completed the task, bring the entire group back together and discuss their predictions.

Explain that they will be exploring the migration route further in a later activity, “Mapping and Analyzing Monarch Migration Data” (pp. 20-21).

#### **Workshop Tip**



Allow participants to explore the Challenge Questions on their own rather than just providing them with the answers.



**BLACKLINE MASTERS FOR  
THESE HANDOUTS CAN BE  
FOUND ON PAGES 24 AND 25.**

#### **Workshop Tip**



This workshop incorporates several Challenge Questions that are part of the Journey North investigations. If you didn't use the activity “Journaling and Using Journey North Challenge Questions” (page 5) in your introductory workshop, you may want to incorporate it as part of this workshop.



## SEASONAL MIGRATIONS *Monarch Butterflies*

### ***OPTIONAL ACTIVITY – The Annual Cycle, Life Cycle, and Migration of the Monarch***

Draw a blank KWL chart on the board or on an overhead. Title it “Annual Cycle, Life Cycle, and Migration of the Monarch.” Ask participants to provide information they already know about the annual cycle of monarch butterflies. What do they want to find out? What questions do they need to answer?

Have participants work individually, in pairs, or in small groups. Challenge them to describe the annual cycle of the monarch population—where monarchs are found and what is occurring over the course of a full year. Have participants begin their annual cycles in August so that the cycles can be compared later.

To be complete, their annual cycle descriptions will need to show an understanding of the life cycle of the individual monarch (from egg, to larva, to adult), as well as the migration patterns of some monarch generations. As part of their descriptions, they can include a calendar, make a map, or draw a diagram.

Bring groups back together and have them share their annual cycle, life cycle, and migration descriptions. Explain that this is an activity that could be used with students throughout their study of monarchs (or other migrations). They can fill in or change their descriptions as they learn more about the species. This type of ongoing activity is a variation on KWL.

You may want to share this simplified overview of the annual cycle with participants at the end of the activity.\*

August and September: The last monarch generation of summer emerges as adult butterflies and begins to migrate to Mexico. (To keep track of generations, we’ll call this the “parent” generation.)

August to November: Fall migration to Mexico.

November to March: The parent generation overwinters at the sanctuaries in Mexico.

March: Spring migration. The parent generation leaves the Mexican sanctuaries.

March and April: The parent generation migrates as far as the southern U.S. states and lays eggs.

April and May: From these eggs, the first spring generation (children) emerges as adult butterflies and migrates northward laying eggs.

May and June: The second generation (grandchildren) emerges as adults and lays eggs.

June and July: The third generation (great grandchildren) emerges and lays eggs.

July and August: The fourth generation (great-great grandchildren) emerges and lays eggs.

August and September: The fifth generation (great-great-great grandchildren) emerges and the cycle continues....

\* This overview is for general understanding only. Timing of the annual cycle will vary from year to year, and timing is always different in different geographic regions. There is also substantial overlap between generations. Taken together, this means there may be as few as three or as many as five generations produced during one summer breeding season, depending on the location and the year.

## WATCHING THE VIDEO

### What You'll Be Watching

Video Module Two—Seasonal Migrations: Monarch Butterflies (running time approx. 18 min.)

Although Journey North provides the opportunity for students to track the migrations of about a dozen animal species, the video focuses on the migration of monarch butterflies.

Although not part of the Journey North activities, many teachers have integrated raising monarchs into their curriculum. The butterflies are tagged and released, beginning their long journey to Mexico. Some students also explore monarch biology through experiments that they devise from questions that they have generated.

Another way for students to learn about the monarchs' migration is through Journey North's "Symbolic Monarch Migration." Students make paper monarch butterflies and send them, as ambassadors, to the children of Mexico. The students in Mexico protect the butterflies for the winter and return them in the spring. Personal letters are exchanged between the students.

Millions of monarchs cover trees and fill the skies in Mexico where the insects spend their winter. Students experience the beauty and excitement of the winter sanctuaries through reports from monarch experts that are filed on the Journey North Web site.

The video follows how teachers and classes track the migration, report their own sightings, and analyze data. Interviews with teachers and educational experts provide insight into the pedagogy behind the Journey North program.

### 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 specific activities that engage students.
- Watch for interdisciplinary aspects of the monarch migration activity.
- Watch for examples of teachers functioning as facilitators for student learning.
- Watch for examples of classes working with Challenge Questions.



## SEASONAL MIGRATIONS *Monarch Butterflies*



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 questions do you have about the monarch migration? (Some of the questions will be answered as participants work through the workshop activities.)
- What science skills did you observe that are taught or reinforced by the monarch investigations?
- How did the students and teachers in the video compare to your students and the way you teach science? Similarities? Differences?
- What did you see in the video that you thought might be interesting to try with your students? Why do you think it is worth trying?
- What are the advantages of an investigation like migrations that runs over an extended period of time? What are the disadvantages?
- Hubert Dyasi suggested that students report from time to time about the progress of their work. How do you incorporate this activity into your teaching?
- Many of the activities in the migrations investigation have cross-curricular applications. How could you facilitate cross-curricular or team teaching in your school?
- What was the most interesting part of the video to you? Why?
- If you have already participated in the Journey North migrations investigations, what tips or recommendations could you give that would help a teacher new to Journey North?
- Where would the Journey North migration investigations fit into your science curriculum?

## AFTER WATCHING THE VIDEO

### *ACTIVITY C – Mapping and Analyzing Monarch Migration Data*

Provide participants with the Sample Monarch Migration Data handout (p. 26). Have partners plot the data on their maps and complete the right column of the Migration Route Prediction Chart, provided in Activity B.

Next, have participants answer Challenge Question #2 in their journals.



A BLACKLINE MASTER FOR THE SAMPLE MONARCH MIGRATION DATA HANDOUT CAN BE FOUND ON PAGE 26.

**CHALLENGE QUESTION #2:**

“How did your predictions compare to the actual results? Did anything surprise you? If the monarch migration pattern was different than what you predicted, can you think of reasons why? Describe what happened and why.”

Bring the group back together and discuss their answers. Point out that the Challenge Questions model good scientific thinking, and they are the types of questions students should begin to ask themselves.

Now take a closer look at the migration pattern. Tell participants to note that on March 26, a monarch was sighted in Demorest, Georgia—a long way from Mexico. Have the partners measure the distance on their maps from the monarch sanctuaries in Mexico [19N, -100W] to Demorest, Georgia [34N, -83W]. If participants ask if butterflies fly over the Gulf of Mexico, tell them that scientists do not believe so. (Depending on the tools available, answers will vary. The actual distance from the monarch sanctuaries in Mexico to Demorest, Georgia is 2,367 km [1,471 miles].)

Have pairs find the answer to Challenge Question #3.

**CHALLENGE QUESTION #3:**

“If the butterfly seen in Georgia had flown straight north from the sanctuaries in Mexico, where would that butterfly have been on March 26?”

**ANSWER:**

*Near Valentine, Nebraska [43N, -100W]. Answers may vary depending on the detail level of the maps used. Remember: no "wrong" answers. If some answers seem way off, ask participants to explain how they determined the location.*

Next, after participants have found the answer, have them answer Challenge Question #4 in their journals.

**CHALLENGE QUESTION #4:**

“Why does it appear that the migration moves eastward after entering the U.S. instead of directly northward from Mexico?”

**ANSWER:**

*Could include: In March, the monarchs would be in danger of freezing temperatures in Nebraska and other northern areas. There would not be milkweed [for butterflies to lay their eggs]. There would be no flowers [with nectar for the butterflies to eat]. In the area where monarchs arrive in March, their habitat is ready. Spring temperatures are usually above freezing and plant development is more advanced.*

Bring the group back together to discuss their answers to Challenge Question #4, and to discuss the entire activity. What parts of the activity do they think would appeal to students? If you have a number of more experienced Journey North teachers, what kinds of classroom management tips and suggestions can they provide to less experienced or new Journey North teachers?

Reinforce the importance of using prediction as a part of the overall instructional strategy. What strategies or techniques do participants use in their classrooms to encourage students to predict outcomes and test their predictions?

**Available  
on the Web**

There are valid data, questionable data, and invalid data. How do you help students learn to distinguish them?

Journey North carefully reviews all data submitted over the Internet for quality control purposes and often contacts observers to confirm data accuracy. However, Journey North also looks for good opportunities to include examples of accurate—but questionable—data for students to scrutinize.

The lesson “You’re the Scientist: Verifying Data Collected by Peers” examines data validity and gives students practice in evaluating data quality. You may want to have participants do the lesson as part of the workshop.

**Go to:**

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



select the “Classroom Lessons” icon

select “You’re the Scientist”



# SEASONAL MIGRATIONS *Monarch Butterflies*



A BLACKLINE MASTER FOR THE  
MIGRATIONS SCAVENGER HUNT  
CAN BE FOUND ON PAGE 27.

## Report Your Sightings



You may want to have participants practice reporting a sighting. Click on the owl icon on any page of the Journey North Web site and follow the directions.



## **OPTIONAL ACTIVITY – Migrations Scavenger Hunt**

If you have access to a computer lab with Internet access, you may want to have participants explore migrations on the Journey North Web site. Distribute the Migrations Scavenger Hunt handout (p. 27).

Here are some things they should look for:

### **Seven Things To Look for Among Journey North’s Migration Studies**

- How many birds, mammals, amphibians, reptiles, and insects does Journey North track?
- What kinds of observations are students asked to report about each species? (Clue: From any species “Home Page,” follow the “About This Study” link.)
- Which animals are tracked using satellite technology, and which by students reporting their own observations?
- How many of the species are endangered?
- How many are found where you live?
- Which crossed into Canada first last spring, hummingbirds or monarch butterflies?
- What does Journey South track in the fall?

### **Six Things To Look for in the Monarch Migration Study**

- When was it announced that the monarchs had left Mexico last spring?
- On which date last spring was the first monarch sighted in your state or province?
- Was this earlier or later than the year before?
- Which week last fall did the migration peak in Texas?
- Find a monarch Challenge Question and its follow-up answer, or “discussion.”
- Where are the answers from the Monarch Expert, Dr. Karen Oberhauser?



## WRAPPING UP

### Journey North Implementation Plan

Separate participants into groups of three to five people. Their task is to come up with a plan for implementing Journey North into their current curriculum. If all teachers in the group have used Journey North, then their task should be to devise a plan for expanding the use of the program—doing additional activities, expanding the number of topics, including other subject area teachers, etc. The action plan should include specific steps that the participants can follow when implementing Journey North.

After groups have been given sufficient time, bring the entire group back together to present their ideas to the larger group. List key points on an overhead.

### KWL Revisited

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

### ***OPTIONAL ACTIVITY – Correlating to Your Standards***

Many school districts, states, and provinces have a set of very specific science standards and curriculum frameworks that teachers must address or fulfill. The activities that comprise the Journey North program fit well with most standards and frameworks. But because each district, state, or province is somewhat different in its requirements, it can be helpful for teachers, curriculum specialists, and administrators to create a correlation that shows how Journey North meets their own requirements.

Separate participants into groups from the same school or district. Using their own standards, groups should create a correlation grid that shows which Journey North activity addresses a specific standard. Participants should focus on the activities from a single Journey North topic, such as Seasonal Migrations, Plants and the Seasons, or Sunlight and the Seasons. Depending on your workshop schedule, groups may begin the process during the workshop and finish it later.

# MIGRATION ROUTE PREDICTION CHART



Predict the route of the monarch migration from Mexico, as the butterflies enter the United States in the spring. Name the state where you think monarchs will arrive first, second, third, etc.

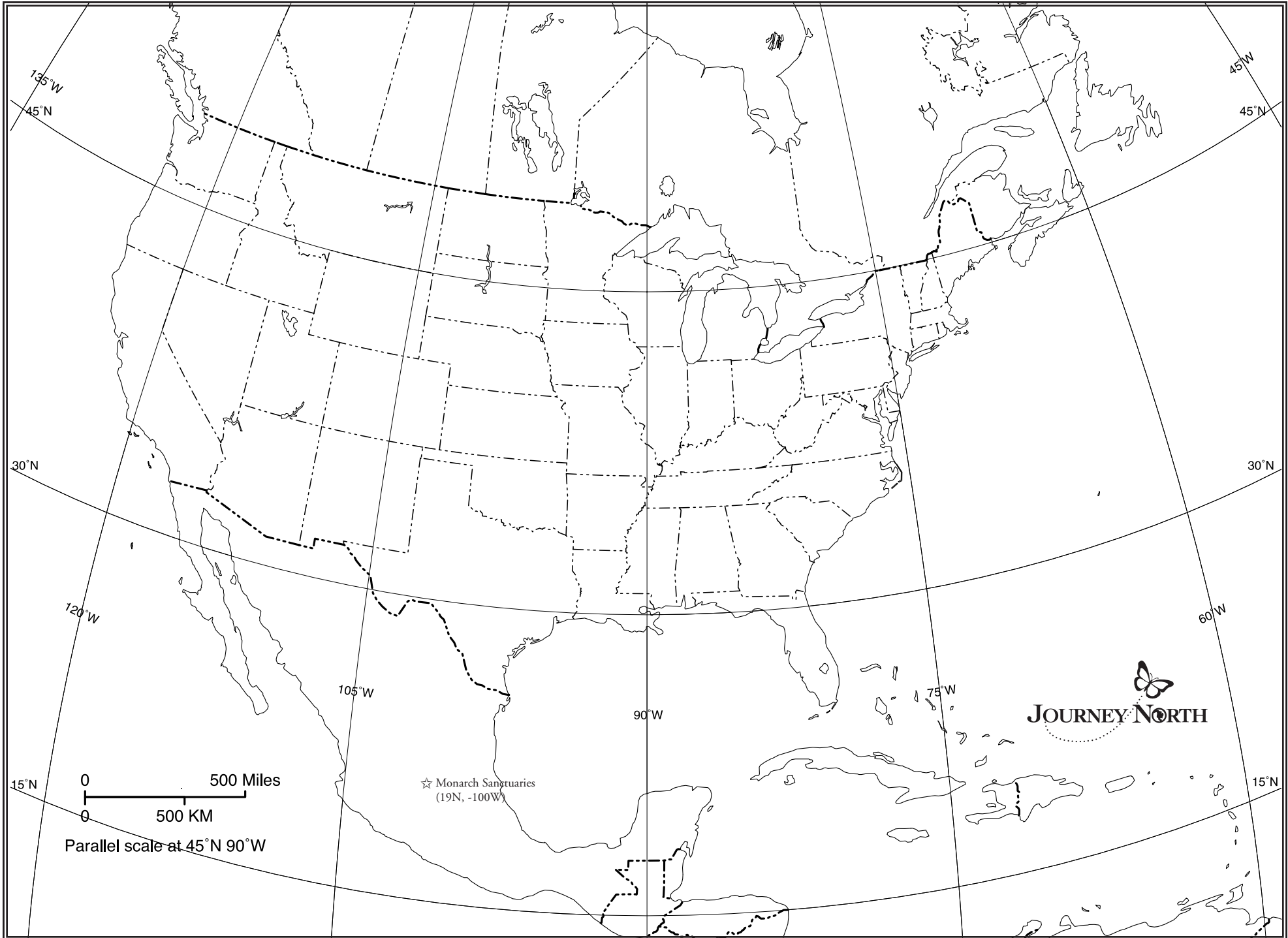
**Name of State Where I Predict  
Monarchs Will Arrive**

**Name of State Where  
Monarchs Actually Arrived**

1st		
2nd		
3rd		
4th		
5th		
6th		
7th		
8th		
9th		
10th		
11th		
12th		
13th		
14th		
15th		

## Challenge Question #1:

“Why do you think the monarch migration will arrive in the states in the order you predicted?”



# SAMPLE MONARCH MIGRATION DATA

## SPRING 2000



These are some of the first monarch sightings received from various states during the spring of 2000. You can plot the data on your migration map or simply use the dates to record the order in which monarchs arrived in each state on your Migration Route Prediction Chart.

Date	City	State	Latitude (N)	Longitude (W)
03/01/00	Austin	TX	30.23	-97.71
03/04/00	Baton Rouge	LA	30.45	-91.19
03/09/00	Clinton	MS	32.39	-90.34
03/10/00	Dauphin Island	AL	30.25	-88.15
03/17/00	Baton Rouge	LA	30.41	-91.15
03/18/00	Ardmore	OK	34.21	-97.17
03/20/00	Texarkana	AR	33.48	-93.92
03/23/00	Tallahassee	FL	30.43	-84.26
03/26/00	Demorest	GA	34.35	-83.36
03/28/00	Piedmont	SC	34.71	-82.46
03/30/00	Wilmington	NC	34.24	-77.95
04/01/00	Powder Springs	GA	33.88	-84.70
04/01/00	Hollywood	MD	38.36	-76.58
04/04/00	Searcy	AR	35.27	-91.85
04/04/00	Perry	OK	36.29	-97.29
04/04/00	Montgomery	AL	32.40	-86.33
04/05/00	Gallatin	TN	36.41	-86.45
04/07/00	Eminence	MO	37.18	-91.48
04/07/00	Seaford	VA	37.19	-76.42
04/07/00	Taylors	SC	34.98	-82.33
04/08/00	Hamden	CT	41.38	-72.94
04/09/00	Smyrna	DE	39.28	-75.53
04/10/00	Grand Tower	IL	37.37	-89.29
04/10/00	Ava	IL	37.88	-89.45

# MIGRATIONS SCAVENGER HUNT



Go to the Journey North Web site at [www.learner.org/jnorth](http://www.learner.org/jnorth)

Here is what you're looking for:

## **Seven Things To Look for Among Journey North's Migration Studies**

- How many birds, mammals, amphibians, reptiles, and insects does Journey North track?
- What kinds of observations are students asked to report about each species?  
(Clue: See "About This Study")
- Which are tracked using satellite technology and which by students reporting their own observations?
- How many of the species are endangered?
- How many are found where you live?
- Which crossed into Canada first last spring, hummingbirds or monarch butterflies?
- What does Journey South track in the fall?

## **Six Things To Look for in Monarch Migrations**

- When was it announced that the monarchs had left Mexico last spring?
- On which date last spring was the first monarch sighted in your state or province?
- Was this earlier or later than the year before?
- Which week last fall did the migration peak in Texas?
- Find a monarch Challenge Question and its answer.
- Where are the answers from the Monarch Expert, Dr. Karen Oberhauser?





## 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.

**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.



**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

# 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](http://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)"*





## OVERVIEW

### What Is the Mystery Class Investigation?

The Mystery Class investigation is an 11-week hunt in which students try to find 10 secret “Mystery Classes” hiding around the globe. The changing amount of sunlight at each site is the central clue. Students take an inspiring journey from knowing only the sunrise and sunset times, to discovering the exact locations of the 10 Mystery Classes. This investigation demonstrates that, as spring sweeps across the Northern Hemisphere, day length changes everywhere on earth. Students see that these dramatic seasonal changes in sunlight affect the entire web of life.

### About the Workshop

The Journey North Mystery Class investigation engages students on a number of levels. Through this workshop, participants will learn to use the Mystery Class investigation with their students. Participants will take part in a hands-on simulation that models what students do. In addition, discussions of the video provide participants with additional techniques and strategies that they can use in their own classrooms.

### Objectives/Outcomes

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

- describe the basic elements of the Journey North Mystery Class investigation,
- implement the Mystery Class investigation in their classrooms, and
- discuss the relationship between a location’s photoperiod and the changing of the seasons.

### Materials You May Need

*For the facilitator:*

- VCR and television monitor
- overhead projector, blank transparencies, and markers
- flip chart or large sheets of paper and markers
- computer with Internet connection (optional)

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

- Mystery Class Data Sheet handout (p. 48)
- Mystery Class Graph handout (p. 49)
- Mystery Class Clues handout (p. 50)
- globes, atlases, world almanacs, encyclopedias, various reference sources
- a variety of balls
- flashlights



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

### Key Concepts for the Facilitator

**The Mystery Class investigation demonstrates the dramatic changes in sunlight throughout the seasons.** Changes in sunlight affect the entire food chain, from plants to animals.

**Students measure and graph photoperiods.** A photoperiod is the amount of daylight between sunrise and sunset each day. (For example, if sunrise is at 6:00 and sunset is at 19:00, the photoperiod is 13 hours.) This activity lets students observe first-hand how the photoperiod changes around the globe with the advance of spring in the Northern Hemisphere.

**Analyzing and interpreting photoperiods helps determine the location of the Mystery Classes relative to the equator.**

**Interdisciplinary clues provided by Journey North during the last six weeks of the activity promote learning and problem solving.**

**Classrooms all over the world simultaneously work to correctly identify all 10 secret Mystery Classes and submit their guesses to Journey North.**

**Challenge Questions provided by Journey North throughout the Mystery Class investigation model the types of questions that scientists ask themselves.** Students learn to ask themselves these types of questions. (For more on this topic, see the Challenge Question activity on page 5.)



## BEFORE WATCHING THE VIDEO

Before introducing any of the activities, provide an overview of the Mystery Class investigation to participants by reading the information in the “What Is the Mystery Class Investigation?” section at the top of the previous page.

### **ACTIVITY A – Thinking About Daylight and Seasons**

Begin by asking participants this Challenge Question:

#### CHALLENGE QUESTION:

“Are the days longer or shorter 500 miles north of where we are? Why?”

Model good instructional technique by allowing participants to reflect on the Challenge Question before discussing it as a group or providing the answer.

#### ANSWER:

*The answer changes depending upon the season, and your location. For instance, if you are in the Northern Hemisphere, days will be longer to the north in the spring and summer (any time after the Vernal Equinox and before the Autumnal Equinox.) Days will be shorter to the north in the fall and winter (any time after the Autumnal Equinox and before the Vernal Equinox.) It might help to think of the extreme north, the Arctic, which has little daylight during much of that time period.*

Separate participants into small groups. Challenge them to come up with a way of explaining or demonstrating why and how the length of daylight (photoperiod) changes throughout a year. Provide groups with materials that they might use for their demonstration such as flashlights, balls, poster paper, markers, etc. Give groups 10 minutes to complete this task.

When groups are finished, they should share their ideas with the entire group. List a summary of each group’s explanation on an overhead or flip chart. Accept all answers and don’t comment whether they are correct or not.

Discuss the concept of accepting all answers with participants. Ask participants to share their strategies and techniques for dealing with wrong answers in an inquiry setting. You may wish to discuss that teachable moments often come from students’ “wrong” answers.



### **OPTIONAL ACTIVITY – How Do You Teach the Concept of Seasonal Change?**

(This activity may be used with teachers who are fairly new to Journey North.) Lead a discussion about how participants are currently teaching the concepts around the changing of the seasons. Ask participants to share ideas about lessons, activities, teaching strategies, or educational products that they have found to be particularly helpful in teaching seasonal change.

What was most effective in helping students grasp the concepts involved? Why?

Explain that the entire Journey North program provides a wealth of activities and lessons that deal with different aspects of seasonal change. Journey North has been created to be used on its own or to complement other curriculum programs. Explain that the Mystery Class activities are especially effective at helping students develop an understanding of how the length of daylight changes as the seasons change and how this affects the entire web of life.



### **A Private Universe**

Many people share similar misconceptions about why we have seasons. Once a person has a deeply rooted misconception, it is very difficult to dispel it, even in the face of solid evidence to the contrary. The video *A Private Universe* examines students' misconceptions concerning the changing seasons and their other misconceptions of science.

You can find more information about *A Private Universe* on the Internet.

#### **Go to:**

**Private Universe Project**

[www.learner.org/catalog/science/pup](http://www.learner.org/catalog/science/pup)

## WATCHING THE VIDEO

### **What You'll Be Watching**

Video Module Four—Sunlight and the Seasons: Mystery Class (running time approx. 17 min.)

The video follows a number of classrooms around the United States as they engage in the Journey North Mystery Class investigation. Students are challenged to find the exact location of 10 secret Mystery Classes located around the world. Beginning with information about sunrise and sunset times, students begin to plot the photoperiods of the Mystery Classes on a graph. As the spring equinox approaches, students begin to realize that the lines on their graphs are converging. Soon students are able to determine the longitude of each of the Mystery Classes. The Journey North staff supplies additional clues about language, culture, geography, or history of the country or area where each Mystery Class is located.

Excitement builds as students use their problem-solving and inquiry skills to zero in on the various locations. Students use a variety of resources to research the clues that will lead them to identifying the 10 Mystery Classes. Students employ skills they've learned in science, math, geography, and language arts, along with problem-solving and research skills, to identify the 10 locations.

At the end of the 11 weeks, the locations are announced, and students celebrate and reflect on their work. Now the students finally get to meet the students of the secret Mystery Classes, who send photos, introductions, and additional information about their schools and locales.



# SUNLIGHT AND THE SEASONS

## Mystery Class

### Shadow Sticks



In advance of the spring Mystery Class investigation, some teachers prepare their students with related activities. Beginning as early as the fall season, they direct students to track the sun's position in the sky and measure the length of days or photoperiods. This builds a foundation of knowledge for students to draw upon as they move through the Mystery Class investigation.

The shadow stick activity shown in the video is available on the Journey North Web site. To find the "Shadow Sticks and the Sun" lessons:

#### Go to:



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



Select the "Classroom Lessons" icon

select the lessons specifically for "Mystery Class"

select "Shadow Sticks and the Sun"

### 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 examples of students synthesizing information.
- Watch for examples of teachers functioning as facilitators for student learning.
- Watch for interdisciplinary aspects of the Mystery Class investigation.
- Watch for different ways students become engaged.

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 questions do you still have about the Mystery Class investigation? (Many of the questions will be answered as the participants work through the Mystery Class Simulation.)
- What classroom management issues came to mind as you watched the video? How would you address them?
- After discussing students' response to a Challenge Question, teacher Dave Kust tells his students that they'll "have to wait and see." How do you think this helps further engage students?
- Do you think there is a need to introduce students to various research skills before they participate in the Mystery Class investigation? Why or why not?
- If you have already done the Mystery Class investigation with students, how do you use the Challenge Questions?
- What was the most interesting thing you saw in the video?
- The Mystery Class investigation unfolds and develops over a period of 11 weeks. What are the advantages of a long-term project over short-term projects? What might be some disadvantages and how would you address them?
- Have you ever team-taught? How would the Mystery Class investigation lend itself to interdisciplinary team teaching?
- How do you help students who are going down a blind alley in their research without giving them the answer?
- Why would you do activities with shadow sticks in the fall and throughout the school year when the Mystery Class investigation takes place in the spring?
- How would you assess student learning during the Mystery Class investigation? What skills would you expect students to demonstrate?

## AFTER WATCHING THE VIDEO

### ACTIVITY B – Mystery Class Simulation

Explain that participants are going to be involved in a Mystery Class investigation of their own. Explain that they are going to follow the same steps as students follow during their 11-week Mystery Class investigation:

- Calculate photoperiods (length of daylight) for the different sites each week.
- Graph photoperiods from week to week.
- Interpret the changes in photoperiod from week to week.
- Use interdisciplinary clues to narrow the search for the Mystery Class sites.

### Calculating Photoperiods

Hand out Mystery Class Data Sheets (p. 48). Separate participants into three groups.

Each group should calculate the photoperiods for a single Mystery Class location and the workshop location. (For the purposes of this activity, Mystery Classes #1, #4, and #9 from the Spring 2000 activity were used.) Groups should record the photoperiods on the data sheet. Do not give groups the photoperiods; let them figure out how to calculate them themselves.

Class #	Sunrise	Sunset	Photoperiod	Longitude
<b>MC #1</b>				
Feb. 7	6:20	19:56	13 hr. 36 min.	
Feb. 14	6:27	19:49	13 hr. 22 min.	58.45 W
Feb. 21	6:33	19:41	13 hr. 8 min.	
<b>MC #4</b>				
Feb. 7	6:24	18:32	12 hr. 8 min.	
Feb. 14	6:25	18:32	12 hr. 7 min.	78.50 W
Feb. 21	6:25	18:32	12 hr. 7 min.	
<b>MC #9</b>				
Feb. 7	8:11	17:46	9 hr. 35 min.	
Feb. 14	7:59	17:59	10 hr.	03.93 E
Feb. 21	7:46	18:11	10 hr. 25 min.	

### Graphing Photoperiods

After groups have calculated photoperiods, the data for their Mystery Class location and the workshop location should be graphed on the Mystery Class Graph (p. 49).



A BLACKLINE MASTER FOR THE MYSTERY CLASS DATA SHEET HANDOUT CAN BE FOUND ON PAGE 48.

### Available on The Web



Participants will also need the sunrise and sunset times for the city or town where you are holding the workshop. Find the sunrise/sunset times for your location on February 7, 14, and 21.

#### Go to:



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



Select the "Classroom Lessons" icon

select the lessons specifically for "Mystery Class"

select "Sunrise/Sunset Tables"



A BLACKLINE MASTER FOR THE MYSTERY CLASS GRAPH HANDOUT CAN BE FOUND ON PAGE 49.



# SUNLIGHT AND THE SEASONS

## Mystery Class

### Interpreting Data

Pose the following Challenge Questions to the participants and have them write their answers in their journals.

#### CHALLENGE QUESTIONS:

1. "What do you know about the locations of the Mystery Classes based on the photoperiod data so far?"
2. "What hemisphere do you think each Mystery Class is in?"
3. "How do their photoperiods compare with each other and with your current location, and what does that tell you?"

#### ANSWERS:

*From the photoperiod data so far, you can tell whether a Mystery Class location is in the Northern or Southern Hemisphere. In addition, comparing the data of one class to another, you can tell if the latitude of one Mystery Class is further north or further south than the other Mystery Class.*

### Using Interdisciplinary Clues

Provide participants with the Mystery Class Clues handout (p. 50). Remind them that by now students would have some information on latitude and longitude and would be working with other resources such as atlases, etc.

#### Mystery Class #1

**Clue #1:** "Hot and humid during summer; winter is mild, but humid. Snowfalls are extremely rare in our hometown."

**Clue #2:** "The temperate climate of our city is characteristic of the river's coastal plain."

**Clue #3:** "Two important rivers flow into the estuary on whose shore our city is located."

**Clue #4:** "If you go approximately 1,000 km to the west from our city, you'll find the highest mountain in our country and continent. If you draw a line from our city southward into the Atlantic Ocean, you will probably come across an archipelago that led to a dreadful armed conflict in 1982."

**Clue #5:** "Our city is the nation's chief port. Our city has an environmental flavor in our local language. World Soccer Cup 1978's inaugural and final games were played in our city."

#### Mystery Class #4

**Clue #1:** "Instead of four seasons of the year, our region has only one, but sometimes it is rainy and sometimes it is dry."

**Clue #2:** "Our official languages here are Spanish and Quechua. Our country has a population of about 12 million people."

**Clue #3:** "We have a National Park that was visited by Charles Darwin in 1835. He called it a 'living laboratory of evolution' because one of every four species found here is not found anywhere else in the world."



A BLACKLINE MASTER FOR THE MYSTERY CLASS CLUES HANDOUT CAN BE FOUND ON PAGE 50.

### Workshop Tip



If you are holding the workshop in a school, it's ideal if participants can use reference sources from the school's library or media center. Otherwise, you will need to have enough reference sources—atlases, world almanacs, etc.—for the participants to research the clues for the Mystery Class locations. A computer with an Internet connection is also helpful.

**Clue #4:** “Our city was an important city for the Incas and was taken over by the Spanish conqueror, Francisco Pizarro, in 1532.”

**Clue #5:** “We are our country’s political center, situated amongst snow-capped volcanoes high in the mountains at around 9,500 ft. There’s a huge volcano that’s very near us. It’s an active volcano and sometimes erupts ashes all over our city. Sometimes we close school because of the volcano.”

### Mystery Class #9

**Clue #1:** “Three languages are spoken here: French, Flemish, and German. It is in the country known as the ‘Capital of Europe.’”

**Clue #2:** “A few of our national products are chocolates, lace, endive, and beer. The franc is the form of currency.”

**Clue #3:** “Vincent Van Gogh once lived nearby, painting the miners that lived in the area.”

**Clue #4:** “Next to the main gate of the city hall is the most famous and mischievous inhabitant, the Guard’s Monkey. Visitors never fail to pet the monkey with their left hand; it’s rumored to bring good luck.”

**Clue #5:** “It is home to the headquarters of the North Atlantic Treaty Organization (NATO), the Supreme Headquarters of the Allied Powers in Europe.”

Allow groups adequate time to do their research. You may want to have groups share where they think their Mystery Class is located before you give them the correct answers.

Lead a discussion of the simulation experience. What did participants learn that will help them manage the Mystery Class investigation with their students?



### Available on the Web



Journey North teacher Cathie Plaehn, who appears in the video, shares her advice for implementing the Mystery Class investigation on the Journey North Web site. Her suggestions are helpful for teachers who are new to Mystery Class and might also provide some tips that are useful to teachers who already use Mystery Class with their students.

#### Go to:



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



select the “Teacher Tips” icon

select “Mystery Class/Cathie Plaehn’s Advice for Mystery Class”

### Mystery Class Locations



After completing the Mystery Class simulation, participants may want to visit the actual Mystery Class sites that are shown in the video.

#### Go to:

[www.learner.org/jnorth/spring2000/species/mclass/Update051200.html](http://www.learner.org/jnorth/spring2000/species/mclass/Update051200.html)

Mystery Class #1 - Buenos Aires, Argentina (34.60 S/58.45 W)

Mystery Class #4 - Quito, Ecuador (00.21 S/78.50 W)

Mystery Class #9 - Mons, Belgium (50.45 N/03.93 E)



### ACTIVITY C – *Seeing the Light: What Really Shapes the Web of Life?*

Journey North is a study of global ecological systems. Sunlight plays a paramount role in all living things. From plants to animals, changes in the availability of sunlight impact the entire web of life. This “webbing” activity is an effective means to refocus and bring participants back to this central concept of all the Journey North investigations.

Separate the participants into small groups. Have them discuss these questions:

- What effect does the sun have on plant growth?
- What effect does the sun have on animal migrations?
- What effect does seasonal change have on the food chain?
- What is the base of the food chain?

Provide each group with a large sheet of paper or posterboard and have them create a web to illustrate the ideas that came up in their discussion. After groups have had time to complete the task, have each group present their web.

As groups present their webs, create a master web that incorporates all groups’ ideas. Point out that the sun is at the base of the food chain, and seasonal changes in sunlight (photoperiods) affect everything in the system, from plants to animals. When studying migration and the return of spring to the Northern Hemisphere, students watch the rebuilding of the food chain and the resulting appearance of plants and animals—at the moment that their habitat is ready.

Close the activity by discussing how a webbing exercise like this one can help tie together and reinforce the concept of seasonal change that students learn during the Mystery Class investigation. The student activity “Seeing the Light” can be found on the Journey North Web site.

#### Available on the Web



Find the “Seeing the Light” lesson on the Journey North Web site.

#### Go to:



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



select the “Classroom Lessons” icon

select the lessons specifically for “Mystery Class”

select “Seeing the Light: Recognizing the Sun’s Role in Living Systems”

## 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

Refer back to the master KWL chart that was created in the Introduction workshop. Fill in information and add to the chart as appropriate.



# MYSTERY CLASS DATA SHEET



## MYSTERY CLASS #1

Longitude: 58.45 W

Date	Sunrise	Sunset	Photoperiod
Feb. 7	6:20	19:56	
Feb. 14	6:27	19:49	
Feb. 21	6:33	19:41	

## MYSTERY CLASS #4

Longitude: 78.50 W

Date	Sunrise	Sunset	Photoperiod
Feb. 7	6:24	18:32	
Feb. 14	6:25	18:32	
Feb. 21	6:25	18:32	

## MYSTERY CLASS #9

Longitude: 03.93 E

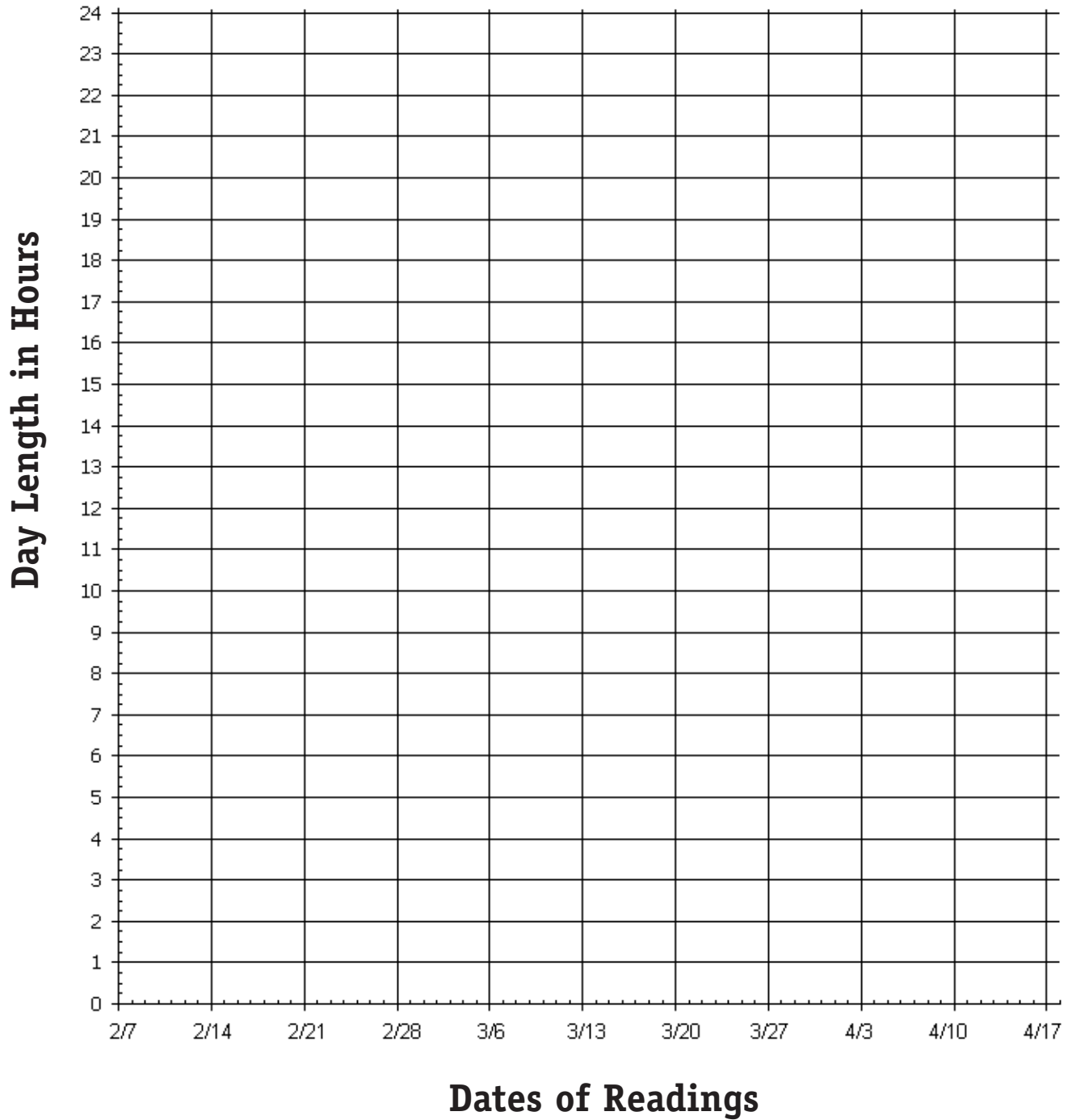
Date	Sunrise	Sunset	Photoperiod
Feb. 7	8:11	17:46	
Feb. 14	7:59	17:59	
Feb. 21	7:46	18:11	

## WORKSHOP LOCATION

Longitude: \_\_\_\_\_

Date	Sunrise	Sunset	Photoperiod
Feb. 7			
Feb. 14			
Feb. 21			

# MYSTERY CLASS GRAPH



# MYSTERY CLASS CLUES



## MYSTERY CLASS #1

**Clue #1:** “Hot and humid during summer; winter is mild, but humid. Snowfalls are extremely rare in our hometown.”

**Clue #2:** “The temperate climate of our city is characteristic of the river’s coastal plain.”

**Clue #3:** “Two important rivers flow into the estuary on whose shore our city is located.”

**Clue #4:** “If you go approximately 1,000 km to the west from our city, you’ll find the highest mountain in our country and continent. If you draw a line from our city southward into the Atlantic Ocean, you will probably come across an archipelago that led to a dreadful armed conflict in 1982.”

**Clue #5:** “Our city is the nation’s chief port. Our city has an environmental flavor in our local language. World Soccer Cup 1978’s inaugural and final games were played in our city.”

## MYSTERY CLASS #4

**Clue #1:** “Instead of four seasons of the year, our region has only one, but sometimes it is rainy and sometimes it is dry.”

**Clue #2:** “Our official languages here are Spanish and Quechua. Our country has a population of about 12 million people.

**Clue #3:** “We have a National Park that was visited by Charles Darwin in 1835. He called it a ‘living laboratory of evolution’ because one of every four species found here is not found anywhere else in the world.”

**Clue #4:** “Our city was an important city for the Incas and was taken over by the Spanish conqueror, Francisco Pizarro, in 1532.”

**Clue #5:** “We are our country’s political center, situated amongst snow-capped volcanoes high in the mountains at around 9,500 ft. There’s a huge volcano that’s very near us. It’s an active volcano and sometimes erupts ashes all over our city. Sometimes we close school because of the volcano.”

## MYSTERY CLASS #9

**Clue #1:** “Three languages are spoken here: French, Flemish, and German. It is in the country known as the ‘Capital of Europe.’”

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**Clue #3:** “Vincent Van Gogh once lived nearby, painting the miners that lived in the area.”

**Clue #4:** “Next to the main gate of the city hall is the most famous and mischievous inhabitant, the Guard’s Monkey. Visitors never fail to pet the monkey with their left hand; it’s rumored to bring good luck.”

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