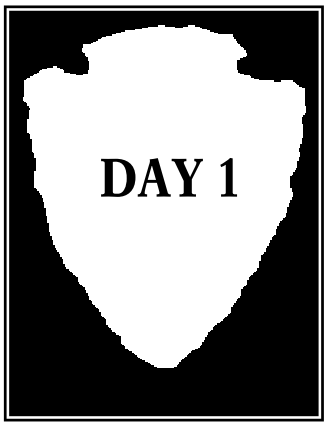



# WHAT HAPPENED HERE?

**OBJECTIVE** After completing this introductory lesson to a unit on glaciers, students will be able to use the scientific method to formulate their own hypotheses about landscape formation.

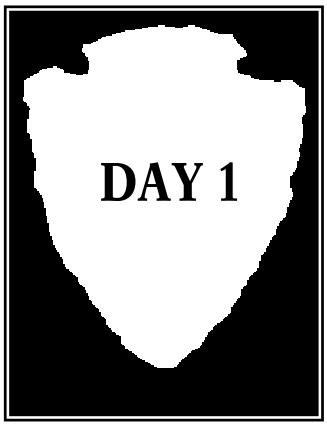
**GRADES** Middle or High School students

**DURATION** 1 50-minute class period

**MATERIALS**

- *What Happened Here?* worksheet for every student
- Landscape photo for each pair or small group of students
- *Views of the National Parks* (via internet or DVD)
- Computer connected to a large classroom screen

**KEY CONCEPTS** Scientific method, inquiry, landscape formation




# WHAT HAPPENED HERE?

## NATIONAL EDUCATION STANDARDS:

**Science**

**NS.5-8.1 Science as Inquiry**

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**NS.5-8.4 Earth and Space Science**

- **Structure of the earth system**

**NS.5-8.7 History and Nature of Science**

- **Science as a human endeavor**
- **Nature of science**

**NS.9-12.1 Science as Inquiry**

- **Abilities necessary to do scientific inquiry**
- **Understandings about scientific inquiry**

**NS.9-12.5 Science and Technology**

- **Understandings about science and technology**

**NS.9-12.6 Personal and Social Perspectives**

- **Natural resources**

**NS.9-12.7 History and Nature of Science**

- **Science as a human endeavor**
- **Nature of scientific knowledge**

# WHAT HAPPENED HERE?

DAY 1

**Essential Question:** *"What formed the landscape in the picture?*

## Lesson Description:

1. This lesson uses the "Think-Pair-Share" instructional method in an inquiry-based activity incorporating glaciers with the Scientific Method.
2. This is the first part of a 2-day lesson, and it will take an entire 50 minute class period.
3. This lesson plan was developed as an introductory lesson to a unit on glaciers. As an inquiry-based lesson, the role of the teacher is to guide the students through the activity without giving them the answers. This encourages them to exercise their observation, thinking and reasoning skills.
4. Using the **Views of the National Parks (Views)** program, the teacher will take the class through the Scientific Method Knowledge Center as the students work through the corresponding worksheet.
5. Although this lesson was designed for the teacher to show the website on a large classroom screen, students can also pair up and work together on individual computers.

## Preparation:

1. Have enough copies of the landscape picture for each **pair** of students to have one.
2. Have a "What Happened Here?" worksheet for each student.
3. To save time, have the Views program up and running before class.

## To get to the Knowledge Center:

1. Go to http://www2.nature.nps.gov/views/
2. Select the Visitor Center.
3. Select the Knowledge Centers.
4. Select the Scientific Method knowledge center.
5. Enter the knowledge center by selecting the "Explore the Scientific Method" option. This brings you to where the lesson and student worksheet begin.

## Suggested Instructional Lesson Plan:

| | |
|---|---|
| 1. Introduction to the lesson | 4 minutes |
| 2. Going through the knowledge center | 38 minutes |
| a. Introduction | 2 minutes |
| b. Observation | 6 minutes |
| c. Question | 8 minutes |
| d. Hypothesis | 10 minutes |
| e. Test | 10 minutes |
| f. Conclusion | 2 minutes |
| 3. Wrap-Up | 3 minutes |

# DETAILED INSTRUCTIONAL LESSON PLAN

## Introduction to the lesson: 2 minutes

1. Begin class by explaining to the students that they will be starting a new unit, but don't give them any specific details.
2. As you pass out the worksheets and landscape pictures, explain that each student is responsible for completing their own worksheet, but they will be working with a partner for parts of the activity.
3. Explain to the class that this activity is meant to encourage them to use their observational skills and to formulate unbiased opinions and ideas based on what they observe, just like real scientists do!
4. Help the class formulate an essential question.

## Going through the knowledge center: 40 minutes

### Introduction: 2 minutes

1. Read through the slide…don't forget to introduce Betsy!

### Observation: 6 minutes

1. Read through the slide
2. "Think-Pair-Share" Activity
   a. Think:
      i. Instruct the students to silently observe the landscape picture.
      ii. Have the students write down 2 to 3 observations, leaving room for a brainstorm session with their partner.
   b. Pair:
      i. Now they will pair up with their partner and talk about what they have observed.
      ii. Together the pairs will come up with a total of 5 observations.
      iii. Have each student put a star next to the observation that they and their partner think will be the best for helping answer the essential question.
   c. Share:
      i. The teacher will select a few students to share their "best" observation with the rest of the class.

### Question: 8 minutes

1. Read through the slide
2. "Think-Pair-Share" Activity
   a. Think:
      i. Instruct the students to silently think of 5 different questions, pertaining to their observations, which could possibly lead to answering the essential question.
      ii. The students should write down 2 to 3 questions. Again, they should leave room for what they brainstorm with their partner.
   b. Pair:
      i. Instruct the students to pair up with their partner and talk about what their questions.
      ii. Together the pairs will come up with a total of 5 questions.
      iii. Have each student put a star next to the question that they and their partner think will be the best for helping answer the essential question.
   c. Share:
      i. The teacher will select a few students to share their "best" question with the rest of the class.
      ii. The students should share what their original observation was, and then the question that corresponds to it.

## Hypothesis: 10 minutes

1. Read through the slide
2. "Think-Pair-Share" Activity
   a. Think:
      i. Instruct the students to individually formulate 2-3 hypotheses that could explain their chosen question.
   c. Pair:
      i. Instruct the students to pair up with their partner and talk about the hypotheses that they formulated.
      ii. Together the pairs will come up with a total of 5 hypotheses that correspond with their selected question.
      iii. Have the students put a star next to, what they feel, is their best hypothesis.
   d. Share:
      i. The teacher will select a few students to share their "best" hypothesis with the rest of the class.
      ii. The students should share what their original observation and question were, and then the hypothesis that corresponds to them.
      iii. At this point, the teacher should ask each student why and how they formulated their hypothesis. Press them by asking "why" over and over! This will really get them thinking.

## Test: 12 minutes

1. Read through the slide
2. "Think-Pair-Share" Activity
   a. Think:
      i. Instruct the students to think about ways that they could test each of their hypotheses.
   b. Pair:
      i. Instruct the students to pair up with their partner and talk about the tests that they came up with.
      ii. Have the students put a star next to, what they feel, is their best test.
   c. Share:
      i. The teacher will select a few students to share their "best" test with the rest of the class.
      ii. The students should share what their original observation, question, and hypothesis were, and then the way that they could test their hypothesis.

## Conclusion: 2 minutes

1. Read through the slide.

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# Wrap Up Activity: 3 Minutes

1. Ask a few of the students to share with the class which hypothesis they thought might best answer the essential question, whether it's the one they thought of or one of their classmates.
2. Ask the students if anyone has an answer to the essential question that is different from any of the ones that were shared with the class.
3. Tell the students that tomorrow they will be conducting an experiment that will answer the essential question.
4. Have the students turn in their worksheets.

Denali National Park - NPS Photo

http://www.nature.nps.gov/views/

**Name:**

# What Happened Here?

**Essential Question:** _____

Science is the process of gaining a better understanding of the world in which we live. The scientific method was developed so scientists could test possible explanations to questions and allow others to verify the results.

There are 5 general steps of the Scientific Method:

***Observation*** ***Question*** ***Hypothesis*** ***Test*** ***Conclusion***

---

## Step 1: Observation

Observing the world around you is an important first step in the scientific method. As you make observations you may begin to ask questions about those observations.

Look at the picture given to you. What do you see? What observations can you make from just looking at the picture?

***Write down 5 observations about the landscape in the picture that might help you answer the essential question:***

1.
2.
3.
4.
5.

---

## Step 2: Ask a Question

The formation of a question comes from observation. However, not all questions can be answered using the scientific method. The scientific method can only be used on those questions that have testable hypotheses.

***Based on your observations, write down 5 questions about the formation of the landscape.***

1.
2.
3.
4.
5.

---

**Name:**

## Step 3: Forming a Hypothesis

To find an answer to a question, a hypothesis is formed. A hypothesis is a possible explanation for the question. They can be proven false, but can never be proven absolutely true. This allows other people the ability to verify the results, and leaves the chance for find better explanations as our understanding grows.

To help remove any personal feelings that may be added when a hypothesis is formed, multiple hypotheses are typically proposed. This causes all the hypotheses to be tested harder in order to throw away the false explanations.

***Develop 5 hypotheses that could explain each of the questions you came up with in step 2.***

1.
2.
3.
4.
5.

## Step 4: Testing the Hypotheses

By testing the multiple hypotheses proposed for a question, a hypothesis is either supported or proven false. The tests are repeatable, meaning other people can take the accepted hypothesis and test it again independently.

***Write down a way to test each of your hypotheses:***

1.
2.
3.
4.
5.

## Step 5: Drawing a Conclusion

The final step of the scientific method is when hypotheses are either accepted or rejected. If a conclusion is reached that one hypothesis is rejected, then another hypothesis needs to be examined. On the other hand, if a hypothesis is accepted the concluding explanation becomes a theory. In both cases, the conclusion should state all the finding so others can verify the results or explore some more of the findings.

For this experiment, you will not be able to draw a conclusion because you were not able to test your hypotheses. However, knowing how to properly state a conclusion will be important for future experiments.