Bill Nye the Science Guy

Storms

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Implementation Guide

Welcome to Disney’s Bill Nye DVD collection!
With the help of this Guide you can bring instructional DVDs into your science curriculum.

What’s on the DVD?

Bill Nye DVDs expand the educational features of Bill Nye the Science Guy programs. Each DVD provides students with science content through video clips aligned with National Science Education Standards (NSES) and a host of other resources.

Short video clips aligned with the NSES provide a unique opportunity for you to enhance your lessons using DVD technology. Now you can show a video clip, or even short segments of a clip, on command. But there are a host of other features, too! See the chart below for a summary.

From the Main menu, there are three chief sections:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watch Program Menu</td>
<td>From this menu, you can play the program straight through or use the clips to customize your viewing.</td>
</tr>
<tr>
<td>Teacher Support</td>
<td>From this menu, you can access this Teacher’s Guide, the Glossary, Internet Links, and the Quiz.</td>
</tr>
<tr>
<td>Bonus Materials</td>
<td>Use this menu to try a different discussion starter, download a special screen-saver, or check out never-before-seen footage.</td>
</tr>
</tbody>
</table>

From the Watch Program menu, you can:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play Program</td>
<td>Play the entire program from start to finish.</td>
</tr>
<tr>
<td>Bilingual Mode</td>
<td>View the entire program or clips in English or Spanish.</td>
</tr>
<tr>
<td>Glossary Mode</td>
<td>Make links to Glossary terms appear during the program.</td>
</tr>
<tr>
<td>Program Overview</td>
<td>View the program introduction, in which Bill discusses the topic covered.</td>
</tr>
<tr>
<td>Try This</td>
<td>Show students demonstrating science concepts.</td>
</tr>
<tr>
<td>Way Cool Scientist</td>
<td>Meet a real scientist who talks about his or her area of study.</td>
</tr>
<tr>
<td>Bill’s Demonstration</td>
<td>Look at a science demonstration conducted by Bill Nye.</td>
</tr>
<tr>
<td>Music Video</td>
<td>Enjoy a short music video that summarizes the topic in an age-appropriate and entertaining manner.</td>
</tr>
<tr>
<td>Science Standards</td>
<td>Take advantage of short video clips from the program, which are aligned with National Science Education Standards.</td>
</tr>
</tbody>
</table>
From the **Teacher Support** menu, you can:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Quiz</td>
<td>Give students a quiz to take independently or as a class. Seven to ten quiz items are aligned with the National Science Education Standards. The items are in multiple-choice or true-false format. Each wrong answer links to a standards-aligned video clip. At the end of the quiz, a scoring function reveals the number of correct initial answers.</td>
</tr>
<tr>
<td>Glossary</td>
<td>Check out definitions of key terms and view video clips that reinforce the concepts.</td>
</tr>
<tr>
<td>DVD Features</td>
<td>View a quick overview of the features found on the DVD.</td>
</tr>
<tr>
<td>Teacher’s Guide</td>
<td>Print out or view this comprehensive Teacher’s Guide in PDF format.</td>
</tr>
<tr>
<td>Internet Link</td>
<td>Link to the Bill Nye area of Disney’s Edustation Web site, where you can find links to Internet sites related to the content of each Bill Nye program.</td>
</tr>
</tbody>
</table>

From the **Bonus Materials** menu, you can:

<table>
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<tr>
<th>Feature</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Bonus Material</td>
<td>Find out what wasn’t in the episode! In most cases, there’s more of the Way Cool Scientist interview, Bill Nye outtakes, and an extra discussion starter.</td>
</tr>
<tr>
<td>Additional Clips</td>
<td>See trailers of related DVDs and videos.</td>
</tr>
<tr>
<td>Screen-Saver</td>
<td>Download this cool screen-saver for your computer.</td>
</tr>
</tbody>
</table>

**The Planning Process**

This Guide provides a Lesson Planning Worksheet (see page 12), which can assist you in setting up your instruction around a topic. The following sections of this Implementation Guide are offered to assist your planning process:

- Determining Objectives and Linking to Standards
- The Learning Cycle
  - Explore
  - Apply
  - Extend
  - Assess
Determining Objectives and Linking to Standards

1. The NSES Teaching Standard A states that science teachers must “select science content and adapt and design curricula to meet the interest, knowledge, understanding, abilities, and experience of students.”

The NSES recommends that teachers “integrate . . . a practical structure for the sequence of activities, and the content to be learned.” The primary instructional model recommended by the NSES is inquiry into authentic student-generated questions about natural or designed phenomena. Since most state and local standards documents were derived from the NSES, you will find that your local and state standards match closely with content standards in the Bill Nye DVD.

Each DVD contains a menu of clips that are aligned with the NSES. You can review the standards and their aligned clips in the Science Standards menu under Watch Program. Also, the Standards listed on page 10 of this Guide allow you to look at additional NSES content standards that are addressed on the video. Here’s an example of the content standards and clips aligned with the Bill Nye DVD entitled Blood and Circulation:

Life Science Standards (NSES) Addressed in Blood and Circulation

Life Science:
Structure and function in living systems

- Living systems at all levels of organization demonstrate the complementary nature of structure and function.
  
  Aligned clips:
  - 1 Blood vessels
  - 2 Heart pump and bloodstream
  - 3 Heart valves and blood circulation
  - 4 White blood cells
  - 5 Capillaries

- The human organism has systems for digestion, respiration, reproduction, circulation, excretion, movement, control, and coordination, and for protection.

  Aligned clips:
  - 6 Heart pump
  - 7 Heart muscle
  - 8 Pumping blood to brain
2. Determine your objectives for the lesson and how these objectives address the standards.

Sample Objectives for *Blood and Circulation*

In this activity students will:
- Observe and describe a body system responsible for supply and transport.
- Use this information to define a body system.
- Ask questions about the circulatory system.
- Explain how structure complements function in organs of the circulatory system.
- Cite examples of current research related to this system.

3. Design a learning cycle of instructional experiences and assessments for the students to engage in that will help students meet these standards. Students may be given teacher-planned investigations or may be guided to design their own investigations.

**The Learning Cycle**

The learning cycle is a sequence of activities that involve students in the learning process. The sequence found here is based on research from Lawson, Abraham, and Renner published in 1989. That has been adapted to include: Explore, Apply, Extend, and Assess:

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**Explore:** Involves assessing students' prior knowledge and providing opportunities for students to interact with content from the video.

**Apply:** Includes having students use the content learned during the Explore section in a new way that is meaningful to future learning.

**Extend:** Allows students to conduct further research around an area of interest within the topic.

**Assess:** Provides strategies meant to inform students and teachers about the content and processes that have been learned.

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**Explore**

The NSES Teaching Standard B states: “Teachers of science guide and facilitate learning.” This standard addresses the constant need to balance your predetermined goals with allowing students to set and meet their own learning goals.

*Focus and Support Inquiries:* Support student inquiries by making decisions about “when to provide information” and “when to connect students with other sources.” Knowing the best time to intervene is often determined by allowing students to ask questions and to explore concepts openly.
The NSES Teaching Standard C states: “Teachers of science engage in ongoing assessment of their teaching and of student learning.”

Assess in Order to Guide Teaching: The Program Overview or the Discussion Starter on the DVD can be used to gauge students’ prior knowledge. You can use student responses to make decisions about appropriate instruction and adaptations in order to meet the needs of individual students. Assessment can be in the form of student reflections from standards-aligned video clips or answers to questions found on the science quiz. Or, as in the following example, a simple graphic organizer can facilitate a formative assessment.

Example: T-Chart from Blood and Circulation

1. Ask students to fill out the “Know-New” T-Chart (see page 14). Have them list what they already know about the circulatory system (heart, blood vessels, blood, etc.) on the left side of their charts.

2. Show the Program Overview for Blood and Circulation. On the right side of the chart, have students list new things they have learned from watching the clip. Walk around the room and assist students in filling in their T-Charts. Replay the program as necessary to allow students to review sections of interest.

3. Once students have completed their charts, ask them to share what they have listed in the “New” column. Write these on the board. Have students write their own working definitions of the circulatory system. Once students have completed their definitions, collect and review their work to assess prior knowledge.

Conduct direct vocabulary instruction in the Explore phase. Research suggests that:

- Students must encounter words in context more than once to learn them.
- Instruction in new words enhances learning those words in context.
- One of the best ways to learn a new word is to associate an image with it.
- Direct vocabulary instruction on words that are critical to new content produces the most powerful learning.

Use the DVD Glossary with the linked video clips to expose students to new vocabulary words in context, along with associated video images. You can also find a printed version of the glossary terms in this Guide on page 16.
Example: Using the Glossary for Direct Vocabulary Instruction

_Blood and Circulation_

1. Present students with a brief explanation or description of the new term or phrase from the glossary. For example: “Capillary: A small blood vessel that connects arteries and veins.”

2. Present students with a nonlinguistic representation of the new term or phrase. Show the video clip associated with the term “capillary.”

3. Ask students to generate their own verbal description of “capillary.”

4. Ask students to create their own nonlinguistic representation of “capillary.”

5. Periodically ask students to review the accuracy of their explanations and representations. This can be done after the Apply activities.

Apply

Based on the information you gained from the Explore assessments, design appropriate activities for your students. Check the experiments listed in the Episode Guide (see page 11) for explanations of the demonstrations from the Bill Nye program as well as for additional experiments designed to help apply the knowledge gained.

In the following example from _Blood and Circulation_, the standards-based video clips provide background information, and an experiment from the Guide helps students apply what they have learned about arteries and veins.

Example: The Structure and Function of Arteries and Veins

1. Have students begin “Know-New” T-Charts, focusing on what they already know about the structure and function of blood vessels, arteries, and veins.

2. Watch the following chapters from the Bill Nye DVD _Blood and Circulation_:
   - Blood vessels
   - Heart pump and bloodstream
   - Capillaries

3. Complete the “Know-New” T-Charts.

4. Give students copies of the Student Recording Sheet (see page 15) and have them fill the sheets out as they conduct their experiments.

5. Do the experiment entitled “Pump it Up!” from the _Blood and Circulation_ Episode Guide, in which students observe the apparent effects of pressure on arteries and veins.

6. Write down any remaining questions about the structure and function of blood vessels, arteries, and veins.
Extend

The NSES Teaching Standard D states: “Teachers of science design and manage learning environments that provide students with the time, space, and resources needed for learning science.” School administrators, parents, and the community can assist teachers in providing local resources that make science lessons pertinent and meaningful.

Identify and Use Resources Outside of the School: “The school science program must extend beyond the walls of the school.” Each Bill Nye DVD contains resources designed to facilitate such understanding, including:

- **Way Cool Scientist**, found in both Watch Program and Bonus Materials, in which scientists discuss their current areas of study. This real-world connection often results in a deeper student understanding of a particular career.

- Disney’s Edustation Web site, where relevant Internet links provide a starting point for students to further explore science topics.

- Try these video clips, with activities parents and students can do at home. The questions generated by students from these experiences can be used as foundations from which they may conduct their own research.

- Standards-aligned video clips and Bill’s demonstration video clips, which can help generate topics for further research. After viewing the clips, have students list their questions, perhaps about the most current developments in a topic. By conducting online or library research, students will find answers to their questions and will learn about a topic in greater depth.

Example: Conducting Student Research Using *Blood and Circulation*

Ask students to choose one of the questions they had after completing the activities from *Blood and Circulation*. An example of a student research question might be, “How has the technology related to artificial hearts advanced in the last ten years?” Explain to students that they will be conducting research to find answers to their questions. Some students may want to complete online or library research, others may want to ask an expert in the field, while others may want to design and conduct a scientific investigation. Encourage students to write a detailed procedure for finding answers to their questions. Ask students to find one or more examples of current research dealing with the circulatory system that is related to their question. **Note:** Students with similar questions may work together to complete the assignment.
Assess

Once students have conducted the research, you may choose to assess them in a number of different ways:

■ By having students write about what they learned in a journal.
■ By having students submit projects or reports.
■ By having students take the program quiz to gauge their understanding of certain facts in the video. You can either print the quiz (found in this Guide on page 18) and have each student complete it individually or use the DVD screen version and the scoring feature for whole-class assessment.
■ By designing other standards-aligned questions to augment those that are provided.

While the quiz will provide you with information about what the students have learned, it does not assess how students have processed the information. Below you will find assessment ideas that can be used to measure both content and process.

A Sample Assessment for Blood and Circulation

1. Explain to students that an important aspect of scientific inquiry is to communicate findings to others. In this assessment, students will present the following information to their peers:
   ■ The question they investigated.
   ■ The method that was used to find answers to their question.
   ■ Problems or successes during the search.
   ■ Answers to their question.
   ■ Current research related to their question.
   ■ New questions that have arisen.

2. Distribute the rubric found in the Lesson Planning Worksheet (see page 13) to students so they know how they will be assessed. Make sure students understand the criteria found in the rubric. Before you begin, you may want to allow students to make changes to the rubric so that it is clearer or makes more sense from their perspectives.

3. Allow students time to gather information to answer their questions and to prepare for their presentations. As students conduct this work, walk around the room and ask questions to assess their progress and provide input as needed.

4. Take a few minutes to clarify the rules of the presentation with the students. You may want to have multiple copies of the rubric available so that peers can rate the presentations.

5. As presentations are made, assess the quality of the student’s work as thoroughly and as equitably as you possibly can.

Congratulations! You have now completed the steps to set up a lesson plan using the Lesson Planning Worksheet. You have also explored many of the features of the Bill Nye DVD as well as the supplemental information found in this Teacher’s Guide. And most important, you’ve made significant strides toward incorporating DVD technology into your day-to-day instruction.
Grades K-4

Science as Inquiry

Abilities necessary to do scientific inquiry

■ Ask a question about objects, organisms, and events in the environment.
■ Plan and conduct a simple investigation.
■ Employ simple equipment and tools to gather data and extend the senses.

Understandings about scientific inquiry

■ Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
■ Scientists use different kinds of investigations depending on the questions they are trying to answer. Types of investigations include describing objects, events, and organisms; classifying them; and doing a fair test (experimenting).
■ Simple instruments, such as magnifiers, thermometers, and rulers, provide more information than scientists obtain using only their senses.
■ Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.

Physical Science

Properties of objects and materials

■ Materials can exist in different states—solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling.

Position and motion of objects

■ The position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.

Earth and Space Science

Changes in the earth and sky

■ Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation.
Science and Technology

Understandings about science and technology

- People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
- Tools help scientists make better observations, measurements, and equipment for investigations. They help scientists see, measure, and do things that they could not otherwise see, measure, and do.

History and Nature of Science

Science as a human endeavor

- Many people choose science as a career and devote their entire lives to studying it. Many people derive great pleasure from doing science.

Grades 5-8

Science as Inquiry

Abilities necessary to do scientific inquiry

- Identify questions that can be answered through scientific investigations.
- Design and conduct a scientific investigation.

Understandings about scientific inquiry

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.
- Current scientific knowledge and understanding guide scientific investigations. Different scientific domains employ different methods, core theories, and standards to advance scientific knowledge and understanding.
- Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.

Physical Science

Motions and forces

- The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph.
- An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.
- If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.
Transfer of energy

- Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.

- Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.

- The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

Earth and Space Science

Structure of the earth system

- Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.

- The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations.

- Clouds, formed by the condensation of water vapor, affect weather and climate.

- Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

Science and Technology

Understandings about science and technology

- Scientific inquiry and technological design have similarities and differences. Scientists propose explanations for questions about the natural world, and engineers propose solutions relating to human problems, needs, and aspirations. Technological solutions are temporary; technologies exist within nature and so they cannot contravene physical or biological principles; technological solutions have side effects; and technologies cost, carry risks, and provide benefits.

- Many different people in different cultures have made and continue to make contributions to science and technology.

- Science and technology are reciprocal. Science helps drive technology, as it addresses questions that demand more sophisticated instruments and provides principles for better instrumentation and technique. Technology is essential to science, because it provides instruments and techniques that enable observations of objects and phenomena that are otherwise unobservable due to factors such as quantity, distance, location, size, and speed. Technology also provides tools for investigations, inquiry, and analysis.

Science in Personal and Social Perspectives

Natural hazards

- Internal and external processes of the earth system cause natural hazards, events that change or destroy human and wildlife habitats, damage property, and harm or kill humans. Natural hazards include earthquakes, landslides, wildfires, volcanic eruptions, floods, storms, and even possible impacts of asteroids.
Risks and benefits

- Students should understand the risks associated with natural hazards (fires, floods, tornadoes, hurricanes, earthquakes, and volcanic eruptions), with chemical hazards (pollutants in air, water, soil, and food), with biological hazards (pollen, viruses, bacterial, and parasites), social hazards (occupational safety and transportation), and with personal hazards (smoking, dieting, and drinking).

History and Nature of Science

Science as a human endeavor

- Women and men of various social and ethnic backgrounds—and with diverse interests, talents, qualities, and motivations—engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.

- Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity—as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.
Episode Guide
Storms

Nifty Questions in This Episode | Awesome Answers
--- | ---
What is a storm? | An atmospheric disturbance causing extreme weather.
What causes storms? | Moisture in the air in combination with heat from the sun and wind; hot and cold air masses meeting.
What is El Niño? | A global weather condition caused when winds over the equatorial region stop blowing and air and water temperatures increase.

Experiments shown on the video:

TILT-A-WHIRL
Objective: To demonstrate a tornado using water.
- Fill two 2-liter plastic bottles with water.
- Hold each bottle by the neck, one in each hand, over a sink or large tub. Turn them upside down at the same time.
- While holding one bottle still so that the water empties straight down, swirl the water in the other bottle in a counter-clockwise direction to create a tornado.
- Which bottle empties the fastest? Why?

More interesting stuff to do:

THE HIGH AND LOW OF IT
Objective: To demonstrate the effects of hot and cold air masses on weather patterns.
- Balance a meter stick or a broom handle lengthwise on the back of a chair or the corner of a countertop.
- Open two paper lunch bags and tape the middle bottom of each bag to the bottom of each end of the stick so that the bags hang down. Adjust the stick so that it remains balanced on the back of the chair.
- Place an electric hot plate 6” to 8” below one of the bags and turn it on. One bag should move up and the other down. Why?
- Turn the meter stick over so that the opened ends of the bags point up. Adjust the stick so that it remains balanced.
- Fill a large beaker or jar with crushed and cubed ice, stir, and let stand for a few minutes. Slowly tip the jar over the openings of one of the bags so that the ice remains in the jar. Hold the jar in that position for a while and observe what happens to the balanced stick. What causes the balance to react in this manner?
- How do hot and cold air affect weather patterns?

RISE AND SINK TO NEW LEVELS
Objective: To demonstrate how temperature effects fluids.
- Obtain a clear plastic tub about 12”x18”x12”. Fill with cold tap water.
- Obtain three baby food jars or other small jars that will fit into the tub.
- Fill the first jar with very hot water and add a few drops of red food coloring. Fill the second jar with crushed or cubed ice; add cold water to cover and a little blue food coloring. Fill the last jar with very cold water and two tablespoons salt. Add orange food coloring and stir.
- Cover the tops of all three jars with plastic wrap and secure with a rubber band around the top.
- Slowly place all the jars in the plastic tub, making sure they are evenly spaced. With a sharp pencil, carefully punch two holes on opposite ends of the plastic wrap on each jar.
- Observe the flow of the contents of the jars. Record the contents of each jar and explain the behavior of hot and cold fluids in the tub. Would air and water temperature affect weather patterns? How?
## Lesson Planning Worksheet

**Lesson Title**

**Objectives**

**Estimated Time Required**

**Materials Needed**

**National Science Educational Standards**

<table>
<thead>
<tr>
<th>Standard 1</th>
<th>Standard 2</th>
<th>Standard 3</th>
<th>Standard 4</th>
<th>Standard 5</th>
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**Explore**

**Apply**

**Extend**

©Disney
As presentations are made, assess the quality of the student’s work as thoroughly and as equitably as you possibly can. The following criteria can be used to assist in your assessment.

Name of Student

Question Investigated

<table>
<thead>
<tr>
<th>Initial Question</th>
<th>Methods for Finding Answers</th>
<th>Results</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Question is broad and not well defined</td>
<td>2 Question is defined but limited to single-answer responses.</td>
<td>1 Student results are undefined.</td>
<td>1 Student is not prepared to speak.</td>
</tr>
<tr>
<td>2 Question is defined but limited to single-answer responses.</td>
<td>2 Students share methods but they are unclear or vague.</td>
<td>2 Student results are incomplete and do not adequately answer the question.</td>
<td>2 Presenter has distracting mannerisms and avoids eye contact with the audience.</td>
</tr>
<tr>
<td>3 Question is clear and might elicit multiple responses that may lead to new ideas and additional questions.</td>
<td>3 Students share methods but not the problems or successes of using the methods.</td>
<td>3 Student results are complete, adequately answer the question, and include current research related to the question.</td>
<td>3 Presentation is clean and clear with some eye contact and very few distractions.</td>
</tr>
<tr>
<td>4 Question is engaging and provokes new ways of thinking about an issue.</td>
<td>4 Students share methods and problems or successes in using the methods.</td>
<td>4 Student results are complete, include current research, and have resulted in one or more additional questions.</td>
<td>4 Presentation is exceptional and unique. Presenter uses regular eye contact and avoids distractions.</td>
</tr>
</tbody>
</table>

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**Bill Nye the Science Guy**

**Student “Know / New” Chart**

<table>
<thead>
<tr>
<th><strong>Know</strong></th>
<th><strong>New</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Write down what you know about the topic of the video.</td>
<td>Write down information from the video that is new to you.</td>
</tr>
</tbody>
</table>
Bill Nye the Science Guy

Student Recording Sheet

Name ____________________________________________ Date ________________

Title of Experiment ________________________________________________________

Question: (What are you testing?) ____________________________________________

__________________________________________________________________________

Procedure: (Describe the experiment) _________________________________________

__________________________________________________________________________

Materials: (List what you used) _______________________________________________

__________________________________________________________________________

Observations: (Record what happened) _________________________________________

__________________________________________________________________________

Results: (Make your own data table)

__________________________________________________________________________

Conclusions: (Use your observations and results to describe what you learned)

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
Storm
A storm is an atmospheric disturbance accompanied by clouds, winds, and precipitation (rain, snow, hail, sleet). This extreme weather is caused by heat from the sun, moisture in the air, and the rotation of the Earth.

El Niño
El Niño refers to the abnormal presence of warm surface water that flows from the eastern Pacific along the western coast of South America. This mysterious recurring phenomenon disrupts typical weather patterns around the globe.

Hurricane and Typhoon
These severe tropical storms or low-pressure systems of spiraling winds, with speeds in excess of 74 mph, are usually accompanied by rain, thunder and lightning. Tropical storms in the western Atlantic region are called hurricanes, whereas typhoons are in the western Pacific region.

Eye of the Storm
The eye refers to the relatively calm center of a tropical storm. The eye is surrounded by a band of clouds and powerful winds.
Lightning
Lightning is a visible discharge of electricity—a flash of light—transmitted between clouds or from one cloud to the Earth. It is caused by a buildup of electrons in the atmosphere.

Thunder
Thunder is the soundwave created by lightning. When lightning strikes, the air instantly heats up and expands so rapidly that it causes the explosive sound of thunder.

Tornado
A tornado is a violently rotating column of air or whirlwind, usually observed as funnel-shaped, moving in a path across the land. Considered the most destructive of all storms, tornados occur when air masses of extremely different temperatures come together.
True or False? Circle T or F

1. El Niño can cause storms to rage all over the globe.  T or F
2. Hurricanes or typhoons occur when large areas of the open ocean soak up heat from the sun.  T or F
3. Because lightning heats up the surrounding air so slowly, its relationship to thunder is currently unknown.  T or F
4. The Earth is the only planet that contains storms.  T or F
5. Lightning is a form of energy made up of protons that move from clouds to the ground.  T or F

Multiple Choice: Circle the letter of the best answer

6. Which of the following correctly describes how the sun’s energy can cause a tornado?
   A. The sun’s energy directly powers the tornado.
   B. The sun’s energy heats the ground which then heats the air above it.
   C. The sun’s energy heats the air which then heats the ground below it.
   D. The sun’s energy is not related to tornados.

7. Which of the following statements describes the role water plays in a rain storm?
   A. When water vapor turns into a liquid, wind-driving energy is released.
   B. Water vapor is a gas that turns into rain.
   C. Warm air carries moisture from the ocean to the atmosphere.
   D. All of the above.

8. Which of the following is true about the air’s temperature at different elevations?
   A. Air closer to space is warmer.
   B. Air closer to space is cooler.
   C. Air closer to the ground is cooler.
   D. All of the above

9. Which of the following statements is true about clouds?
   A. Clouds contain electrons that can find their way to the ground as lightning.
   B. Since clouds are formed by the condensation of water vapor, they do not affect the weather.
   C. Clouds only form on sunny, warm days.
   D. All of the above

10. Which of the following affects the weather worldwide?
    A. Tornado
    B. Blizzard
    C. El Niño
    D. None of the above