STEM FROM THE START™

DISCOVERY GUIDE

LESSON
MISSION: TEMPERATURE

PRE-K-2 STEM LESSONS
FEATURING ONLINE VIDEO + ACTIVITIES

LEARNIVERSE Educational Media
NEW HAMPSHIRE PUBLIC TELEVISION

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Take a Short Survey - Tell Us What You Think!

STEM from the START Overview

MEET THE QUINKS
Each video lesson in STEM from the START features the Quinks, three curious explorers from outer space – Quazar, Neutrina and Fluxx – who have come to Earth to learn more about how things on the planet work! With the help of a human friend, they explore basic principles of physical science.

SCIENTIFIC METHOD
Each lesson in STEM from the START is presented as a mission. In each mission students are asked to observe, research, develop hypotheses, make predictions, experiment and reach conclusions – just like real scientists!

DISCOVERY BREAKS
Each video lesson includes short segments where a concept or idea is introduced and explored and followed by a Discovery Break. Each Discovery Break features a question posed directly to students. The video lesson is designed to be paused or stopped at this point so students can engage in an activity or exploration found in the Discovery Guide. Activities and explorations in the Discovery Guide are designed so that they can easily be done with items found in most classrooms or homes.

DISCOVERY QUIZ
In addition to Discovery Breaks, the video lessons include a Discovery Quiz. These present a series of questions to the students, with time after each question to pause the video lesson for students to respond.

STEM IN THE REAL WORLD
The Quinks visit real scientists and engineers, who explain the concepts covered in each video lesson.

Each Discovery Guide is a template for using the lessons with young learners. Educators and parents are encouraged to adapt and extend the ideas found in this guide and to share their experiences at **nhptv.org/stem**.

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Lesson Introduction

OVERVIEW
Willow and the Quinks explore how things can be hot, cold, or in between and that you can measure temperature using a scientific instrument called a thermometer. They also discover that the Earth is warmed by the Sun and that certain places on Earth are warm or cold depending on where they are located.

SCIENCE FOUNDATIONS
Heat and cold are all about energy and the movement of molecules! The further apart molecules are the hotter an object is. The molecules in cold objects are slower moving and closer together. Temperature is the measure of the speed or kinetic energy of the molecules in an object.

The Earth gets its energy from the Sun. The two poles are cold primarily because of the curvature of the Earth and the dispersal of light. The Equator is hot because it is hit with direct sunlight.

Quick Science Demonstration on Transfer of Heat Energy
Take an ice cube and hold wrap it in a piece of paper towel in your hand until the ice cube melts. Make note what happens to the ice and of how your hand feels.

Does it feel like it is getting colder because of the ice? Actually, your hand will feel cold because the heat from your hand is transferring to the ice and melting it!

OBJECTIVES
At the end of the lesson learners will:
- Identify the sun as a source of heat energy.
- Explain why it is cold at the North and South Poles and hot at the equator.
- Describe a variety of things that are hot, cold, or just right.
- Use a thermometer to measure temperature.

Key Vocabulary
Temperature - How hot or cold something is.
Thermometer - Instrument used to measure temperature.

Other Vocabulary	
Flexible	Quiver
Force	Waterproof
Pressure	Rubber
Transparent	Civil Engineer
Incandescent	Elastic
Materials	Gravel

Next Generation Science Standards

Matter and Its Interactions - K-2

2-PS1-1 Matter and Its Interactions
Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
[*Clarification Statement:* Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

Disciplinary Core Ideas
PS1.A: Structure and Properties of Matter
Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.

2-PS1-2 Matter and Its Interactions
Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. [*Clarification Statement:* Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.]

Disciplinary Core Ideas
PS1.A: Structure and Properties of Matter
Different properties are suited to different purposes.

Discovery Break One

OVERVIEW
Each of the Quinks has returned from exploring different regions of the Earth. Quazar is hot and sweating, Neutrina is cold and shivering, and Fluxx is nice and comfortable.

Objectives
- Students will make observations about behavior that indicate a difference in temperature.
- Students will identify different locations on Earth that might be hot, cold, or in between in temperature.

Previewing Activity
Ask students to give examples of how their bodies react when they are hot or cold.

Viewing
Play the video and pause at ***Discovery Break One - What was different about the places the Quinks popped into?***

Post-Viewing
Ask students:
What were each of the Quinks doing that gave you a clue about whether they had been to a hot location, a cold location, or a location where the temperature was comfortable?

Can you give me some examples of places on Earth where they might have visited where it was hot, cold, or just right?

Can you tell me some places you have been where it was hot, cold, or just right? What types of things did you see or do there?

What time of year is it hot, cold or in between where we live?

What are some things we can do if we are too hot or too cold?

Literature Extra
Goldilocks and the Three Bears by Jan Brett
A family of bears that decide to take a walk when they discover that their porridge is too hot to eat right away.

Challenge children to write or tell their own fairy-tale where something is too hot, too cold and just right!

Arts Extra
Have students draw a picture of themselves when they are hot, cold and comfortable.

Have students draw pictures of places that are hot, cold or just right and describe the details they include to show heat, cold and in-between.

Discovery Break Two

OVERVIEW

Each of the Quinks describe where they ended up on their explorations. Neutrina describes a place where people are bundled up in heavy clothes and the houses are made of snow. Quazar describes a place that has sand and water. Fluxx describes a place that was just right where it was dark and people were watching other people that were really big and flat.

After each Quink describes the location they visited, viewers are asked to figure out where they were.

Objectives

Students predict a location being described as hot, cold, or in between by analyzing details.

Students locate the poles and the equator on a globe and describe the temperature at each location.

Students identify places that are hot, cold, or in between.

Vocabulary		
Bundled	South Pole	Material
North Pole	Shelters	Equator

Pre-viewing

Say to students:

Each of the Quinks went to a different location. Let's see if we can help Willow figure out where they went by examining the evidence!

Viewing

Discovery Questions

Pause the video when you see the spinning question mark and have students answer the questions by analyzing the clues each Quink gave when describing their location.

1. Where was Neutrina? (North Pole - students might name other cold places, but remind them that one of the descriptions Neutrina gave was that it was a place with houses made of snow.

2. Where was Quazar? (beach)

3. Where was Fluxx? (movie theater, or watching TV at home)

Post-viewing

Pause the lesson at ***Discovery Break Two " Can you guess what's hot, cold and in between.?"***

Say to students:

The Quinks visited places with different temperatures, can you name some places on Earth where the temperature is hot or cold? Are there places that can be hot sometimes and cold or in between other times? What could change a place from hot to cold or in between?

Students might describe seasons, climate control - turning on the heat or air conditioning, differences from day to night, cloudy to sunny, etc.

Science Extra

In this segment, Willow explains that the poles are cold and the equator is hot, but she doesn't explain why.

The primary reason is due to the curvature of the Earth. The equator receives more direct sunlight. The sunlight that reaches the poles is more dispersed or spread out.

You can show this to students by shining a flashlight onto a globe (or a ball.) The middle of the globe will receive more direct light than the top and bottom of the globe. This works best if you turn off the lights in the room.

Discovery Break Three

OVERVIEW
Willow explains the temperature is how hot or cold something is and it is measured with a special instrument called a thermometer.

She shows the Quinks how a thermometer measures a glass of cold water and a glass of hot water.

Objectives
Students can identify a thermometer as an instrument used to measure temperature.

Students describe temperature as how hot or cold something is.

Students identify temperatures on a Fahrenheit thermometer as being hot, just right or cold.

Students identify some activities or times they might use a thermometer to measure temperature. (cooking, deciding what clothes to wear outside, to see if they have a fever)

Vocabulary	
Temperature	Colder
Thermometer	Fahrenheit
Warmer	

Pre-viewing
Say to students:
Can anyone tell me how we measure temperature? What temperature do you think is really cold? What temperature do you think is really hot? What do you think the temperature is outside right now? What do you think the temperature is in this room right now?

Viewing
Say to students: *Let's see what Willow and the Quinks know about temperature!*

Play the video and pause at ***Discovery Break 3 - Can you read a thermometer?***

Hands-on Activity
Students make a paper thermometer. See the template and directions on the next page.

Materials	
Tape	Red markers
Paper	Scissors

Procedure:
1. Have students color strip one red.

2. Cut out strip one, strip two, and thermometer along the dotted outside lines.

3. Cut two slots along the dotted lines on the thermometer.

4. Tape the two strips together.

5. Slide the strips, red side facing front, into the two slots on the front of the thermometer.

6. Students can decorate their thermometer with pictures of things you might do when the temperature is cold, hot or just right.

After students have made their thermometers, call out various temperatures to students and have them show them on their thermometers!

MAKE A THERMOMETER

100
90
80
70
60
50
40
30
20
10
0

Thermometer

Strip One - Color Red

Strip Two

Discovery Quiz

OVERVIEW

Neutrina has made a bubblepod thermometer. The Quinks go on a mission to measure the temperature of places around the Earth. They make stops at a desert with a camel and palm trees (120°), in a grassy area where a mom and young child are blowing bubbles (70°), on a snowy mountaintop with a downhill skier (5°) and at a beach with a family kicking a soccer ball (95°).

Objectives

Students can predict the temperature of a location as being hot, cold or just right for humans based on observation of visual clues.

Note: You might introduce or have students come up with some additional words for describing temperature - warm, cool, freezing, comfortable, chilly, etc.

Vocabulary	
Temperature	Observation
Thermometer	Fahrenheit

Pre-viewing

Say to students:

Can anyone tell me what things might tell you if a location was hot, cold or in between? Could you tell by what people are wearing, what people are doing, what kinds of plants there are in a location, or what type of animals there are? Could you tell by what the weather is like?

Let the students give some examples of visual observations that might give an indication of temperature.

Viewing

Say to students: Let's see what Willow and the Quinks know about temperature!

Pause the video after each on screen question and ask students what they think the temperature is and what observations they are using to make their prediction.

Discovery Break Four

OVERVIEW
The Quinks return from their mission. Fluxx begins to quiver, which means he has a question. He wonders what makes the beach hot. Willow shows the Quinks two glasses of water. One has been inside and one has been outside in the sun. She explains that the sun warmed the water in the glass and the Quinks conclude that the sun also warms the beach. Willow explains that the sun warms the beach and everything else on Earth.

Objectives
Students can identify the sun as what warms the Earth and makes it livable.

Vocabulary	
Quiver	Million
Sun	Fahrenheit

Pre-viewing
Say to students:
Who has been to the beach in the summer? Was the beach hot or cold? Why do you think the beach was hot or cold?

Viewing
Say to students: *I think Fluxx might have a question about the beach!*

Play the video and pause at ***Discovery Break 4- What makes the beach so hot?*** Have students discuss what they think might make the beach hot.

Resume Lesson
Willow goes on to explain that the sun is what warms the earth and makes it a place where we can live.

Post-viewing
Ask students to give some examples of how the sun warms the earth. Ask them what happens when the sun sets in the evening? Do they think the temperature goes down.

Fluxx learned that the sun made the beach hot, but is the beach always hot? Can they think of times when the beach is not hot? Are there places where the beach is never hot, are there places where the beach is always hot? Are there places where the beach is hot sometimes and cold at other times?

Ask students if they can think of some ways that we protect ourselves from the heat of the sun! For example, umbrellas, parasols, hats with brims, shade trees, awnings, etc...

Discovery Break Five

OVERVIEW
Willow asks "What are some of your favorite things the sun warms?"

Objectives
Students create a work of art of showing how the sun warms the earth.

Procedure
Provide students with art materials, - paper, paint, crayons, markers and have them create a drawing, painting, collage or other work of art showing how the sun warms the earth.

You can share images of other artist works as inspiration.

Some other ideas might include:

Decorating paper plates as the sun.

Making sun art with sun art paper. (Sun art paper is light-sensitized paper that lets you make a photographic image of an object place on it without a camera.)

Make a paper plate sundial.

Materials	
Paper plate	Straw
Crayons/Markers	Ruler
Pencil	

1. Poke a hole in the center of the plate with a pencil.

2. Push the straw through the hole (you might want to tape it in place)

3. At noon, take the plate outside and look at the shadow of the pencil on the plate. Write the number 12 at the edge of the plate where the shadow ends.

4. Take a ruler and draw a line from the 12 across the plate. This will be 6. Set you plate so that the 12 is at the top and the six on the bottom and draw a line from left side of the plate to the right side, this will be 9 and 3. You can now mark the other hours on you sundial.

5. Students can decorate their sundials with markers or crayons.

Discovery Break Six

OVERVIEW
The Quinks meet Steve and Heather. They are putting solar panels on a barn. They explain how solar panels capture the power of the sun. Steve challenges them to build something that would keep a marshmallow cooler in the sun.

Objectives
Students use trial and error and problem solving skills to create something that will protect a marshmallow from the heat of the sun.

Vocabulary	
Engineer	Solar Panel

Previewing Activity
Ask the students:
Can anyone tell me what solar energy is? Have you ever seen a solar panel?

Say to the students:
The Quinks are going to meet two engineers who are putting solar panels on a barn. Let's see what they learn!

Viewing
Resume the video. Pause right after Steve and Heather say: asks, "Can you think like and engineer and figure it out?"

Post-viewing
Say to the students:
Do you think you can build something that will keep a marshmallow cool in the sun?

Hands-on Activity
Students create a structure or container that will keep a marshmallow cool in the sun.

Procedure:

Have students (working in small groups or individually) come up with a blueprint for a container or a structure that will protect a marshmallow from the heat of the sun using only materials they can find in the room. Materials used might include newspaper, cardboard, boxes, trash bags, paper towel tubes, or craft sticks.

Once they have created their marshmallow protection structure/container have them explain to the class what they have created and why they think it will protect a marshmallow. On the next warm, sunny day, have them test their creation.

Additional Engineering Challenge
Have students create a container that will keep an ice cube from melting for as long as possible. Provide students with a variety of materials like newspaper, cotton balls, foam, cloth, aluminum foil, cardboard, plastic bags, paper towel tubes, tape, clay, Styrofoam, etc.

Review

OVERVIEW

The Quinks return from a trip to the beach and report that by using an umbrella, they were able to keep cool in the sun. The lesson ends with the Quinks singing the *Explorers Song*.

We're Explorers

We're explorers.
Explorers!
The world that's what we explore!
We're explorers.
Explorers!
Day after day...
Learning more and more!

Review Questions

1. The Quinks discovered you can measure temperature using this tool.
Answer: Thermometer

2. This object is close to 93 million miles away from the Earth, but it still keeps the planet warm!
Answer: The Sun

EXTENSIONS

Language Arts
Read-Aloud Poetry
The Sky is Low, the Clouds are Mean - Emily Dicknson
Jack Frost - Helen Bayley Davis
Snowball - Shel Silverstein
It's Hot - Shel Silverstein

MISSION: TEMPERATURE

STEM from the START is an innovative, online video-plus-activities curriculum for PreK-2 learners available at www.nhptv.org/STEM.
Featuring kid-friendly animated characters called QUINKS, the goal of STEM from the START is to nurture students' natural curiosity and love of discovery, while laying the groundwork for ongoing success in STEM (Science, Technology, Engineering and Math) subjects.

DISCOVERY GUIDE
Authors
Dennis Neil Kleinman
Susan Adams, Educational Services Manager, NHPB

Editor
Grace Lessner

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This certifies that

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is an Explorer and knows all about

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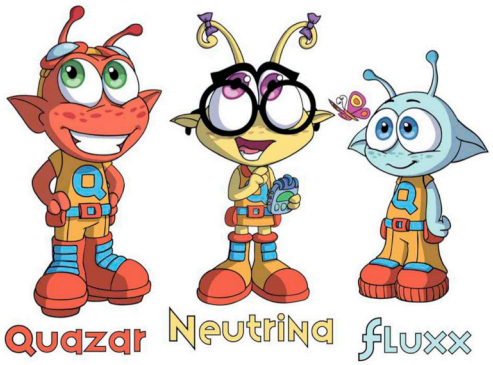

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