



# DISCOVERY GUIDE

## LESSON MISSION: MOTION 1



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



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## 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](http://nhptv.org/stem).

# MISSION: MOTION 1

## Lesson Introduction

### OVERVIEW

Willow and the Quinks explore motion and forces.

### SCIENCE FOUNDATIONS

The Quinks discover that for an object to move, a force like a push or a pull needs to move it! This is Newton's First Law of Motion, also known as the Law of Inertia. An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an external force.

### OBJECTIVES

**At the end of the lesson learners will:**

- Describe what is needed to move an object at rest.
- Identify whether an object has been moved by a push or a pull.
- Demonstrate how a push or a pull can move an object.

### KEY VOCABULARY

**Object** - something that you can see and touch that is not alive

**Motion** - changing location or position

**Force** - a push or a pull

**Push** - a force that moves something forward or away from you

**Pull** - a force that draws something closer to you

**Categorize** - to put things into groups

### Next Generation Science Standards

#### **K-PS2-1 Motion and Stability: Forces and Interactions**

Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

#### *Disciplinary Core Ideas*

##### **PS2.A: Forces and Motion**

Pushes and pulls can have different strengths and directions.

Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

##### **PS2.B: Types of Interactions**

When objects touch or collide, they push on one another and can change motion.

##### **PS3.C: Relationship Between Energy and Forces**

A bigger push or pull makes things speed up or slow down more quickly. (secondary)

#### **K-PS2-2 Motion and Stability: Forces and Interactions**

Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

## Discovery Break One

### OVERVIEW

The Quinks have seen an object that flies through the air, races along the ground and jumps up and down. Willow is stumped and can't think of an object that does all three movements. Willow finally guesses that the object is a ball and shows how a ball can fly through the air, race (roll) across the ground and jump (bounce) up and down.

### Objectives

Students can name some different types of motion.

Students demonstrate different kinds of motion.

### Previewing Activity

Have the students do some moving! Ask them to jump, slide, turn, and hop. See if they can think of any other ways they might move.

### Viewing

Play the video and pause at **Discovery Break One - What flies, races and jumps?**

### Ask students:

Have students name things that might fly through the air, race along the ground and jump up and down. There are lots of possible answers!

**Resume Video** after students have come up with some possible answers and pause when Willow says "And motion is pretty amazing too!"

### Post-viewing

If students named a ball as an object that did all three things, ask them how they came up with that answer. If they didn't think of a ball, ask them why not?

Ask them if there is another word that the Quinks might have used besides "raced" or "jumps up and down" to describe how a ball might move.

Can they think of other motion words to describe the movement of a ball?

### PE Extra

Take the students to the gym or playground and have them make a ball race along the ground, jump up and down and fly through the air.

Have them make note of what they needed to do to make a ball do those things.

Did they have to push or pull the ball?

Ask the students if they can think of a game or a sport where a ball might be bounced up and down, thrown through the air and rolled on the ground?

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## Discovery Break Two

### OVERVIEW

Willow defines motion is as when something moves from one place to another.

### Objectives

Students can describe what motion is.

Students can identify when an object in motion.

### Vocabulary

**Motion** - when something moves from one place to another.

### Viewing

Resume the video and tell students to listen carefully to what Willow has to say about motion!

Pause at the video at **Discovery Break Two - What do you know about motion?**

Ask students if they can tell you what Willow said motion was.

Ask students to look around the room and identify something that is in motion.

Have students list things they have seen over the course of the day that were in motion.

## Discovery Break Three

### OVERVIEW

Neutrino announces that they need to study the ball to see how it moves in such “super-spectacular” ways. They Quinks gather around the ball and stare at it, time passes but the ball does not move! Fluxx thinks the ball is sleeping and Quazar tries to wake it up by playing a bugle.

### Objectives

Students can describe what needs to happen to make an object at rest move.

### Viewing

Say to students: Let’s join Willow and the Quinks and see if they have any questions about movement.

Play the video and pause at **Discovery Break 3 - Why isn’t the ball moving?**

### Hands-on Activity

#### Materials

Pennies	
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Place a penny in front of each child. Ask them to observe the penny and raise their hand when it moves.

After a minute or so, ask them what they observed about the motion of penny.

Ask them why they think it did not move?

What do they think would have to happen to make it move?

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## Discovery Break Four

### OVERVIEW

Willow explains that to make the ball move, you have to apply a force, like a push. She asks the class to see what it can learn about using pushes to make things move.

### Objectives

Students can identify a force as a push or a pull that changes the motion of an object.

Students can predict what will happen to an object if a force is applied to it.

Students can move an object by applying a push to it.

### PE Extra

Take students out to the playground (or gym) and ask them to identify things that they might do there that would involve applying a push as a force to move an object.

Examples might include - pushing a someone on a swing, throwing a basketball, pushing off with your foot when you run, doing pushups, kicking a kickball, or jumping.

### Vocabulary

Push	Force
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### Viewing

Say to students: Let's see what Willow does to move a ball!

Play the video and pause at **Discovery Break 4- What can you discover about how pushes can make things move?**

Let see if we can figure out some different way to push a ball!

### Hands-on Activity

Working in groups or as individuals, have students crumple a piece of paper up into a ball.

Have students see how many different ways they can come up with apply a force to the paper balls that will push them into motion.

### Materials

Paper	Straws
Pencils/Craft Sticks	

## Discovery Break Five

### OVERVIEW

Fluxx begins to Quiver! That means he has a question. He wonders if a push is the only kind of force that can move an object.

### Objectives

Students identify a pull as a force that can move an object.

### Vocabulary

Quiver	Pull
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### Viewing

Say to students: Let's see what else we can learn about forces!

Play the video and pause at **Discovery Break 5- Is a push the only way to put something in motion?**

### Activity

Say to the students - we all know what a push is, right? Who can give me an example of a push?

I am going to give you some examples of a force moving an object, I want you to tell me if it is a push! If it is not a push, let's see if we can figure out what type of a force it is. Are you ready?

When someone drags their sled up a hill is that a push?

When you close the door in this room is that a push?

When you open up a refrigerator door, is that a push?

Give any other examples you can think of, especially examples you can demonstrate in the room!

# MISSION: MOTION 1

## Discovery Quiz

### OVERVIEW

The Quinks travel around the world and look for examples of pushes and pulls.

### Objectives

Students identify a pull as a force that can move an object.

### Viewing

Say to students: Let's see what else the Quinks can observe about pushes and pulls!

Play the video and pause at **the end of each Discovery Question.**

The first example is a goat pulling a cart. (The girl walking is also pushing against the pavement with her legs as she walks!)

The second example is a loader pushing dirt. (The tires on the loader are also pushing against the gravel to move the loader forwards and backwards and gravity is pulling the dirt down as the loader dumps it!)

The next example is a whale swimming. At first Fluxx isn't sure if it is a push or a pull, but they look at the whale again and realize that its tail is pushing against the water and that is moving the whale forward.

The last example is a girl lifting a barbell. The Quinks realize that the girl pulls the barbell up to her chest and then pushes it over her head.

## Discovery Break 6

### OVERVIEW

Willow asks if the students can identify pushes and pulls.

### Objectives

Students identify a pull as a force as a push or a pull.

### Viewing

Say to students: Let's see what else we can learn about forces!

Play the video and pause at **Discovery Break 6- Can you categorize by pushes and pulls?**

### Activity

Say to the students - I am going to name some things that involve motion. See if you can tell me if it is a push or a pull or both! Are you ready?

1. Squeezing toothpaste out of a tube
2. Jumping over a puddle
3. Throwing a baseball
4. Giving someone a high five
5. Tapping someone on the shoulder
6. Tying your shoes
7. Blowing a bubble
8. Picking trash up off the floor
9. Turning the page of a book
10. Petting a dog
11. Taking a book off a shelf
12. Putting on socks
13. Zipping up a coat

# MISSION: MOTION 1

## Review

### OVERVIEW

In this lesson the Quinks leaned about Forces, motion, and pushes and pulls.

### 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. What do you need to put an object into motion?

**Answer: Force**

2. Can you name two different forces?

**Answer: Pushes and Pulls**

3. If I put a penny on the table will it move? What will it take to make it move?

**Answer: No, a force or a push or a pull.**

### EXTENSIONS

#### Science

Gravity is a force that pulls things down. You can test inertia and gravity with a cup, a playing card and a coin. Place the card on the opening of the cup and the coin in the middle of the card. Flick the card at the edge so it shoots out from the cup. If you flick fast enough and straight enough, the coin should drop directly into the cup because there wasn't enough time for the energy from the moving card to transfer to the coin, so gravity pulled the coin into the cup.

#### Math

Go to the playground and take an inventory of all the equipment. Next record whether the equipment uses a push or a pull or both for its motion. Make a Push, Pull, or Both Venn Diagram.

#### Engineering

Slides work because of pushing and gravity! They also work because of friction! Without enough friction, you would travel down a slide too fast for safety and with too much friction you would travel down a slide too slow for fun. Have students test the best material to minimize the friction on a slide using a variety of materials like carpet scraps, plastic wrap, cloth, cardboard etc. Have them use a 10 pound bag of potatoes to test the materials and not themselves!

#### Science

Cut a paper towel tube in half along its length so you have an open tube. Rest the tube on a stack of books. Place a matchbox car at the end of the tube. Place a ball at the top of the tube and let it go so it hits the car. Measure how far the car travels when it is pushed by the ball. Change the weight of the car by taping a penny to it. What does that do to the distance the car travels? Add more pennies and see what happens. Add or take away a book from the stack. What does that do to the distance the car traveled?

#### Language Arts

Vocabulary Development: Have students create a list of words that describe movement. For example: push, pull, drag, drop, roll, slide, bump, nudge, bounce, slither, wiggle, etc.

**STEM from the START is an innovative, online video-plus-activities curriculum for PreK-2 learners available at [www.nhptv.org/STEM](http://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**

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# CERTIFICATE OF ACHIEVEMENT

THIS CERTIFIES THAT

\_\_\_\_\_

IS AN EXPLORER AND KNOWS ALL ABOUT

## MOTION 1

DATE: \_\_\_\_\_



Quazar

Neutrino

fluxx

# MISSION: MOTION 1

