

The following instructional plan is part of a GaDOE collection of Unit Frameworks, Performance Tasks, examples of Student Work, and Teacher Commentary. Many more GaDOE approved instructional plans are available by using the Search Standards feature located on GeorgiaStandards.Org.

Georgia Performance Standards Framework

Unit One Organizer:

4 Weeks

Pushes and Pulls

OVERVIEW: This unit teaches speed and direction are changed by pushes and pulls. In order to master the standards, students will apply the concepts to familiar situations and objects found in everyday activities such as brooms, balls, other sports equipment, and toys.

STANDARDS ADDRESSED IN THIS UNIT

Focus Standards: S2P3a,b Students will demonstrate changes in speed and direction using pushes and pulls.

- a. Demonstrate how pushing and pulling an object affects the motion of the object.
- b. Demonstrate the effects of changes of speed on an object.

Supporting Standards:

S2CS1. Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.

- a. Raise questions about the world around them and be willing to seek answers to some of the questions by making careful observations and measurements and trying to figure things out.

S2CS2 Students will have computation and estimation skills necessary for analyzing data and following scientific explanations.

- a. Use whole numbers in ordering, counting, identifying, measuring, and describing things and experiences.
- b. Readily gives the sums and differences of single-digit numbers in ordinary, practical contexts and judge the reasonableness of the answer.
- c. Give rough estimates of numerical answers to problems before doing them formally.
- d. Make quantitative estimates of familiar lengths, weights, and time intervals, and check them by measuring.

S2CS3 Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.

- a. Use ordinary hand tools and instruments to construct, measure, and look at objects.
- b. Assemble, describe, take apart, and reassemble constructions using interlocking blocks, erector sets, and other things.
- c. Make something that can actually be used to perform a task, using paper, cardboard, wood plastic, metal, or existing objects.

S2CS4 Students will use ideas of system, model, change, and scale in exploring scientific and technological matters.

- a. Identify the parts of things, such as toys or tools, and identify what things can do when put together that they could not do otherwise.
- b. Use a model—such as a toy or picture—to describe a feature of the primary thing.
- c. Describe change in the size, weight, color, or movement of things, and note which of their other qualities remain the same during a specific change.
- d. Compare very different sizes, weights, ages, and speeds (fast/slow) of both human made and natural things.

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STANDARDS ADDRESSED IN THIS UNIT (continuation)

S2CS5 Students will communicate scientific ideas and activities clearly.

- a. Write instructions that others can follow in carrying out a scientific procedure.
- b. Make sketches to aid in explaining scientific procedures or ideas.
- c. Locate scientific information in reference books, back issues of newspapers and magazines, CD-ROMS, and computer bases.

S2CS6 Students will be familiar with the character of scientific knowledge and how it is achieved. Students will recognize that:

- a. When a science investigation is done the way it was done before, we expect to get a similar result.
- b. Science involves collecting data and testing hypotheses.
- c. Scientists often repeat experiments multiple times and subject their ideas to criticism by other scientists who may disagree with them and do further tests.
- d. All different kinds of people can be and are scientists.

ELA2R2 The student demonstrates the ability to read orally with speed, accuracy, and expression. The student

- a. Applies letter-sound knowledge to decode quickly and accurately.
- b. Automatically recognizes additional high frequency and familiar words within texts.
- c. Reads familiar text with expression.
- d. Reads second-grade texts at a target rate of 90 words correct per minute.
- e. Uses self-correction when subsequent reading indicates an earlier misreading within grade-level text.

ELA2R3 The student acquires and uses grade-level words to communicate effectively. The student

- a. Reads a variety of texts and uses new words in oral and written language.
- b. Recognizes grade appropriate words with multiple meanings.
- c. Recognizes and applies the appropriate usage of homophones, homographs, antonyms, and synonyms.
- d. Determines the meaning of unknown words on the basis of context.

M2N4 Students will understand and compare fractions.

- a. Model, identify, label, and compare fractions (thirds, sixths, eighths, tenths) as a representation of equal parts of a whole or of a set.
- b. Know that when all fractional parts are included, such as three thirds, the result is equal to the whole.

M2M1 Students will know the standard units of inch, foot, yard, and metric units of centimeter and meter and measure length to the nearest inch or centimeter.

- a. Compare the relationship of one unit to another by measuring objects twice using different units each time.
- b. Estimate lengths, and then measure to determine if estimations were reasonable.
- c. Determine an appropriate tool and unit for measuring.

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ENDURING UNDERSTANDINGS

- Things are moving all around you.
- Movement can be natural, like wind or water.
- People cause movement with pushes and pulls.
- A force is a push or a pull that makes something move.
- A push or a pull can change the location of an object, change a direction, or stop a moving object.
- A moving object will travel in a straight line if it is not interrupted.
- You can predict how the direction of an object will change.
- Gravity is a force that pulls objects toward the earth.
- It is easier to pull something across a smooth surface than a rough surface.
- You can measure how far something has been moved.
- You can measure force.
- You can predict where an object will be moved or where it will stop.

ESSENTIAL QUESTIONS:

- What makes things move?
- How can you move something farther?
- Why are forces needed?
- How is push like a pull? Different?
- Where is it easier to pull things?
- What surfaces make moving things easier?
- How is speed affected by push and pull?
- Why does speed change?
- Why is gravity important in our daily life?
- How can motion be described?
- How can you use forces?

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MISCONCEPTIONS	PROPER CONCEPTIONS
<ul style="list-style-type: none"> • People cannot tell ahead of time where something will land. 	<ul style="list-style-type: none"> • You can predict how the direction of an object will change.
<ul style="list-style-type: none"> • Things move by themselves. 	<ul style="list-style-type: none"> • A force is a push or pull that makes something move.
<ul style="list-style-type: none"> • When something is moving it always goes straight. • When something is moving it goes wherever it wants. 	<ul style="list-style-type: none"> • A moving object will travel in a straight line if it is not touched. • Push or pull can change a direction of movement.
<ul style="list-style-type: none"> • Wind cannot be used to help people. 	<ul style="list-style-type: none"> • Wind is a force and can be used to run machines.
<ul style="list-style-type: none"> • Water cannot be used to help people. 	<ul style="list-style-type: none"> • Water is a force and can be used to run machines.
<ul style="list-style-type: none"> • Things stop because they are tired of moving. 	<ul style="list-style-type: none"> • Push or pull can cause something to stop.

CONCEPTS	KNOW AND DO	LANGUAGE	EVIDENCE
<ul style="list-style-type: none"> • A force is a push or pull that makes something move. • A moving object will travel in a straight line if it is not touched. The distance it travels depends on the amount of force and the surface it is traveling on. 	<ul style="list-style-type: none"> • After brainstorming, students will identify push and pull in toys, machines, sports, daily life experiences-put up the flag, open the door, put on my socks, etc. • Using the same amount of force, students will roll objects such as marbles, tennis balls, ball bearings across various surfaces, such as tile floor, carpet floor, wax paper, or sand paper. Each trial will first be predicted, repeated, measured, and recorded. 	<ul style="list-style-type: none"> • Push, pull, motion, force • Path, resistance, surface, friction, straight, curve 	<ul style="list-style-type: none"> • Students will dramatize- use the action portrayed as new words for the song, “Here We Go Round the Mulberry Bush” as they demonstrate push and pull. Each time the students come to the last phrase in the song, end with the words, “with a push or pull in the morning.” • In science journal students will complete a chart and make a graph showing findings.

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CONCEPTS	KNOW AND DO	LANGUAGE	EVIDENCE
<ul style="list-style-type: none"> • A push or a pull can change the direction of a moving object and cause it to stop. • Wind and water are forces. • In some simple tools, like clippers, brooms, saws, rake, and hammers, push and pull can work together. 	<ul style="list-style-type: none"> • Students working in teams will plan, illustrate, and set up obstacle courses for marbles, tennis balls, or ball bearings to travel. • Students will construct tin foil boats with paper sails and demonstrate push and pull while the boats float in water. • Students will create Zoom Balls (see resources Zoom Balls for instructions) to understand how sometimes both forces of push and pull need to be used at the same time. 	<ul style="list-style-type: none"> • Obstacle, course, drop, roll, stop, gravity • Wind, water, power, drag, connect • speed, direction 	<ul style="list-style-type: none"> • After constructing the obstacle course students will illustrate the path, predict the time, record the length the object traveled, and document the time it took to travel the course and come to a stop. • Students will illustrate and label in their science journals their sail boats dragging each other across water when the wind pushes against the sail, or being pushed across the water by the wind. • Students will work in pairs to demonstrate push and pull working together using the Zoom Balls.

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EVIDENCE OF LEARNING:

By the conclusion of this unit, students should be able to demonstrate the following competencies: (see goals)

Culminating Activity: Teams, pair, and individuals will demonstrate various sports equipment while explaining push, pull, and effects of change of speed on sports objects.

GRASPS

Goal: (a) Students will identify pushing and pulling on people and sports objects.

(b) Students will demonstrate the effects of changes of speed on these **objects**.

Role: You have been invited to participate in “Sports Mania” at the World Congress Center. You will be demonstrating push and pull and effects of changes of speed for your chosen sport.

Audience: Participants of “Sport Mania”—people who LOVE all kind of sports.

Scenario: In the winter, The World Congress Center opens its doors to the world of sports. Every sport is invited to set up demonstrations so kids can have a chance to try out different sports. The theme this year is Push and Pull. As you visit each booth, record your findings for push and pull in your Science Journals.

Product: You will need to divide up into groups of 2’s or 3’s or you may present alone. Decide on your sport (football, baseball, hockey, tennis, golf, cheerleading, wrestling, soccer, track, volley ball, etc). Brainstorm to identify pushes and pulls in your event. Figure out how speed comes into play. Compile the equipment necessary to play your sport. Demonstrate to the participants how your sport uses push and pull and how speed is a factor to your sport. Set up the booths and hold your own “Sports Mania Day” as a class.

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TASKS

The following collection of tasks represents the level of depth, rigor, and complexity expected of all students to demonstrate evidence of learning. (Most lessons will take more than one day to complete. Timeframes are suggested and are dependent on your own class.)

Lesson: Push and Pull

Introduction

Introduce Standards. Continue using “language” from the standards during the unit. Refer to posted standard as necessary throughout the unit. On the board or on chart paper make an Experience/Wonder/Discover (EWD) chart through class discussion. “Experience” represents personal experiences that students have had related to the standards. Include a few of your own experiences to engage students. “Wonder” represents questions students might have in addition to the essential questions already included here. Add knowledge and understanding gained throughout the unit under “Discover.” You might want to supply each child with index cards and a baggie for storage for vocabulary cards. As a word is discussed, write it on one side of the card with a definition /illustration on the back. You could also give each child a set of sticky notes which can be adhered to the inside cover of the science journal. Cards completed should include push, pull, motion, and force.

Hook and Attention Getter: After the introduction discussion help the children define force as a push or pull that makes something move. Set out different toys they have brought from home for this science lesson. Divide into pairs, or groups of three or four and ask them to study the toys to determine how the push - pull (force) occurs. Each child should illustrate and label in his/her science journal. Teams can then demonstrate their toys to the class.

Extension: Teams of threes and fours are given sports equipment (baseball bat/ soccer ball/ football/ golf club and ball/ kickball) Each group should be given time to work together to define and then prepare a demonstration using the specific equipment. During the demonstration, the audience (classmates) calls out push or pulls when it occurs.

Extension: Each team is given a challenge to go around the room or school and find an example of push or pull. Look for things like putting up the flag, opening or closing a door, putting a book back on a shelf, slipping on a pair of shoes or putting on a coat. Teams report back to peers with their findings. Refer to EWD chart.

Check for understanding: Sing the song “Here We Go Round the Mulberry Bush.” Have the children join in. Demonstrate doing different push and pull movements. When the last line is sung, change the words to “a push or pull in the morning.” Have students complete [Lesson 1 Review](#).

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TASKS

Lesson: Moving Objects Follow a Path

Introduction

This lesson explores the path a moving object takes.

Hook and Attention Getter: Make room in your classroom or hall and roll a tennis ball across the floor in a straight path. As the children retell what happened, do it again being careful to use the same amount of force. After the third roll, write the words path, resistance, surface, friction, straight, curve on the board as future vocabulary words. Repeat this demonstration on a different surface (tile first, then carpet/ dirt then grass). Children complete their vocabulary cards with their own definitions or illustrations. Read a push/pull book.

Extension: Teams of 2, 3, or 4 are given objects that roll (tennis balls, marbles, ball bearings, beads, or peas. Each group is given the challenge to roll their items one at a time across various surfaces (a tile floor, carpet, wax paper, sand or dirt, paper, cardboard, or material). It should be stressed the same amount of force needs to be used with each item. Ask your students to predict, repeat each trial 3 times, measure the length rolled each time, and record the findings in the science journals. These findings can be extended to a math lesson by graphing them on a chart. Discuss the findings as a group and completed vocabulary cards on path, resistance, surface, friction, straight, crooked, and curve.

Check for Understanding: Review records of movement measurements recorded in science journals. A graph is a good way to show data. Encourage students to draw line and bar graphs to show their findings. Check vocabulary word cards to be sure definitions or illustrations are being completed for each word.

Extension: Students can explore how push and pull can change the direction of a moving object. Working in teams, students can plan, illustrate, and set up an obstacle course for a marble, tennis ball, or ball bearing to travel. Encourage imagination and the use of different leveled surfaces (from table to chair to slanted book to floor) to give extended movement. Allow each team to demonstrate. Complete vocabulary word cards for obstacle, course, drop, roll, stop, gravity after discussing the meaning of each. Add to EWD chart.

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TASKS

Lesson: Wind and Water are Forces

Introduction

Watch a video from the weather channel on wind damage, hurricanes, or tsunamis. www.unitedstreaming.com keyword search: wind, storms, hurricanes, or tsunamis. Discuss the power these storms have. Allow children to express fears, past experiences, and thoughts. Show pictures of windmills, dams, moving rivers, and sailboats. Ask the children how wind and water are being used.

Extension: Students can explore the power of wind and water. Each child will construct a tinfoil boat with a paper sail attached to a mast made from a cut piece of straw and held in place with a tiny bit of clay or chewing gum. Give each child a piece of tinfoil the size of an extended hand. Allow everyone to construct his/her boat using their own design. Decorate paper sails with permanent markers or crayons. Attach the sails to the masts and use the clay or gum to hold it in place.

Set the boats on dry land and see if they move. Question the children to see what they would do to make the boats move. (Put them in water, add wind (a small fan) to push them across the water, or attach a string to them and pull them across the water.) Set up pans of water and let the children experiment with push and pull in the water. Discuss why some boats move better than others. Record findings in journals.

Extension: Allow teams to construct a second boat made with the perfect design that will enable it to move across the water. Set up a fan on one end of the table. Put one boat in each pan and turn on the fan to allow the wind to push it across the water surface. Examine the winning boat to decide why it is the fastest boat. Complete vocabulary cards for wind, water, power, drag and connect.

Check for Understanding: Students illustrate in their journals their sailboats. Label where there is a push and a pull. Wind pushes on the sail to make it move forward. When a piece of yarn is attached to the front of the boat, it can then be pulled. The shape of the boat makes a difference how it moves in the water. Have students complete [Push/Pull #2](#)

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TASKS

Lesson: Push and Pull Work Together

Introduction

In this lesson students will discover how push and pull can work together.

Hook and Attention Getter: Get out a broom and start sweeping the floor. When you get tired, ask another child to take over and be a broom sweeper. As the broom is moving around the classroom, ask if anyone sees an example of push and pull. When the children see a push, they should call out push and stand up. When a child sees pull, they should say pull and sit down. Try to do the movements with each sweep of the broom.

Extension: Students can create a Zoom Ball following the directions at <http://www.uen.org/Lessonplan/preview.cgi?LPid=10037>. Children should work in groups of 2, 3, or 4 and follow a teacher demonstration. Allow time for experimentation with the Zoom Balls. Students demonstrate their Zoom Balls. Students will come to understand how sometimes both forces of push and pull need to be used at the same time to make it work.

Check for Understanding: Play the game “Sparkle” using all of the vocabulary words. The children stand in a circle, facing inside. The leader calls out a word and the first child says the first letter of the word. Continue around the circle until the word is spelled. The next person says “Sparkle” (or any other word agreed upon by the class.) The next person says what the word means or draws a picture on the board to explain the meaning. If someone misses a letter, or forgets to say Sparkle, or does not know what the word means, he/she squats down in the circle. This game needs to move fast to be fun! It is important that everyone remains quiet so the spelling and definition can be heard.

Have students complete [Push/Pull #3](#)

Check for Understanding: Revisit the EWD chart.

Have students complete [Unit Test](#).

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TEACHER INFORMATION AND RESOURCES

The following websites have good information and some resources.

- NASA Space Link www.nasa.gov
- Zoom Balls <http://www.uen.org/Lessonplan/preview.cgi?LPid=10037>
- Georgia Science Links <http://www.georgiascienceteacher.org/links.htm>
- Videos available from <http://brainpop.com> or www.unitedstreaming.com

The following books support this unit.

Push and Pull Patricia J. Murphy.

Push and Pull Robin Nelson.

Push or Pull? Wiley Blevens.

Push or Pull Susan Canizares.

Push and Pull Hollie J. Endres .

Push and Pull Mike and Maria Gordon.

Push and Pull Lola M. Schaefer.

Motion Darlene Stille.

I Fall Down Vicki Cobb. Science Play.

Magic School Bus Plays Ball Scholastic

Awesome Experiments in Force and Motion Michael Dispezio,

Pushing and Pulling (Science For Fun) Gary Gibson.

And Everyone Shouted, "Pull!" Claire Llewellyn.

Push and Pull. Marcia Freeman.

Push and Pull Jack Challoner.

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Push and Pull Unit Test

Scientist _____

Scientists write in complete sentences!

1. What is a push?
2. What is a pull?
3. When something moves in any direction it has a ____ _ ____ _ ____ _.
4. Two marbles are rolling. Both marbles are exactly alike. They have each been pushed with the exact same force. One marble goes further than the other. Why?
5. Two boats are floating on a lake. They each have a sail that is exactly alike. The exact same wind blows on the two sails. One boat goes clear across the lake, but the other one stops half way. Why?
6. If a ball is rolling on a tile floor, what kind of path will it have if nothing touches it? What determines the speed of a baseball?
7. What causes an apple to fall out of a tree?
8. What is friction?
9. What do you call the floor a ball is rolling across?

Word Bank									
Force	Speed	Stop	Curve	Motion	Straight	Path	Connect	Surface	Power
Obstacle	Drop	Drag	Roll	Gravity	Wind	Friction	Resistance	Water	Direction



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Push or Pull -Test One

Scientist

1. A _____ is a push or pull that makes something move.

motion path force obstacle

2. A _____ is a movement forward.

roll push path pull

3. A _____ is a movement backwards.

roll push path pull

4. Something going either forward or backwards is _____.

motion path force obstacle

5. A yo-yo pulls when it _____.

gets wound up goes down goes up sits still

6. A baseball bat pushes when it _____.

gets swung back is taken out of the bag hits the ball strikes out

7. When the flag goes up the pole the rope is being _____.

held pushed swung pulled

8. To close a door you would need to _____ it.

lock swing push pull

9. To open a door, you would need to _____ it.

lock swing push pull

10. When you put on your socks, you have to _____ them over your toes.

pull rub push lay

[Return to Push and Pull Lesson](#)

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Push or Pull -Test Two

Scientist _____

1. A moving object will travel in a _____ line if it is not touched.

curved bumpy crooked straight

2. The distance a ball rolls depends on _____.

(the force it is pushed) (the surface it travels on) (both the force and the surface) (who rolls it)

3. When a marble rolls on a _____ it will go farther.

smooth dirt tile floor carpet grass

4. When a marble rolls on a _____ it will go a very short distance.

smooth dirt tile floor carpet grass

5. Something rubbing against a surface is _____.

path straight motion resistance

6. What makes your hands get hot when you rub them back and forth?

friction obstacle gravity straight

7. When a tennis ball rolls on _____ it will go farther.

gravel blacktop carpet grass

8. When a tennis ball rolls on _____ it will go a very short distance.

gravel blacktop carpet grass

9. When the Braves pitcher throws a ball to first base, how does he throw it?

curved to the left curved to the right straight underhanded

10. When an outfielder throws a ball to home plate, how does he throw it?

underhanded straight curved to the left curved to the right

[Return to Wind and Water are Forces](#)

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Push or Pull -Test Three

Scientist _____

1. A _____ can stop a rolling marble.

Path gravity obstacle motion

2. What makes a sail boat move forward?

friction wind drag path

3. A _____ can change the direction of a rolling ball.

push course curve drop

4. An obstacle can be a _____.

motion force rock course

5. A string tied to the front of a toy makes it easy to _____.

roll stop push pull

6. Wind becomes powerful when it _____.

pushes stops starts drags

7. What causes a peach to fall from the tree?

Friction obstacle gravity power

8. The speed of a baseball is determined by _____.

gravity force size resistance

9. A rock on the ground can change the _____ of a rolling ball.

direction size surface friction

10. The _____ of a tin foil boat can make it go farther in the water.

color shape size

[Return to Push and Pull Work Together](#)