Topic
Force and motion

Key Question
How are the concepts of push and pull important when flying a kite?

Learning Goals
Students will:
1. define and explore the concepts of push and pull,
2. relate push and pull to real-world situations such as flying a kite,
3. construct simple kites, and
4. fly the kites to experience how push and pull are important in keeping the kites in the air.

Guiding Documents
Project 2061 Benchmarks
- The way to change how something is moving is to give it a push or a pull.
- Things near the earth fall to the ground unless something holds them up.

NRC Standards
- 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.
- Measuring with multiple copies of units of the same size, such as paper clips laid end to end

Math
Measurement
- length
Science
Physical science
- force and motion
Integrated Processes
Observing
Comparing and contrasting
Analyzing
Generalizing

Materials
For each student:
- one 12" x 18" sheet of construction paper (see Management 4)
- 10-15 meters of kite string (see Management 11)
- one non-flex drinking straw (see Management 10)

For the class:
- paper, various sizes, colors, and types (see Management 4)
- crayons or colored pencils (see Management 6)
- scissors
- tape
- glue
- lion and lamb patterns, enlarged (see Management 5)
- Kite Flying Safety sheet

Background Information
National standards at the primary level talk about force and motion in terms of pushes and pulls. Force is different from other measurable quantities such as mass or length because it has a direction attached to it. You cannot exert a force with no direction. Even the youngest children intuitively understand this concept. They know that if they push on something, it will move away from them (if the magnitude of the push is great enough), and that if they pull something, it will move towards them (if the magnitude of the pull is great enough). They understand that you cannot push or pull something without moving it unless the object is too large or heavy to be moved by the strength of the push or pull.

In this activity, students will be exploring pushes and pulls in the context of flying a kite. The push, in this case, is exerted by the wind on the surface of the kite, causing it to fly in the air. The student holding the string attached to the kite exerts the pull. As long as the magnitude of the push and the pull are constant, the kite will fly in the same position. If the wind suddenly begins to blow harder, the push will cause the student to feel a stronger tug on the line. This will force them to pull against the kite with more strength or move forward. Likewise, if the student pulls on the string causing the strength of the pull to be greater than the push of the wind, the kite will move forward, and possibly dip, or even fall from the sky.
Management

1. This activity is divided into two parts. In Part One, students will be challenged to think about force and motion as pushes and pulls. In Part Two, students will apply the concepts of push and pull to the real world as they fly kites and experience the push of the wind and their pull on the string.

2. You will need a windy day to do Part Two of this activity. The one-straw kites that students will be making require a consistent breeze in order for them to experience the feel of the wind pushing on the kite.

3. Please adhere to the safety rules when flying kits.

4. To make the bodies (heads) of the kites, students will each need one 12” x 18” piece of construction paper. White or cream is recommended for the lamb, and yellow for the lion. To decorate the kites and to make tails, tissue paper, crepe paper, and/or construction paper in a variety of colors and sizes should also be made available.

5. There are two kite patterns from which students can choose—a lion and a lamb. You may wish to let students choose their pattern, or simply give each pattern to half of the class. To make the kites, enlarge the patterns 125% so that they will be the right size for a 12” x 18” sheet of paper. A sufficient number of patterns to be used as templates should be copied onto cardboard and cut out before beginning this activity.

6. Students should be encouraged to decorate their kites using the materials provided. To make a mane for the lion, students can cut a fringe out of brown or yellow tissue or crepe paper and glue it to the perimeter of the kite. (Construction paper is not as desirable because of its weight.) To decorate the lambs, students can glue small amounts of cotton from separated cotton balls to the face and tail. Be cautious about adding too much weight as the weight of the kites will affect the amount of wind necessary to get them to fly.

7. You will have to decide if you want to have the kites cut out for your students ahead of time, or if you wish to do the tracing and cutting yourself.

8. A step-by-step construction guide for the kites is included following the teacher’s manual. Be sure to make at least one kite yourself before doing this activity with the class to be sure that you understand the procedure.

9. The 3-cm fold that is made to create the keel of the kite is very important. Unless your students are able to fold neatly and accurately, you will need to make this fold for them once the patterns are cut out.

10. Do not use flexible straws.

11. Each student should be given 10-15 meters of kite string. This length will allow sufficient height but will be short enough for students to deal with. The string should be wound around a piece of cardboard, an empty paper tube, or some other similar object. Each piece of string should be securely laped to the holder so that it does not pull free while students are flying the kites. Another option is to have students bring kite string from home.

Procedure

Part One

1. Ask the class what a push looks like. Invite several students to come up to the front of the class and demonstrate a push. Have each one do something different.

2. Ask them what all of the pushes had in common. (Most of the students probably used their hands to put pressure against something that moved away from them as a result of the force.)

3. Ask students if they think it is possible to push something without touching it. Brainstorm possibilities as a class. Hopefully someone will eventually think of using his or her breath (wind) to push something. (If not, make the suggestion yourself.)

4. Challenge students to push an object, such as a pencil, across their desk using their breath.

5. Discuss whether students think a push using their hands and a push using their breath are the same. Be sure that students understand that even though they can’t see their breath, it pushes objects in exactly the same way that their fingers do.

6. Have students think of examples in the real world where objects are pushed by air. (Trash blowing in the wind, kites, dandelion seeds, etc.)

7. Ask the class what a pull looks like. Invite several students to come up to the front of the class and demonstrate a pull. Have each one do something different.

8. Ask them what the pulls had in common. (Most of the students probably used their hands to put pressure on something that moved towards them as a result of the force.)

9. Have students think of examples in the real world where things are pulled. (Trailers attached to cars, pulling a wagon down the street, being pulled behind a boat while water-skiing, etc.)

10. Discuss the difference between a push and a pull. (Both pushes and pulls are forces exerted on objects. The difference is the direction of the force.)

11. For our discussion on kites, ask students what makes a kite fly. (the wind) Ask what keeps a kite from flying away when it is being pushed by the wind. (It is attached to a string that someone is holding on to.)

Part Two

1. Tell students that they are going to be making their own kites so that they can explore pushes and pulls.

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2. Distribute the necessary materials for the kites and assist students in cutting them out and taping them together (if this has not been done for them).

3. Once students have cut out the faces of their kites, distribute the materials for decorating and have students make their lions and lambs. Be sure that they decorate the side of the kite that will be facing the ground when it flies. This is the side with the keel.

4. Assist students in taping the straw to the backs of the kites and affixing the strings to the proper places on the keels.

5. Have students measure the height of their kite using a non-standard unit such as paper clips in a chain, Unifix cubes, a piece of string, etc. Instruct them to design tails that are about three times as long as their kites are high. Tails need not be extremely wide (2-5 cm). Assist students in taping the tails to the bottoms of their kites. (Keep in mind that the larger the tail, the greater the drag (air friction). If a student’s kite does not fly, it may have too much drag. Shortening or perhaps narrowing the tail can solve this.)

6. Go over the safety rules page with students and establish the rules for flying the kites in this activity. Be sure to set a distance which students must keep from each other while flying their kites.

7. Take the class outdoors to the open space you plan to use. Discuss how to get the kites to fly. Assist students in launching their kites and try to help them keep the kites at a good “cruising altitude.” (Depending on the wind conditions and the design of the kites, this may take some time and patience to achieve.)

8. If any students have kites that have trouble flying, try to make the necessary modifications so that they will be able to fly them. (See A Word About Kites.)

10. Ask students to pay attention to how it feels to hold the kite while it is flying.

11. At various times, instruct students to pull on their kite strings and observe what happens.

12. Instruct students to change their positions in relation to the direction of the wind and to note the behavior of the kites.

13. After students have had sufficient time to fly and explore, have them slowly and carefully reel in their kites and come inside.

14. Once back in the classroom, have a closing time of discussion and sharing where students share their observations and what they learned from the experience.

Discussion

1. How did you have to stand in order for your kite to fly? [with my back to the wind] Why? (so that the wind can push on the front surface of the kite)

2. What happened when you moved so that the wind was not at your back? [The kite would not fly.] Why?

3. How did it feel to hold the kite while it was flying? [The wind could be felt pushing against the kite, the string was straight and taut, etc.]

4. What happened when you pulled the kite string? Did how much you pulled change how the kite reacted? [The harder you pull, the more the kite is affected.]

Curriculum Correlation

Literature

Bacon, Ron. Wind. Scholastic, Inc. New York, 1984. (Short book uses rythmy poetry and simple language to describe different ways the wind blows.)

Bauer, Caroline Feller (Ed.) Wintry Day: Stories and Poems. J.B. Lippincott. New York, 1988. (A collection of stories and poems about wind by a variety of authors, with a bibliography, a glossary of names for winds, and a few activities.)


Gibbons, Gail. Catch the Wind: All About Kites. Little, Brown and Company. Boston, 1989. (Kate and Sam visit the kite Shop where they learn about the history of kites and how to fly them.)


Murphy, Stuart J. Let’s Fly a Kite (MathStart). Harper-Collins, New York, 2000. (Introduces the concept of symmetry as two siblings who hate to share try to fly a kite.)

A Word About Kites

Even the best of store-bought kites can be temperamental and difficult to fly. Homemade kites have even more potential to be poor fliers. Many factors can influence how well a homemade kite will fly. Here are some suggestions for ways to fix common problems.

<table>
<thead>
<tr>
<th>If the kite:</th>
<th>Try:</th>
</tr>
</thead>
<tbody>
<tr>
<td>won’t fly at all</td>
<td>reducing the amount of drag by shortening the tail or moving the string up on the keel.</td>
</tr>
<tr>
<td>flies, but helter-skelter and crashes</td>
<td>moving the string down on the keel.</td>
</tr>
<tr>
<td>flies, but not steady</td>
<td>lengthening the tail to increase the drag.</td>
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</tbody>
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1. Never fly your kite near trees, power lines, buildings, or other objects that the kite could get stuck on.

2. Never fly your kite in wet or stormy weather or when the winds are too strong for you.

3. Do not fly your kite too close to any other kites or your lines may get crossed.

4. Do not walk backwards without looking while flying your kite. You could trip on something or run into something.
1. Fold your paper in half along the long edge.

2. Line up the straight edge of the pattern with the folded edge.

3. Trace around the pattern and cut it out.

4. Fold the pattern and the paper along the dashed line. This folded piece will be the keel of the kite.

5. Open up the large flaps and tape along the fold you just made so that the edges line up exactly.

6. Decorate the front of the kite.

7. Securely tape the straw to the top of the kite on the back.

8. Reinforce the area where you will be attaching the string with tape. Make a hole in the keel at the level marked on the pattern and tie the string through it. (This hole should be in the center of the keel approximately one-third of the way from the top of the kite.)

9. Attach the tail. The tail should be about three times the length of the kite body. The kite is now ready to fly!
Place this edge along the fold.

Attach string here.

Make your crease here.

LAMB
Place this edge along the fold.

Attach string here.

Make your crease here.

Trace around the outside line and then cut.

LION
Meaning of guivre. What does guivre mean? Information and translations of guivre in the most comprehensive dictionary definitions resource on the web. A guivre is a mythical creature similar to a dragon. In legend they were portrayed as serpentine creatures who possessed venomous breath and prowled the countryside of Medieval France. The words “guivre” (wurm, wyvern [which is derived from it], or serpent) and “givre” are spelling variations of the more common word “vouivre”. Vouivre, in Franc-Comtois, is the equivalent of the old French word “guivre.” All these forms are derived ultimately from Latin vīpera, as is English viper. I cannot grasp their difference. In these next two sentences I can’t see any. Ich habe vor einem Monat in Graz gewohnt. and. Ich habe seit einem Monat in Graz gewohnt. Vor is used when a spot in time is addressed, but described by an elapsed time span. Seit is used for unfinished time spans, meaning the action is still in progress. It’s confusing because it looks similar to the construct “for/since” in English. The VOR (VHF Omnidirectional Radiorange) System consisting of many strategically located transmitter stations supports air traffic with directional information. By demodulating the signal of a VOR transmitter station the VOR receiver on board an aircraft is able to provide bearing information relative to the transmitter station. By receiving two or more VOR stations the pilots can determine their exact location by triangulation. The directional information is derived by comparing the phase between a 30 Hz reference signal and a 30 Hz variable phase signal. bevor or vor and other tricky words. Mixing up vor and bevor and also davor is a really common mistake; for beginners as well as advanced learners. And it’s the same story for nach, danach and nachdem. Today, we train exactly when to use which. Because German, pedantic as it is, wants a distinct word for each function. That’s why we have to deal with six words in total. bevor and nachdem : connect a verbs/sentences vor and nach : connect a nouns davor/vorher and danach : a stand-alone reference. Now, if you’re not a grammar nerd or you have a similar distinction in your language, then this distinction doesn’t come naturally to you at all. And that’s exactly why we doing this exercise to you.