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Bruce Museum at Home

STEAM Activities for Children

Lesson # 17: In the Heat of the Kite

Week of July 20th, 2020

This week's STEAM At Home lesson will have you looking for that next strong breeze and getting ready to take flight! Most of the items for this experiment may be in your house already, but you will need to visit a post office to get a Tyvek mailer or use a leftover one you already have. Please plan accordingly before beginning any project with your learners, and don't forget to wear sunscreen when you take your kite outside!

Learners will use their science journals to predict, record, and explore their experiments. If your learners haven't made a science journal, instructions can be found here. If learners have a notebook or other paper they prefer to use, that's fine.

In order of appearance, this lesson contains: a materials list for In the Heat of the Kite and a simple art activity, instructions for the experiment, ways to add on to the activity, a brief art activity, and NGSS Performance Expectations.

Kite flying is a great time for learners of all ages. Make sure you fly your kite in a safe environment where your learners can run and fly their kites high.

Materials for In the Heat of the Kite: a sheet of Tyvek (if you don't have Tyvek at home, go to a post office and get a priority mail envelope. There are also links in the lesson to other kite builds that don't use Tyvek.), plastic straight-straws, painter's or masking tape, lightweight fabric or gift tissue, lightweight string or curling ribbon, a hole punch, pencils, scissors, a ruler, a piece of cardboard with a notch cut into each side, and the diagram for the kite.

Materials for the craft project: markers, stickers, a ruler, stamps.

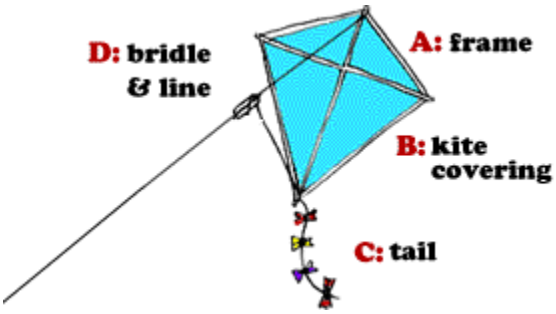
How do kites work?

You may have flown a kite, or many times before, but do you know the physics of how kites fly? Ask your learners questions to get them thinking about their own experiences with kites and other airborne objects.

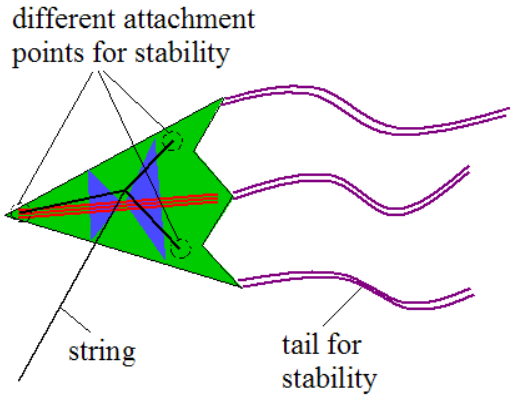
- Have they ever flown a kite before?
    - What was it like?
    - How long did their kite stay up in the air?
    - What was it like outside when they flew their kite?
- How are kites different from paper airplanes, parachutes, or rockets?
- What do they think is the most important part of a kite?

- How do you get a kite to fly?
    - Do you ever have to expend energy to get a kite to fly?

The basic physical makeup of a kite is simple.

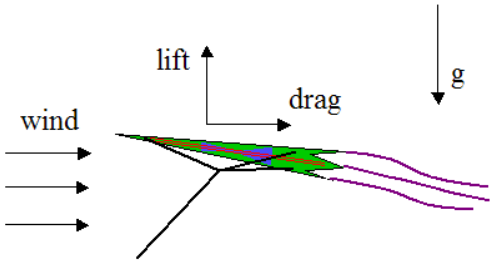


Every kite has a frame, which can be as simple as two sticks crossed in a traditional flat kite, or with or two parallel sticks in a sled kite. A lightweight material, which can be plastic or paper, is stretched over the frame. At the bottom, or end, of the kite is a tail which is not only attractive but adds to stability. Finally, the kite will have a bridle: an attachment that is tied on to at least two points of the frame, and the long line from which the kite flies.



Kites are not like rockets, propelled into the air by a physical or chemical force from below, and they aren't like a paper airplane or parachute, coasting on air-resistance. Kites actually work remarkably like an airplane when they are in flight. Instead of using powerful engines to create **lift,** the kite relies on the force of wind blowing towards and underneath the kite to create **lift.**

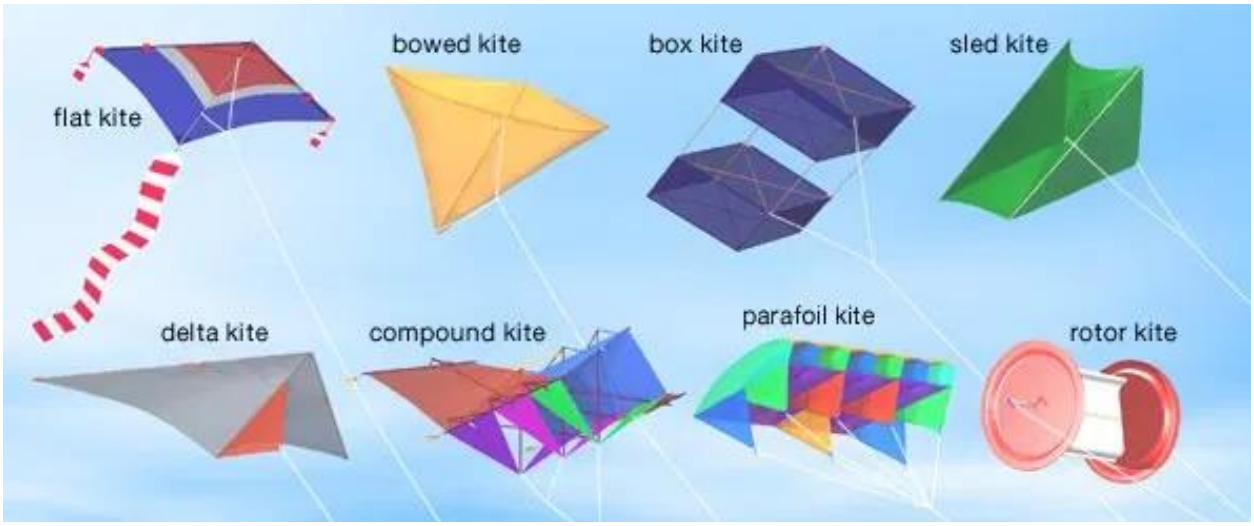
Wind moves across the surface of a kite and creates pressure. **Lift** results from the pressure being deflected along the face of the kite. In other words, the wind pushes up on the kite. Think of wind pressure like a hand, pushing the kite up into the sky and holding it there.



The lifting force is (relatively) weak, which is why kites need to be made of lightweight materials. Kites sometimes need a bit of supplemental force in order to take flight, this means creating **apparent wind,** by running and pulling the kite behind you.

Get Making!

While there are lots of different styles of kites that you can make at home, the easiest and most likely to fly well is a simple sled kite made of Tyvek. You can also use newspaper to make this kite, but Tyvek is the most sturdy, light weight, easy to work with, and readily available material. If you don't have a Tyvek mailer at home, and don't feel comfortable going to the post office and taking a mailer, feel free to use newspaper or even a brown paper bag. Be aware, however, that your kite will be heavier than it would be if it was made of Tyvek. You can also make a different type of kite, using one of these sets of instructions.



- Upcycled materials flat kite.
- Homemade box or tetrahedron kite

The kite we are making is a sled kite, but there are many other styles to try! Before you get started on your kite, take a look at this template, and consider printing it out. When we made our kites, we scaled everything down by about 2 inches. This was necessary due to the size of the Tyvek mailers. Your learners will be able to get flying in no time; just follow the instructions below.

- Using the template as a guide, trace the outline of your kite in pencil on the sheet of Tyvek.
- Cut the shape out.
- With the short flat end as the “top” reinforce the two left and right points with tape and punch a hole through them.
- Create two supports for your kite by pinching one end of a straw and slotting it into another straw.
    - Use as many straws as you need to have two supports that are the length of the kite.
- Tape the straws down on the kite, going from top to bottom.
- Thread a string that is twice as long as the kite’s width through the two holes and tie it off.
    - This will be your kite’s bridle.

- Create a tail on the bottom of your kite using strips of light weight cloth, ribbon, or strips of tissue or crepe paper.
- Decide how long you want your kite's line to be and cut a piece of string or ribbon to the appropriate length.
    - Consider where you will be flying your kite before you choose the length. How high do you want your kite to go?
- Tape one end of the line to your notched cardboard and tie the other end to the middle of the bridle.
    - Wrap the excess line around the card until your kite is hanging off about a foot and a half of line.
- You are ready to fly!

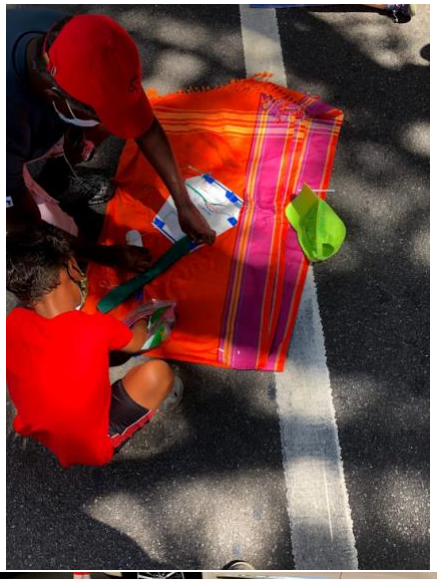
Now that your kites are ready, it's time to get outside and fly. These tips will help you get your kite up and soaring.

- Choose an open area, with few trees and buildings.
- Choose a day that is windy; kites need wind to fly.
    - Beaches are very good for kites as there is almost always wind coming in from the water and lots of open space.
- Figure out which way the wind is coming from and run into the wind.
    - To figure out the direction of the wind you can look at leaves, flags, weathervanes, or wet a finger and hold it up into the air. You will feel the wind cooling your finger when your finger is facing into the wind.
- Holding the kite out behind you, with a few feet of string hanging free, start running!
    - Once you have some speed, let go. The kite will fly in the air behind you.

- Once you catch some wind, start letting out your line. Let it out until it's used up or the line begins to go slack.
    - You will need to pull in the line and release the line as the intensity of the wind grows and diminishes.

After playing with your kite for a bit, ask your learner questions to help them think more deeply about the activity. Learners can use their science journals to record their responses or their own questions.

- How high can you make your kite fly?
- Can you make your kite do “tricks”?
    - Loop-de-loops?
    - Zigzags?
    - Can you write your name with the kite in the sky?
- What is the best kind of wind for your kite?
- If you were going to change something about your kite’s construction, what would you change?
- What happens if you get rid of the tail?
- What happens if you add onto the tail?



Craft Project: If you are using a Tyvek mailer you may have noticed that only one side has words on it, and the other side is blank. What a great excuse to decorate your kite however you’d like! There’s no right or wrong way to decorate your kite, just keep in mind that when your kite is up high, you will still want to be able to see your design. Consider making something big, bold, and beautiful! We used markers and stickers to decorate our kites because we were working outside. If you want to use paint or crayons, feel free!

NGSS Performance Expectations

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

K-2-ETS1-2 Engineering Design

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

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.

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. *

3-PS2-1 Motion and Stability: Forces and Interactions

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object

3-PS2-2 Motion and Stability: Forces and Interactions

Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.