STEM Connections

KaZoon Kites

Below are ideas for connecting the KaZoon Kite activity to STEM concepts and principles. For more ideas and detailed STEM lessons, consult the *KaZoon Kites Teacher's Guide*.

ACTIVITY OVERVIEW

Students build and fly tetrahedron kites made from straw, string, and tissue paper. The kites fly best in a 5-8 mph wind – far away from trees, power lines, and buildings. Athletic fields can often be a good place to fly these kites.

SCIENCE

Equilibrium

Have students build KaZoon Kites from the materials supplied. Before flying the kites, talk with the students about scientific observations, preparing them to consider what is happening during a kite flight.

Have students fly their kites for five to 10 minutes and then immediately write four different actions of the kite and what they did to respond to those actions. Have them describe things that were both successful and unsuccessful.

Discuss the four forces of flight (gravity, thrust, drag, and lift) in terms of equilibrium; all forces must be balanced to maintain level, steady flight.

Choose a few student responses to discuss in class, focusing on what forces were acting on the kites and what effect the actions of the students had on regaining or losing level, steady flight.

Help students relate their experiences to an airplane pilot responding to changes in the flight of an airplane.

The emphasis of this lesson should be on helping students visualize the forces at work, observe the equilibrium point (level, steady flight), and understand that equilibrium can be affected by outside forces to help control flight.

ENGINEERING

Design a Kite

The inherent stability of the tetrahedron cells within a KaZoon Kite provides opportunities for students to create their own tetrahedron kite designs. The important design constraint for students to remember is to have all the tetrahedron cells oriented the same direction. Otherwise, you have forces counteracting each other and the design will likely not be successful.

Cells tied together in a line can fly, or cells tied together in one to three planes on top of each other can fly. Combining four KaZoon Kites together into a large tetrahedron kite makes a large, stable kite as well.

Have students experience flying their KaZoon Kites before beginning the design activity. After they have some flight experience, have them go through the Design Loop to come up with some design solutions to prototype. Have them document their ideas in an engineering notebook, complete with sketches and notes of what works and what doesn't.

Set a time frame for completion; some of the design work may be done outside of class. Parental involvement might be helpful, depending on the ages of the students.

TECHNOLOGY

Measuring Kite Line Tension

Have students build KaZoon Kites from the materials supplied.

Have students work in teams of two or three to fly and measure string tension as the kites are flown in various wind conditions.

Students will tie 30-foot kite strings onto their kites and will tie a one-inch loop on the free end of the strings. After the kite is in flight and a student is holding the loop end of the string, one end of a spring scale is inserted into the loop and a student holds the other end of the scale.

One team member will call out a wind speed (a digital wind speed indicator is preferred), the student flying the kite will call out the force gauge reading, and the third student will record the data (wind speed and force). Students should attempt to get data at several different wind speeds and record that data in their data tables.

Students should determine a general trend regarding measured data (i.e., the greater the wind velocity, the greater the amount of force).

Data for the class can be consolidated to provide a broader data set if desired. The activity could be extended to include altitude data along with force data.

MATH

Surface Area

Have students begin building Kazoon Kites from the materials supplied. Have the students stop after the four individual tetrahedron cells have been constructed.

Have students measure the sides and altitude of one triangle of one of the tetrahedron cells. Have students use the formula $A = 1/2\ bh$ to determine the area of the triangle.

Have students count the number of faces on one small tetrahedron cell. Have them multiply the number of faces by the area of the triangle to determine the total surface area of one tetrahedron cell.

Have students complete the kite construction. Have them estimate the total surface area of the constructed KaZoon Kite and record that estimation.

Have students determine the surface area of the KaZoon Kite by two methods:

1. Count the number of triangles in the faces of the KaZoon Kite and multiply that by the area for each triangle.
2. Measure the side and altitude of one face (larger triangle) of the KaZoon Kite, and multiply that area times the number of large faces.

Have students compare calculations for the total surface area. They should be very close to the same.

PITSCO EDUCATION

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