

Soaring in the Wind: The Science of Kite Flying

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For the teacher

The video is about the science of kite flying and the setting is in Malaysia. The video can be used as an extension of a physics lessons especially after the students have learned about forces. It will focus on some of the concepts such as gravity, thrust, lift and drag. Some principles such as Bernoulli's Principle and Newton's Law are now framed within the context of flying kites. With this video, students are encouraged to think about kite flying in terms of the scientific concepts of flight while discovering and enjoying the world of kite flying which is shared throughout many parts of the world. As an added value, the video will also share some information about Malaysian kites which are "tailless". The Malaysian kite is called "Wau" (read "wow") and there are many distinctive designs and each Malaysian state has its own official Wau. Malaysia has 14 states.

The objectives of the lesson are for the students to:

- a) identify and know which forces makes kites fly,
- b) relate the flight dynamics to the anatomy of the kite,
- c) understand physical variables contributing to the flight

Thus by comparing and contrasting, the typical kite and the Wau, students should be able to realize that kites are designed based on scientific principles related to theories of flight. The lessons will be conducted in class and students are to work on the questions given in the lesson in small groups. Two simple experiments to study how air flows on a kite will be presented for students to carry out.

Segment 1

Teacher is to inform class that the lesson is about forces in kite flying. Teacher will then show class the video content of segment 1. At the end of the video, the presenter will ask questions. The questions are to be answered during Activity 1.

Activity 1

Teacher divides students into 3 to 4 per group to discuss between them about kites: The first activity is for students to display what they know about kites and their experiences with kites. Encourage students to share their experiences about kite flying.

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Segment 2

In the video, using picture in picture technique, presenter will explain the anatomy emphasizing the shape/geometry, surface area, kite frame (stability), and highlight the basic principles of kite making. At the end of the session, presenter will pose questions that will focus on the concepts of kite flying.

Activity 2

Students discuss in groups to answer questions in Segment 2.

Segment 3

The presenter will ask the students to conduct experiment to further demonstrate their understanding and answers from Activity 2.

Activity 3

To enhance their understanding students will be asked to conduct Experiment 1 in groups to demonstrate the concepts of lift and gravity. The teacher should have the experimental set up ready. The same equipment will be used in Activity 4.

The teacher will have to provide the following items for the experiment for each group. Students may have to take turns with the fan.

Apparatus: Two cardboards (or papers) of different density (namely Cardboard A and Cardboard B), Standing fan.

Activity 3.1: Holding a Cardboard A in front of a fan.

Activity 3.2: Holding a piece of Cardboard B in front of the fan; repeats with just a half piece of the Cardboard B.

The teacher should encourage students to talk about how the wind is affecting the cardboard's movement. Does the change in material affect the movement? Does size matter?

Segment 4

The presenter will comment on the experiment and its significance. She will then explain about the forces involved in kite flying: gravity (weight), thrust (tension), lift and drag showing the variables on still pictures/diagrams in the video using the picture in picture technique. (Refer to attached Notes).

Activity 4

Teacher should ask students to carry out the experiment in groups and encourage them to discuss answers in Segment 4.

Ask students to focus on three variables such as material, size and wind speed and invite them to answer the questions by carrying out the next class activity.

Apparatus: as before. You will need to provide additional materials such as thin paper, plastic or other lightweight materials.

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The experiment should try to vary three different variables:

- a) using different materials,
- b) different fan speed and
- c) different sizes of the material.

Ask students to note the different results observed from the experiment. You can vary the variables accordingly. Students should try to make explicit their observations and try to relate to lift and drag.

Segment 5

Presenter will answer questions in Segment 4.

The students should be encouraged to try out making kites and flying them if possible. We hope you will make time for the activities. Otherwise there are many good web sites to visit about kite flying.

Good luck!