

Teachers' Guide

Objectives of the lesson

Cognitive objectives:

- Students explain how a land yacht can move
- Students recognize the importance of wind energy in the motion of yachts
- Students compare the size of the sail to the speed of the sail
- Students test the effect of the variables “size of sail” and “inclined angle from the fan” to the “speed of the yacht”

Emotional objectives:

- Students wonder about the result of their investigation
- Students are willing to follow the instructions from their educator and collaborate in their group

Psychomotor objectives:

- Students collaborate in their groups
- Students can handle the measurement instruments
- Students develop their fine motor skills
- Students can communicate effectively with their groups and in the plenary discussion, develop their critical thinking skills and be creative when they are asked to solve a problem

*You need to have at least one fan

Introduction to the activity

The introductory discussion is about sailing, and we refer to the way we place the sails to make the yacht move in the desirable way. It is a complex issue, so you can to what extend you will discuss about it. If you have students who sail, encourage them to talk and describe how they drive a boat.

You can find more information [here](#).

It is important to refer to the wind power, the forces applied to the sails from the air, and from the water to the yacht, either to move, turn or stop the boat. One major objective of the lesson is students to understand that humans use science to move in the sea. Through engineering, this motion is more effective.

STEM concepts in the activity



Science: wind power, forces, air resistance

Technology: utility of science to design a sea transportation means

Engineering: engineering design, proper placement of sail, sail support

Mathematics: measurement, comparison

Building

The basic building is up to step 12, where each group will have done their own land yacht. Steps 13-21 show you how to change one sail to the bigger one, as well as steps 22-30.

Answers to the worksheet

The building stops at step 12.

1. We repeat the measurements to have a more objective result, since there are errors during the measurement. Beware, the fan need to work at the same speed each time.

2. The speed changes according to the angle the land yacht is placed.

3. Remove the sail and continue the building at steps 13-21, inserting a bigger sail. Discuss with the students how important it is to hold the sail tightly.

Your measurements show that the yacht is moving further.

4. Move on to steps 22-30, placing an even bigger sail.

Your measurements show that the yacht is moving further.

The result is that the greater the sail, the faster and further the yacht moves.

5. Open activity for the students. The restriction is that we cannot depend exclusively on the air for our vehicles to move, because then they will move only when it is windy. So, we need to find an alternative power source that lets the vehicle move under any condition. So, our result is that we cannot use the wind power to create vehicles, apart from enhancing their operation.