

Physics Fun Program Plan - Sail Car

Description

Interested in bringing science to your library patrons? Explore speed, building, and mechanics in simple, fun, hands-on experiments. With a borrowed WLS physics kit, ideal for ages 8+, teams build sail cars and race them against each other or the clock. Fun and educational.

Audience

Ages 8+

Budget/Costs

Free WLS kit (borrowed)

Consumable supplies: \$5.00

Cost per participant: \$.25

Number of participants

Up to 20, depending on ages

Program Time

1 hour plus .5 hours staff setup time

Collection and Dewey Connections

Physics - 620.0078, 530.078, 531.107

Wind Power - 333.9

STEAM Tie-ins

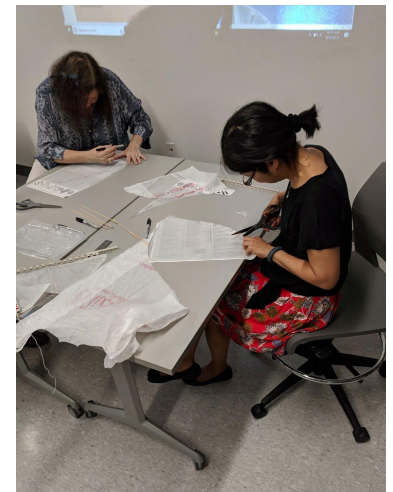
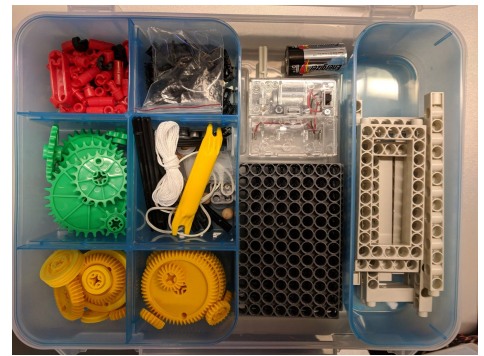
Science: physics, speed, machines

Technology: batteries, electronics

Engineering: balance, speed, velocity

Art (optional): colors and cutting

Math (optional): calculating time and distance



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Supplies

Box or window fan - 1 or 2, depending on size of group

For Each Group

From standard library programming supplies

Scissors

Plastic grocery bag

Tape

Markers or decals for decorating sails

1 18" piece of string (can be cut from the string in the kit ahead of time or during workshop)

[Wooden skewers](#)

Preparation

At least 2 weeks ahead of the program, set up kit request.

<https://it.westchesterlibraries.org/services-2/westchester-library-system-leader-lab/wls-leader-lab-kits/>

On day of workshop, prepare area: 15 minutes

1. Copy handouts as needed.
2. Cut wooden skewers into 3 lengths (see pattern), 1 set for each group
3. Arrange kits and supplies for each group: scissors, a plastic grocery bag, tape, sail template, markers or decals for decorating sails, one 18" piece of string (can be cut from the string in the kit ahead of time or during workshop), wooden skewers.
In addition, depending on age of participants and program time, thread and needle to sew sail to mast.
4. Set up race area with fan, starting line and finish line
 - a. On different surfaces (tiled and un-carpeted areas work best)
 - b. With timer
5. (optional) Set up projector and laptop to display vehicle photograph, pg 11
http://www.thamesandkosmos.com/images/support/PhysicsWorkshop_ManualImages.pdf

Introduction: 5 minutes

Provide overview and tips for building

- Use the picture on page 12 of the book as a guide
- Choose all parts first and arrange them so they're ready to go together
- Red joint pins and anchor pins can be used interchangeably.
- Be careful to orient the rods in the same direction as in the picture.
 - The pin on the end of the long rod on the chassis points to the single wheel.
 - The pin on the end of the long rod on the mast points to the bottom of the sail.
- The sails can be sewn or taped to the mast.

Build the vehicle: 20 - 30 minutes, depending on age and number of participants

1. Assemble the chassis and then secure the connection between the two base frames with tape.
2. Assemble the mast.
3. Make the sail
 - a. Trace the template for the sail onto a sheet of plastic (such as from a thick trash bag).
 - b. Cut it out, including the triangles along the curved edge.
 - c. Use the dotted lines to fold the plastic at the edges of the sail, and secure the hems with tape.
 - d. Tape the wooden skewers to the sail (see pattern) to provide a support framework.
 - e. Attach the sail to the mast. There should be some “give” so that the sail isn’t stretched too tight. Use tape or sew with needle and thread after adding a layer of tape to the sail edge for reinforcement.
4. Attach the mast and sail to the chassis
5. TEST!

Provide guidance and troubleshooting help.

- Encourage testing, troubleshooting and teamwork
- Participants will finish at different times. Those who finish sooner may decorate sails with markers or decals, or make racing “start” and “finish” flags.

Race sail cars: 15 - 20 minutes depending on age and number of participants

Options (possibly have two racing stations so two activities can occur at the same time)

- Run in “heats,” narrowing the field over successive heats until there is a final two
 - Allow time between heats for adjustments to sails
 - Increasing the angle of the mast to the chassis (more perpendicular) increases speed
- Run timed races

Take candid, group photos and a closeup photo of all vehicles

Cleanup and close: 5 minutes

1. Disassemble sail cars. Participants can keep sails. Replace all parts in kit boxes
2. (optional) Discuss what made the sail cars work well
3. (optional) Distribute prizes

Physics Fun! Speed and Velocity

Speed

- The rate of motion of a body
- Distance traveled/travel time

Velocity

- The speed and direction of a body

SPEED =
meters (km) per second (s) = m/s
kilometers (km) per hour (h) = km/h
Miles (mi) per hour (h) = mi/h

Wheels are the simple machine that made higher speeds possible

Land Sailing - https://en.wikipedia.org/wiki/Land_sailing

- Powered by wind
- Land sailboats often go four to five times the speed of the wind
- Vehicles usually have 3 wheels and are operated by pedals
- The oldest description of a “land yacht” is from China, c. 550 AD
- The world land speed record for a wind-powered vehicle was set in 2009 by Briton Richard Jenkins with a speed of 126.1 mph (202.9 km/h).
- The most popular places for land sailing in the US are dry lakes in California and Nevada

Related Links

[Land Sailing on Wikipedia](#)

[Blo-Kart Racing](#)

[The Physics of Land Sailing](#)

[Simple Machines on Wikipedia](#)

[Thames & Kosmos Physics Workshop Kit](#)