2019 Super STEM Saturday

Air STEM Activities
- "Fizzy" Rocket Propulsion
- "Cargo" Plane
- "Hovering" Balloon Pilot

"Fizzy" Rocket Propulsion
- Purpose
    - Design and build a rocket with propulsion system. Launch rocket into the air from the launch pad and measure height.
- Vetted (Time) – 50min
- Agenda
    - Decorate Paper
    - Cut shapes (nose cone, body, fins)
    - Assemble Rocket (canister to body, attach nose cone and fins)
    - Fill canister with water and tablet
    - Put on lid and place rocket in pan
    - Count down
    - Measure height
- Materials
    - Paper (lightweight – ream)
    - Saran wrap (keep rocket dry)
    - Scissors (5)
    - Tape
    - Crayons (5)
    - Markers
    - Stickers (Misc)
    - Paper Towels
    - Film canisters or medicine canister (25)
    - Tape Measure (1)
    - Stop Watch (1)
    - Alka-Seltzer tablets (150)
    - Water (a gallon or so)
    - Trays/pans (10)
    - Tarp (1)
- Supervision (Help)
    - Assistance cutting shapes and taping parts
    - Assistance launching rockets and measuring height
    - Assistance cleaning pans for reuse
- Room Requirements
    - Tables to assemble rockets
    - Open space to place tarp, trays and launch rockets
- Award Measurement
    - Most Artistic Rocket
    - Highest distance flown
    - Best design

"Cargo" Plane

- Purpose
  - Design a paper airplane to carry fixed cargo for the longest distance and carry most cargo for fixed distance.
- Vetted (Time)
- Agenda
  - Design paper airplane (dart versus glider).
    - 3 designs
  - Color paper and fold airplane
  - Load fixed number of coins
  - Fly airplane across room for distance
  - Load maximum coins
  - Fly airplane fixed distance for most cargo
- Materials
  - 8 ½ x 11 paper – Construction paper
  - Tape
  - Paperclips
  - Crayons, markers, stickers
  - Coins (pennies, dimes, nickels, quarters)
  - Tape measure
  - Duct tape (Distances on the floor)
  - Posters – Rocket, Plane, STEM classification
- Supervision (Help)
- Room Requirements
  - Table to color and make paper airplane
  - Open area to fly paper airplane
- Award Measurement
  - Longest flight with fixed number of coins
  - Most coin payload to fly 10 feet
  - Most artistic plane
  - Best design

"Hovering" Balloon Pilot

- Purpose
  - Design and build a balloon with basket that hovers in the air. Apply breeze to pilot balloon to target.
- Vetted (Time)
- Agenda
  - Build basket and attach to balloon with string
  - Add weighted materials (paper clips, coins) to get balloon to hover
  - Apply breeze to pilot balloon to target
- Materials
  - Helium
  - Balloons
  - String/Yarn
  - Scissors
  - Hole punch (single)
  - Dixie cups
  - Decorating Materials (stickers, crayons, markers, etc.)
  - Weighted Objects (Large & Small Paper clips, String)
  - Air Source (battery operated fan)
    - Straw
    - Hand Fan
  - Target or finish line (row of desks to fly above)
- Supervision (Help)
- Room Requirements
  - Tables to assemble baskets to balloons
  - Open area to pilot balloon across room
- Award Measurement
  - Quickest balloon hovere
  - Quickest balloon pilot to reach target or cross finish line

Water STEM Activities

- **What Floats your boat? Buoyancy activity**
- **Wind Propulsion**
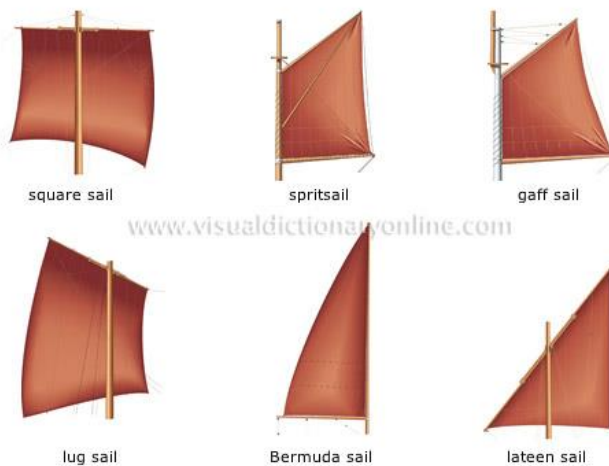- **Displacement**

What Floats your Boat?

- What Floats Your Boat? - Aluminum foil boat activity - deals with shape, buoyancy, etc. Can also be used as a contest to see what design can hold the most "cargo". Cargo can be pennies or washers, etc. Does design effect buoyancy?
- Purpose
  a. See Above
- Vetted (Time) – 50min
- Agenda
  a. Precut Aluminum Foil
  b. Review potential designs?
  c. Instructions
  d. Why does 1 design work better then others?
- Material
  a. Aluminum Foil
  b. Plastic Pool (kiddie)
  c. Towels (cloth rags)
  d. Tarp
  e. H2O
  f. Pennies (500ish)
  g. Scrap Paper / Pens
  h. Plastic Pitcher
- Supervision (Help)
  a. Folding and building ships
  b. Control of the kids
- Room Requirements
  a. Access to water
  b.
- Award Measurement

  Different Designs / Who can hold the most? / Float the longest?

Wind Propulsion

Use ivory soap to carve boats to determine the best design for speed. Talk about hull shape/ sail shape. Have Cubs design boats and race them in the raingutter track.

- Material
  - Ivory soap
  - Plastic butter knives
  - Paper for sales
  - Scissors
  - Straws/ popsicle sticks for sail mast
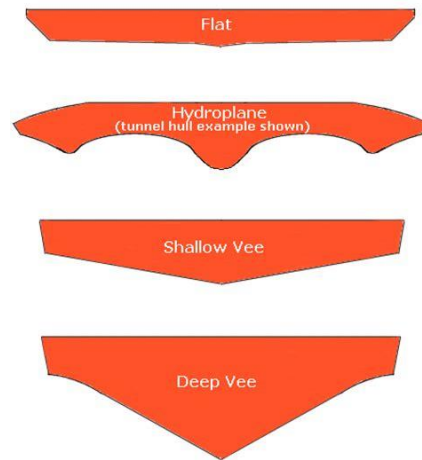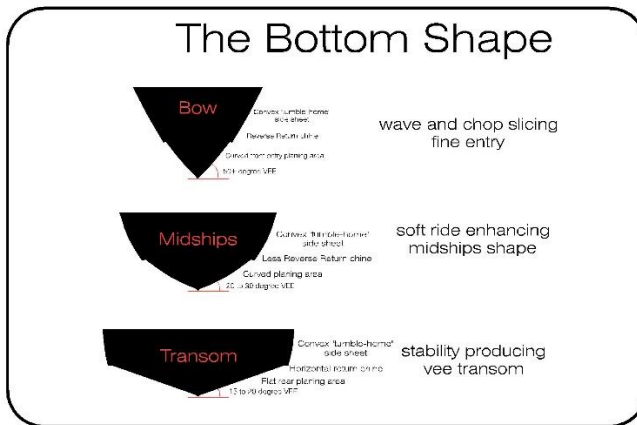
Displacement

- Measuring Displacement and Density of Objects in Water: When does something float or sink? This can be done in a variety of ways using a variety of items. Still have not narrowed it down. A simple way is with different fruits.

  - Purpose
    a. Measure displacement and volume. Put an object in a container and measure the rising of the water and measure the change. Block of wood, fruit, etc. Capture the displaced water and measure it.

  - Vetted (Time) – 50min
  - Agenda
    a. Container filled to the brim with water
    b. Put object in water
    c. Capture and measure water
    d. See what the density changes are
    e. Weight the fruit

  - Material
    a. Containers
    b. Objects
    c. Water
    d. Scale
    e.
  - Supervision (Help)
  - Room Requirements
  - Award Measurement
    a. Object to hover for the longest time (equilibrium)
    b. Neutral boyancy

Land STEM Activities
- Catapults
- Super Pinewood
- Lava Lamp

Catapults:

- Purpose
  - Design and Build a catapult. Launch projectile and try to knock down increasingly heavier targets
- Vetted (Time)
- Agenda
  - Brief explanation of catapult dynamics
  - Show a few different designs for ideas (Doesn't need to be best configuration)
- Materials
  - • Popsicle sticks (10-20 per catapult)
  - • Rubber bands (1-2 per catapult)
  - • Masking tape
  - • Plastic utensils (preferably spoons)
  - • String (cotton, or something else easy to tie and manipulate. Not absolutely necessary)
  - • Paper (construction and/or printer)
  - • Plastic or paper cups (as targets)
  - • Mini marshmallows (or another suitable projectile)
    - M&Ms
    - Jelly Beans
  - Targets

- Supervision (Help)
  - Assistance taping
  - Assistance measuring
- Room Requirements
  - Tables to assemble catapults
  - Space to shoot catapults
- Award Measurement
  - Best design
  - Heaviest target knocked down
  - Furthest shot
  - Most Accurate
- Additional Information:
  http://beam.berkeley.edu/sites/default/files/Mini%20Catapults%20Lesson.pdf

Super Lego Pinewood Derby:

- Purpose
  - Modify Lego Derby car to increase performance (Doesn't have to comply with standard rules)
- Vetted (Time)
- Agenda
  - Explain car dynamics
  - Discuss possible modifications
    - Slimming body
    - adding weight in certain places
    - Scoops
  - Design and make modifications for a pre-fabricated car (Probably best to have teams)
  - Race cars
- Materials
  - Pre-Fabricated cars (as templates)
  - Race Track
  - Legos
    - Weights
  - Designs printed out or up on the projector

- Supervision (Help)
  - Assistance designing modifications
  - Assistance building cars
- Room Requirements
  - Tables to design and make modifications on
  - Space for Race track
- Award Measurement
  - Best design
  - Fastest car

Lava Lamp

- Purpose
  - Create a Lava Lamp with home supplies
- Vetted (Time)
- Agenda
  - Explain how Lava Lamps work
    - Have a real lamp to show
  - Design bottles
  - Fill with Materials
  - Test reaction
  - See if reaction can be changed based on consistency
- Materials
  - Water
  - Clear plastic bottles – 25-50 bottles (drinking water)
  - Vegetable oil (Corey to test)
  - Food Coloring
  - Alka-Seltzer (Or other fizzing tablets)
- Supervision
  - Filling bottles
- Room Requirements
  - Water
  - Tables to assemble Lava Lamps
- Award Measurement
  - Best reaction?
- Additional Information: http://www.sciencekids.co.nz/experiments/easylavalamp.html
  - Can be brought home