



# Everyday Engineering: STEM@Home



GRADE LEVEL:  
ELEMENTARY AND  
MIDDLE SCHOOL

## Activity: Foil Boats



### MATERIALS:

- Aluminum foil square, recommended size: 6" x 6"
- Weights: Pennies, marbles, beans, LEGO figures will work. You just need something consistent.
- Water
- Pan, sink, bathtub

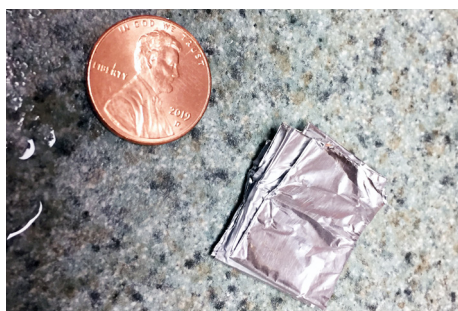


### DO THIS:

Take a single sheet of aluminum foil, 6" x 6" works well, and fold it flat, pressing out all the air.

Continue folding until you can't make it any smaller.

Will this little square of foil sink or float? *Try it!*



You should find that it sinks.

Now unfold the foil and fold it into a boat shape. Add some weight. You can use pennies, marbles, or even toy figures. How many weights can it hold?



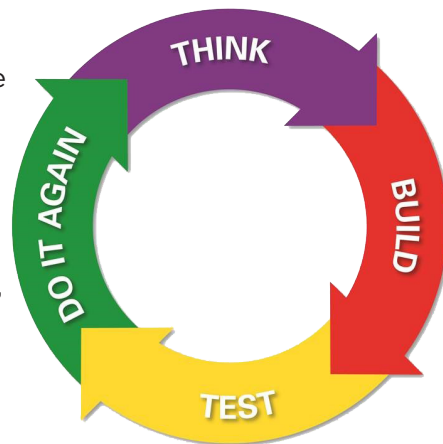
### TALK ABOUT THIS:

Can you redesign a foil boat to hold even more weight? What's the most weight it can hold? Engineers use the Engineering Design Process in solving problems. This means that they think about the problem, design a possible solution, test it, then try again to see if they can improve.

Why could the same piece of foil not only float, but hold even more weight? Water has a buoyant force that pushes up, while gravity is pushing down. By spreading out the weight of the foil (unfolding it) the water had more area to push up on, decreasing the density of the "boat."

Don't feel comfortable going into the concepts of buoyancy or density? That's okay! Focus more on the engineering design process of building, testing, and rebuilding based on what you've discovered.

Engineers are creative problem solvers. They are given a problem—build a boat. They are given constraints (limitations)—it can only be built from a piece of foil. Then they use their imagination to come up with an answer.





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One of the best things about working with something like aluminum foil is that no one feels upset when it doesn't work the first time. Kids laugh when the boat sinks and are eager to try to make a better one. *Make it a race!*

This is a great activity to do as a family because it's unlikely that the grown-ups can automatically do it perfectly. Make a leader board and allow everyone to build and test as many boats as they can in an hour. Talk about what you're doing, using the questions that are provided in the activity. Can you improve your design?

*Want more challenge?* Ask each person to predict how many pennies their boat will hold before they begin. Then score in two parts—half the score is by how close they are to the maximum weight, and the other half is based on how closely their final weight matches their prediction.



## WATCH THIS:

Watch one of the engineering marvels of the world as the Falkirk Wheel raises and lowers canal boats hundreds of feet. In the past, the boats had to make their way through a series of 11 locks which took an entire day. Now it can be accomplished in minutes!

[https://www.youtube.com/watch?time\\_continue=8&v=yBm2rz\\_YaKw&feature=emb\\_logo](https://www.youtube.com/watch?time_continue=8&v=yBm2rz_YaKw&feature=emb_logo)



## WANT TO GO FURTHER?

This activity and many others were developed in support of the award winning documentary *Dream Big: Engineering Our World*. This activity was adapted to showcase how to do it at home.

For more in-depth coverage download the Foil Boat activity from the Dream Big website, <http://discovere.org/dreambig/activities/db-activity/Foil%20Boats>. There you will find discussion questions for younger as well as older children, relevant vocabulary, and more.

*Dream Big: Engineering Our World* is available on Netflix and can also be obtained from Vimeo for \$6.99 for a 48-hour period of time or \$13.99 to view and download anytime.

The free library of over 65 activities and webisodes can be found at [discovere.org/dreambig](http://discovere.org/dreambig).

