FUNNY FORCES

TEACHER GUIDE

ACCELERATE

PLANNING

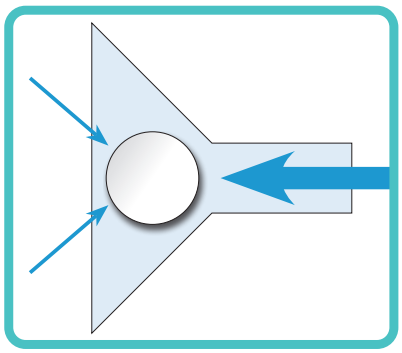
Here's a suggested schedule for this kit! The activities should be completed in order, but you can choose when the lessons take place over time.

ACTIVITY INFORMATION	SECTION(S)	TIME REQUIRED	DAY/ LESSON
ACTIVITY 1: PING-PONG PHENOMENON Can you keep a ball in the air without touching it? **Time required: 45 min**	☐ Free Floating	45 minutes	Day 1
ACTIVITY 2: WATCH ME FLOW Find out more about the forces that were pushing on the ping-pong ball. **Time required: 1 h 45 min**	☐ High Pressure Situation	45 minutes	Day 2
	☐ Go with the Flow ☐ Show What You Know	60 minutes	Day 3
ACTIVITY 3: BALANCING ACT Find out how forces can move other objects. **Time required: 1 h 45 min**	☐ The Tipping Point	45 minutes	Day 5
	☐ The Drop Zone ☐ Rubber Band Launch	60 minutes	Day 6
ACTIVITY 4: KEEP IT SIMPLE Learn about simple machines in everyday life.	☐ What i		

THINK ABOUT IT!

Question 1: Describe the motion of the ball when you blow fast and slow through the funnel.
Answer: Answers will vary. The ball shouldn't move out of the funnel if the student blows fast enough. However, the ball will shake and spin in the bottom of the funnel.
How to Help: *In Activity 1, the student was directed to draw markings on the ping-pong ball. This will help them describe the motion of the ball.*

Question 2: Draw a picture of the ball and the funnel pointed sideways. Add arrows in your picture to show the forces interacting with the ping-pong ball.



Answer:
• The student will draw the ball inside the funnel. The funnel opens to the side.
• Arrows should show the force of air blowing through the nozzle of the funnel and out between the sides of the ball. The student should also indicate the force of air pressure pushing the ball back into the funnel.
• The student may also draw arrows indicating the force of gravity pointing down, arrows showing the ball spinning, or small movements back and forth.

How to Help:
• *Encourage the student to use arrows for at least 2 forces. The diagram in the reading section shows multiple arrows pushing on the ping-pong ball, but one arrow in each direction is enough for the student to draw.*
• *In the next section, the student will receive more direction on drawing force diagrams.*

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GO WITH THE FLOW

PREPARATION AND SUPERVISION

■ Your student will hold a ball near running water to observe the ball being pushed into the stream of water.
■ Have your student adjust the stream of water until the motion of the ball is stable. Adjust the ball up and down the stream of water to find a balance point.
■ The ping-pong ball should be the most stable ball. The weight of the wood ball causes it to push through the stream of water, resulting in it swinging back and forth through the water.
■ Air molecules are pushing into the area of low pressure while the water is running. When the ball enters the stream of water, there is an additional force that pushes the water around the curved surface of the ball.
• The water follows the curve of the ball because of the Coandă effect, which affects the flow of fluids around curved surfaces. This is not included in the Student Workbook but may be useful in advanced discussion.
• If desired, the student can repeat the faucet experiment with the back of a spoon. Slowly move the curved side of the spoon toward the stream of water and observe the flow of water as it curves. This is similar to the flow of air over a curved airplane wing.

REFLECT AND REVISE

REFLECT

Question 1: Think about how well your incredible invention worked. Did it complete all the actions without interruption? Describe the issues you found with your invention.
Answer: Answers will vary based on the test results.
How to Help: Encourage your student to view their invention overall, and determine how many actions were successful and how many need improvements.

Question 2: Describe how your invention met the criteria and constraints of this challenge. Describe how your invention did not meet the criteria and constraints of this challenge.
Answer: Answers will vary based on the test results.
How to Help: *Check that your student uses evidence to make connections to the criteria and constraints.*

Question 3: How can you make your invention design better? Look at the notes you took in the last section to improve your design. Write or draw what changes you would like to make.
Answer: Answers will vary.
How to Help: *Check that your student has an evidence-based design before moving on to the revise phase.*

PREPARATION AND SUPERVISION

- Remind your student to gather new materials needed for their revisions before building. Then, they will test the revised design and write their observations in the table.
- As your student tests their design, encourage them to make minor adjustments or observe actions that stopped the flow.
- The **Reflect and Revise** section is part of the cycle in the engineering process. Encourage your student to be persistent in making improvements to their design. Let them know that engineers do not complete their designs on the first try.
- As mentioned in **Share Your Design**, encourage your student to take video of successful tests to share with family and friends. You may decide to help them to share their videos on social media.

STEM AND SOCIAL MEDIA

There are many benefits of using social media to talk about science, technology, engineering and math (STEM):

- It can inspire others to learn or do their own experiments, meaning that other families will be motivated to engage with science and technology.
- It shows that you think STEM is important, which will encourage your student to view STEM as an important part of their education, into college or their career choices.
- It builds a sense of community, showing anyone can do science. And that we can work together to make STEM accessible and enjoyable for everyone.

Don't be shy documenting or sharing your student doing science and engineering!

ACCELERATE

SCIENCE UNLOCKED

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Kit	SU-FUNFOR
Instructions	IN-FUNFORT
Revision Date	3/2022