GRADES 3-5

SNOOPY™ IN SPACE

Dear Educator,
Inspire your students to reach for the stars! Join Snoopy and Woodstock as they explore the International Space Station, go on a spacewalk, travel to the Moon, and dream about the journey to Mars in this STEM program based on the new ***Snoopy in Space*** series available now on AppleTV+.

Developed by the curriculum specialists at Young Minds Inspired (YMI) as part of a unique partnership between NASA and Peanuts Worldwide, these easy-to-implement classroom activities will engage your students with fascinating facts about space and the solar system, while boosting their creative problem-solving skills and reinforcing the value of teamwork and perseverance to succeed. And students can build on this classroom experience as they watch Snoopy achieve his dream of becoming an astronaut!

Please share this program with other teachers at your school. And let us know your opinion of the program by visiting ymiclassroom.com/feedback-snoopy-in-space. We look forward to your comments and suggestions.

Sincerely,

Dr. Dominic Kinsley
Editor in Chief
Young Minds Inspired

Program Objectives

- ★ To fuel STEM learning by tapping into students' interest in space and the appeal of the Peanuts characters to inspire creative problem solving
- ★ To instill enthusiasm for space exploration and future NASA endeavors
- ★ To motivate students to become active participants in the next phases of our nation's real-life space adventure

Target Audience

Students in grades 3-5

How to Use This Program

Download, photocopy, and distribute the three reproducible activity sheets to all students. Prepare the materials for each activity in advance. Have students take the sheets home to share the activities for families listed at the bottom of each sheet. Visit ymiclassroom.com/snoopy-in-space for standards alignment. Viewing ***Snoopy in Space*** episodes will enhance student engagement, but is not required to complete the activities.

Activity 1
All Aboard the ISS!

Students learn about thrust as they test balloon-powered straw rockets in class.

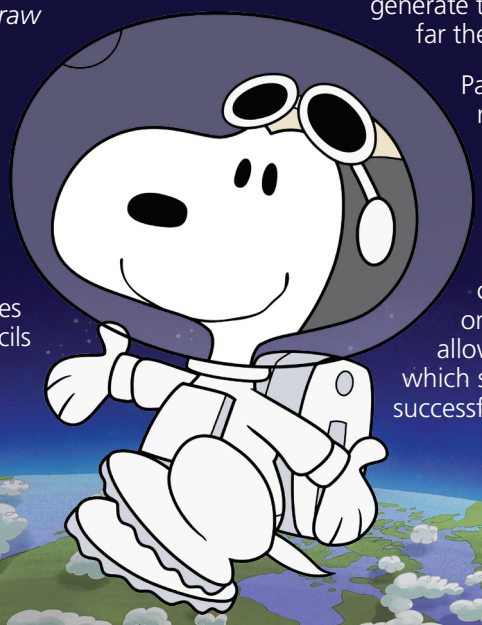
Materials needed:
1 textbook,1 pencil; Per group, 1 round and 1 long balloon, scissors, 1 piece of string or yarn about 10 feet long, 2 plastic straws (cut one in half), masking tape, copies of the activity sheet, pencils

Introduce the activity by having a student push a textbook to make it slide across a table. Then have them push the same book harder, using more force this time. Does the book slide faster the second time? Try the same experiment with a pencil. Did it take less force to move the pencil than the book?

Tell students that they just demonstrated Newton's Second Law of Motion: The acceleration of an object depends on the amount of force acting on it and the mass of the object. In other words, an object will move faster when it is pushed harder. And an object with less mass will move faster than an object with more mass when both are pushed with the same force. In this example, the book has more mass (weight) than the pencil, so it took more force to propel it across the table. (Note: This explanation does not take into account inertia and friction, which are also significant factors.)

In the exciting new Apple TV+ series ***Snoopy in Space***, NASA sends Snoopy to the International Space Station, or ISS, which orbits Earth. It takes a huge rocket and a lot of force to get him there. Rocket engineers call that force *thrust.* Tell students that they are going to work in small groups to design and test balloon-powered straw rockets. They will experiment to determine how much force is needed to move the straw rocket, how to generate that force or *thrust*, and how far the straw rocket moves.

Pass out the activity sheet, review the instructions, divide students into small groups, and pass out the materials. Allow about 30 minutes for students to engineer and test their designs, then complete the questions on the activity sheet. If time allows, have students discuss which straw rocket was most successful and why.



Questions? Contact YMI toll-free at 1-800-859-8005
or by email at feedback@ymiclassroom.com.

Next challenge students to describe how their test results might change in microgravity.

Explain that gravity is what pulls objects towards Earth. When you jump, gravity pulls you back down. Gravity always pulls on the space station to keep it in orbit. However, the space station is also going around the Earth, so it is free falling around Earth. Explain to students that they may experience free fall when they are on a swing. At the top of each swing, when they feel they are lifting off the seat, they are experiencing a moment of free fall. This is microgravity. The space station is constantly in free fall, so the astronauts onboard are constantly experiencing microgravity. Would microgravity have any effect on students' straw rockets?

Activity Sheet Answers: While answers will vary, here is an overview of anticipated results: **Test 1** – The movement of the air as it escapes from the balloon provides thrust; more thrust (or air) will make the straw rocket go faster. **Test 2** – The straw rocket will move faster and farther down the string. **Your Turn! (Test 3)** – If the balloon is filled halfway with air, the straw rocket will not travel as far along the string. Test results should show that the greater the force, the faster and farther an object moves. (Remind students that friction between the string and straw is also a factor in all three tests.)

Activity 2
Mission to the Moon!

Students learn about the connection between the lack of weather on the Moon and craters, then use creative problem-solving skills to help Snoopy and Woodstock get out of a crater they've fallen into.

Materials needed: copies of the activity sheet, pencils

Ask students to share what they know about the Moon. Tell students that in the new AppleTV+ series ***Snoopy in Space***, Snoopy is ecstatic to travel to the Moon. His mission? Measure Moon craters and collect Moon rocks.

Tell students that the Moon is covered with impact craters formed when space rocks crashed into the Moon. These bowl-shaped cavities or "dents" can be several miles wide and very deep. By measuring the size of craters, scientists can learn more about how the space rocks that hit the Moon have shaped its surface. This can help them understand the Moon's history. Because there is virtually no weather on the Moon, there is no wind or rain to disturb the craters.

Explain to students that during their Moon mission, Snoopy and Woodstock accidentally fall into a large crater. The walls are too steep to climb out, and although the gravity on the Moon is about one-sixth that of Earth, they cannot jump high enough to escape. All they have is an extendable golf club and a golf ball. How can they get out?

Pass out the activity sheet and divide students into small groups. For fun, invite them to guess how Snoopy and Woodstock use their golf equipment to escape the crater. (Answer: Woodstock sits on the golf ball, which Snoopy hits out of the crater. Then Snoopy extends the golf club and uses it to pole vault over the crater rim!) Have each group brainstorm a realistic way to escape the crater, listing the equipment they would need on the back of the worksheet and drawing a picture of how they imagine their escape method would work. Compare solutions in a class discussion and, if possible, have students experiment to test their escape ideas.

Activity 3
Ready, Set, Mars!

Students learn about NASA's plans for sending astronauts to Mars and what life will be like once they get there, then design a prototype of a Hab, or habitation module.

Materials needed: Per group: a small container of Play-Doh or clay, 3 sheets of construction paper or cardstock, 8-10 wooden craft sticks, a paper plate or tin pie plate to use as a base, and a roll of masking tape; a fan for creating "wind"; copies of the activity sheet, pencils

Tell students that Snoopy and Woodstock dream about a trip to Mars. But NASA won't be ready to send astronauts to Mars until they learn more about surviving there and can build a Hab (habitation module) where astronauts can eat, sleep, and perform experiments. The Hab will have to withstand winds that can blow up to 60 mph during dust storms that can last for weeks on Mars.

NASA scientists have been making prototypes of Martian Habs. When a prototype fails, it teaches scientists what to do next.

Tell students that they will engineer their own Hab prototypes. Pass out the activity sheet and review the instructions. Then divide students into small groups and pass out the materials. Allow about 30 minutes for students to engineer their designs. **Teaching tip!** Make the activity more challenging by creating a rule that students may not tape their structures to the surface of the plate or pie tin.

When students have finished their first prototype, test each one with the fan. Place the fan in front of each Hab so that it blows directly at the prototype. Try using a lower setting at first, then a higher setting, if the fan has different speeds. After students observe what happens to their Habs, help them brainstorm ways to improve their prototypes while learning from its failures. Allow students to make changes and test their prototypes again. Than have students complete the activity by drawing a picture of their best design and describing the changes they made to build it.

Resources

ymiclassroom.com/snoopy-in-space

***Snoopy in Space*:**
apple.co/snoopyinspace

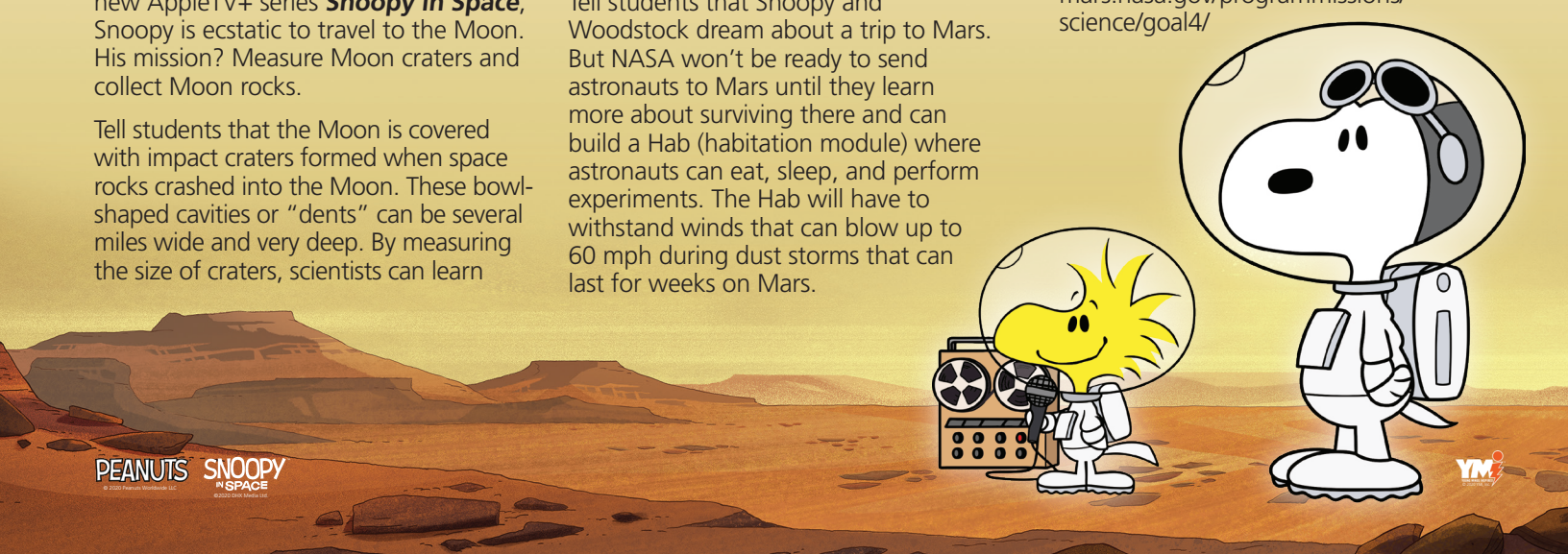
NASA on Microgravity:
nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-microgravity-58.html

NASA Science Space Place:
spaceplace.nasa.gov/craters/en/

NASA Science Solar System Exploration – Earth's Moon:
solarsystem.nasa.gov/moons/earths-moon/in-depth/

Kennedy Space Center – Lunar Geology:
science.ksc.nasa.gov/mirrors/arc/prospector/science/geologys.html

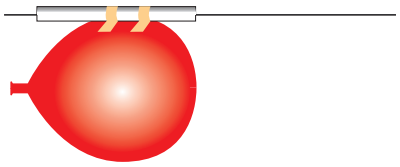
NASA Mars Exploration:
mars.nasa.gov/programmissions/science/goal4/



All Aboard the ISS!

In an exciting episode from ***Snoopy in Space*** on AppleTV+, Snoopy and Woodstock need a huge rocket to get them to the International Space Station, or ISS. As you've learned, Newton's Second Law of Motion tells us that it takes a lot of force, or thrust, to move such a big rocket. To learn more, you can experiment with balloon-powered straw rockets in your classroom.

Test 1: Using the materials your teacher gives you, follow these directions.



1. Tie one end of the string to a chair or other support structure.
2. Thread the other end of the string through one of the straws.
3. Pull the string tight and tie it to another support structure as directed by your teacher.
4. Blow up the **round** balloon, but do not tie off the end. How many breaths did it take? ___
5. Have one person pinch the end of the balloon closed and hold it, while another team member tapes the balloon to the straw on the string. The balloon should hang below the straw with the end parallel to the string.
6. Position the straw at one end of the string and let go of the end of the balloon to see how far and fast your rocket travels.

What force propelled your straw rocket?

_____

What could you do to make the straw rocket go faster and farther?

_____

_____

Test 2: Try the experiment again, using the **long** balloon with the same number of breaths as Test 1 and one of the half straws. Describe what happens. Was it what you expected? Why or why not?

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_____

Your Turn! Now try the experiment once more, changing one variable. For example, fill the balloon with half as many breaths or change the angle of the string. Use this template to record your results on the back of this sheet.

Test 3: Change made: _____

_____

What we think will happen: _____

_____

What happens? _____

_____

Test Results: On the back of this sheet, draw the straw rocket design that was most successful. Then discuss in class how this activity demonstrates Newton's Second Law of Motion.

Did you know? It takes astronauts like Snoopy about 6 hours to reach the International Space Station. What did Snoopy do when he got there? Find out by watching ***Snoopy in Space*** on AppleTV+, on the Apple TV app, or via apple.co/snoopyinspace.

Families: On a clear night, you can see the ISS with your own eyes. Visit spotthestation.nasa.gov to find out when the ISS will pass overhead near you.

Mission to the Moon!

Scientists can learn a lot about the Moon by looking closely at Moon rocks and by measuring Moon craters. Some Moon craters are very deep and miles wide, while others are small and shallow.

In the new AppleTV+ series ***Snoopy in Space***, one of Snoopy's missions on the Moon is to measure a large crater. Unfortunately, Snoopy and Woodstock fall into the crater and become trapped at the bottom. Although the gravity on the Moon is about one-sixth that of Earth, they cannot jump high enough to get out of the crater. Instead, they must use creative problem-solving to escape. But all they have with them is an extendable golf club and a golf ball.

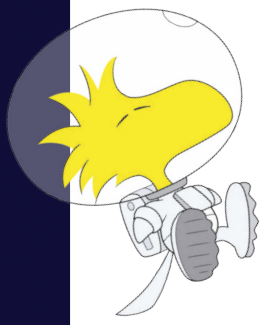
For fun, use your imagination to guess how Snoopy and Woodstock get out of the crater. Then brainstorm with your small group to come up with a real plan to escape the crater. List the equipment you would need on the back of this sheet. Then draw a picture of how you would get Snoopy and Woodstock to safety.

Did you know? The Apollo astronauts brought 800 pounds of Moon rocks back to Earth. Many contained large amounts of natural glass, which formed when meteors hit the Moon. What do Snoopy and Woodstock do with the rocks they find on the Moon? Find out by watching ***Snoopy in Space*** on AppleTV+, on the Apple TV app, or via apple.co/snoopyinspace.

Families: Make your own "Moon craters" at home, following the instructions at this link: jpl.nasa.gov/edu/teach/activity/make-a-crater/.

Ready, Set, Mars!

Snoopy and Woodstock are dreaming of a mission to Mars. But NASA scientists need to learn more about surviving on Mars before we send astronauts there. And they need to design a safe place for astronauts to live while they explore Mars. Scientists test their designs by making a prototype, or model. Some challenges on Mars are strong winds that can blow up to 60 mph during dust storms that can last for weeks. Martian habitats, or Habs, need to be strong enough to withstand these.



How would you keep astronauts safe from windy Martian dust storms? With your group, use the materials you've been given to build a prototype of a Hab that can stand up to the winds of a Martian dust storm. Then ask your teacher to test it with a fan. What happens when it encounters this "Martian wind"? Describe what happens below.

_____

_____

_____

_____

Failures give us clues about what to try next. Brainstorm ways to improve your Hab with your group, and then rebuild it. When you are ready, ask your teacher to test it with the fan again. What happens this time? Did your improvements work? Are there any more improvements you can make? Write your answers below.

_____

_____

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_____

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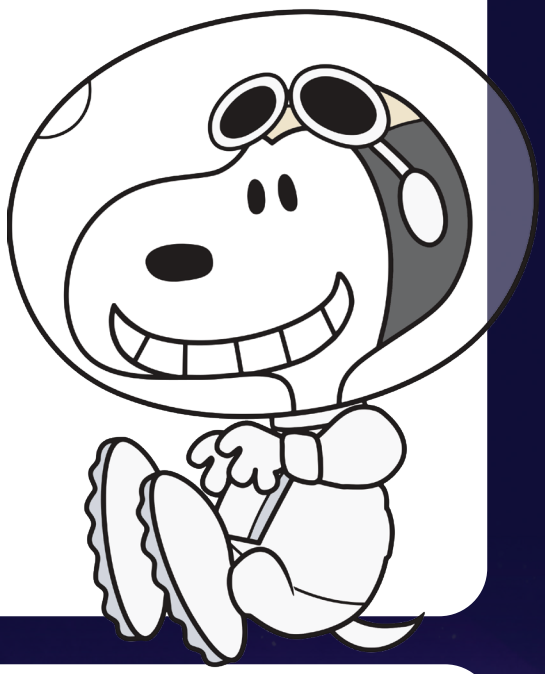

Continue to test and improve your prototype. Draw a picture of the final version of your prototype on the other side of this sheet, and list the improvements you made to your design.

Did you know? It will take about 9 months for astronauts to travel from Earth to Mars. Find out what the Peanuts gang learns about Mars and how they create their own Mars mission by watching ***Snoopy in Space*** on AppleTV+, on the Apple TV app, or via apple.co/snoopyinspace.

Families: Can you find Mars or any other planets in the night sky? Find out how you can locate planets in the night sky by visiting cfa.harvard.edu/skyreport.