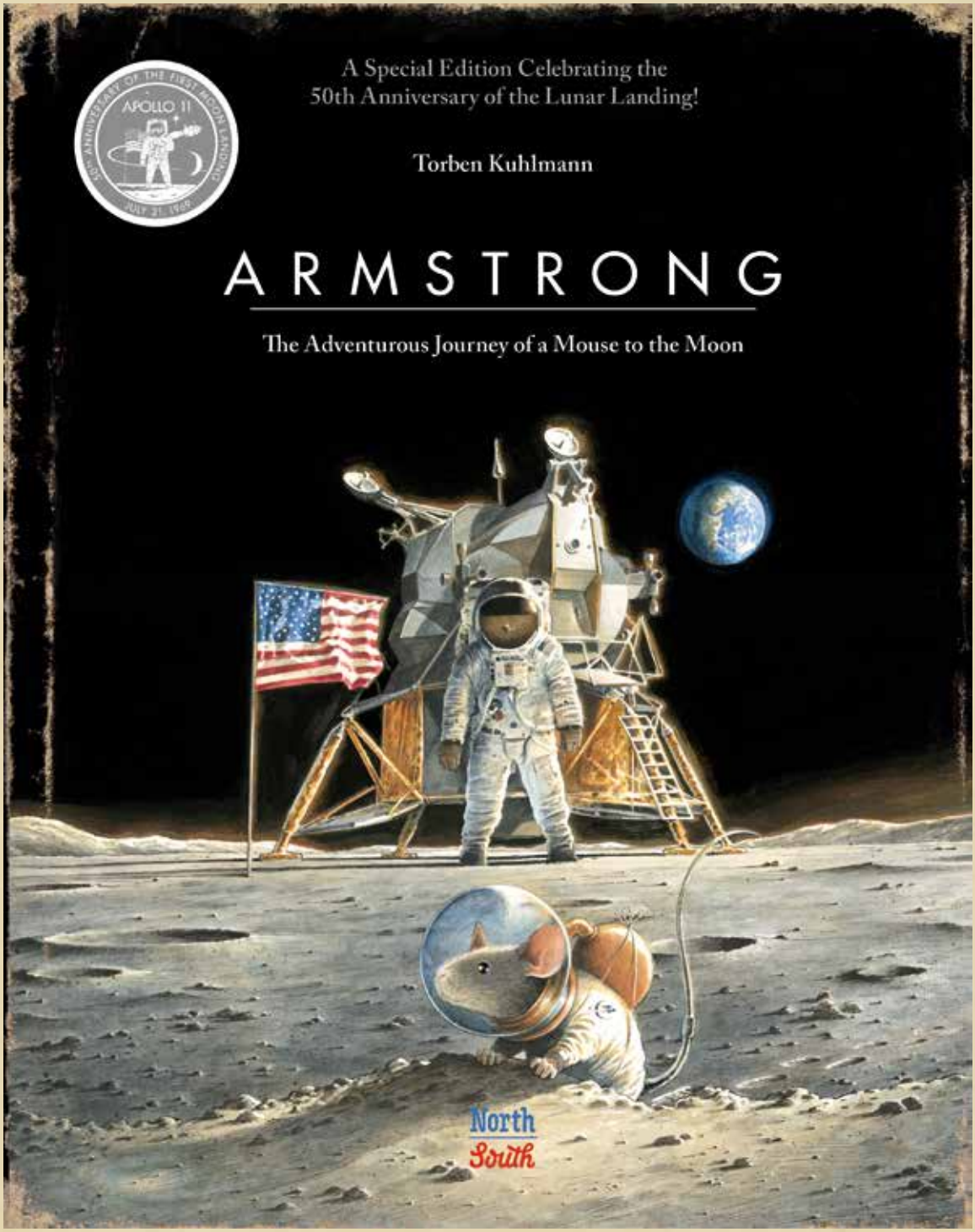
DISCUSSION GUIDE



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ARMSTRONG

The Adventurous Journey of a Mouse to the Moon

This 50th Anniversary edition transports readers to the moon and beyond.

A discussion guide grades 3-5

Before Reading—Building background knowledge
Essential Questions:
World History

- Who is Neil Armstrong?
- What contributions has he made to society?
- Why do we celebrate the 5oth anniversary of the 1969 Moon Landing?
- Why was the moon landing so important to Americans?
- Why is the "Apollo Program" considered NASA'S most important space program?
- What was happening in world history at that time?
- Why do competing world powers come into conflict?
- How did the United States get to the moon?
- What was the Space Race?
- Who were some of the important people and what were some important events in the Space Race?
- How was the Space Race symbolic of the Cold War for both the U.S. and the Soviet Union?
- How did the political climate of the mid 1900's give rise to the space race?
- What were the major space exploration milestones for the U.S. and Russia through 1975?

Science & Innovation

- How do we know what's "out there" in space?
- What features of the moon can be seen with the naked eye?
- What is the moon made of?
- How did the invention of the telescope unravel mysteries of the universe?
- What are technological developments; past and present that are related to space exploration?
- How has technology aided us in our study of the universe?
- Who were the big players? (Galileo Galilei, Sir Isaac Newton, Wright Brothers)
- What are the steps in the scientific Process?
- What are the steps to the Engineering and Design Process?

During Reading- Reading for purpose

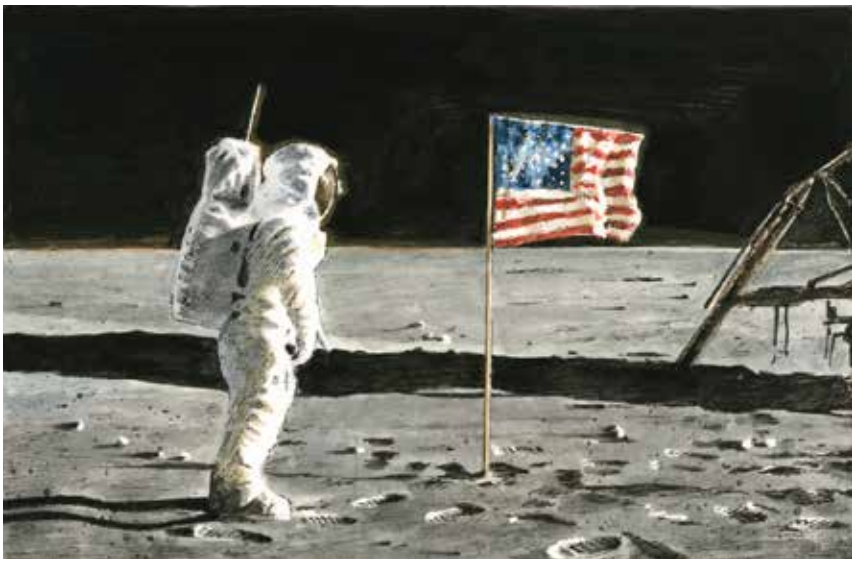
- Determine the themes or central ideas from ARMSTRONG using details in the book including how the characters in the story respond to challenges.
- As you read the story, what famous figure in American history are you thinking about?
- Think about how the main character, Little Mouse tries to prove to the other mice what the moon is made of. Why is this difficult?
- Have you ever tried to convince someone about something and they were not open to believing?
- What kind a person/mouse is the main character? What are the hopes, dreams, fears, talents and beliefs of Little Mouse?
- Summarize the chapters in the text. Explain how the chapters fit together to provide the overall structure of the story.
- Compare and contrast two or more events in the story drawing on specific details in the book; Designing a space suit & building a rocket ship
- Determine the meaning of words and phrases as they are used in the book including figurative language such as metaphors and similes.

"At first it hung in the sky fat and round."
"The capsule groaned and began to shake."
"Like a beautiful blue-green jewel", whispered the Little Mouse admiringly.

- How does How does Torben Kuhlmann use "personification" and "humor" in the book?
- Why is *ARMSTRONG* considered "science fiction"?
- Describe how Little Mouse's point of view influences how events are described.
- Analyze how the detailed illustrations contribute to the meaning, tone, and beauty of *ARMSTRONG*.
- What did Little Mouse invent? What problem was he trying to solve?
- Success often involves qualities such as hard work, persistence, and commitment. How does Little Mouse become successful in the story?
- How did the letter from the Professor change his trajectory or thinking?
- Inventions can have far-reaching effects. What inventions were needed before astronauts could travel to the moon?

Why is this quote so important in history? Explain; who, what, where, when, and why

"That's one small step for a man, one giant leap for mankind."



Plan, design and create a T shirt or a poster for the celebration of the 50th Anniversary of the First Moon Landing on July 20th, 2019

EXAMPLES

After Reading

Making connections to text: Go back to the story, ARMSTRONG. How does Little Mouse use the Scientific Method and the Engineering and Design Process to answer questions about the moon and solve problems on how to get to the moon?

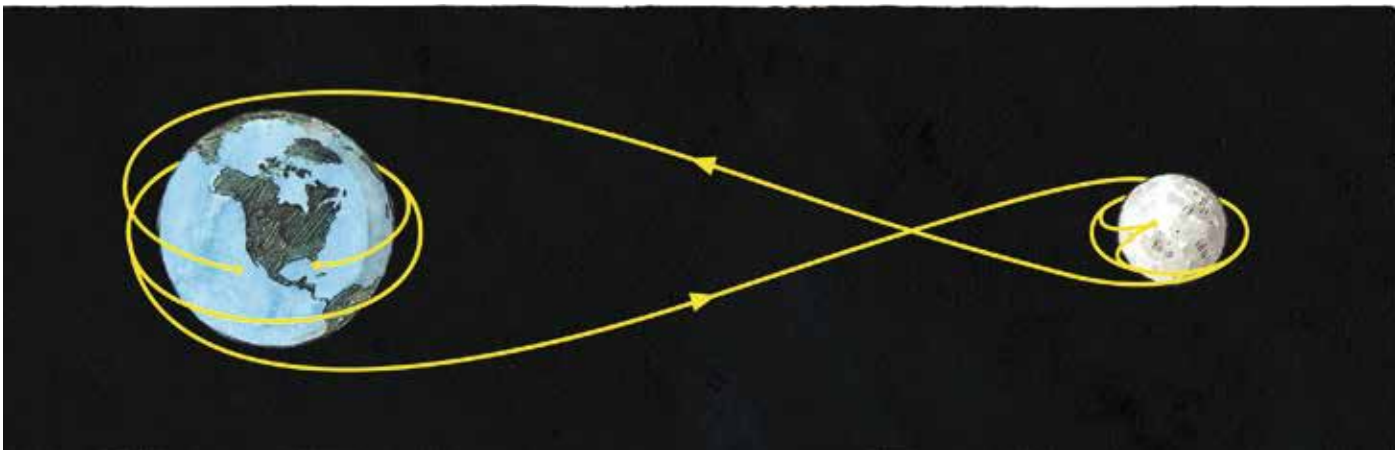
How are the two processes alike and different?

Steps in the Scientific Process

Step 1: Ask a question
Step 2: Do background research
Step 3: Construct a hypothesis- try to make an educated guess about step 1.
Step 4: Test your hypothesis by doing an experiment
Step 5: Analyze the data and draw a conclusion
Step 6: Share your results

Steps to the Engineering and Design Process

1. Define the Problem
2. Do Background Research
3. Specify Requirements
4. Brainstorm Solutions
5. Choose the Best Solution
6. Do Development Work
7. Build a Prototype
8. Test and Redesign

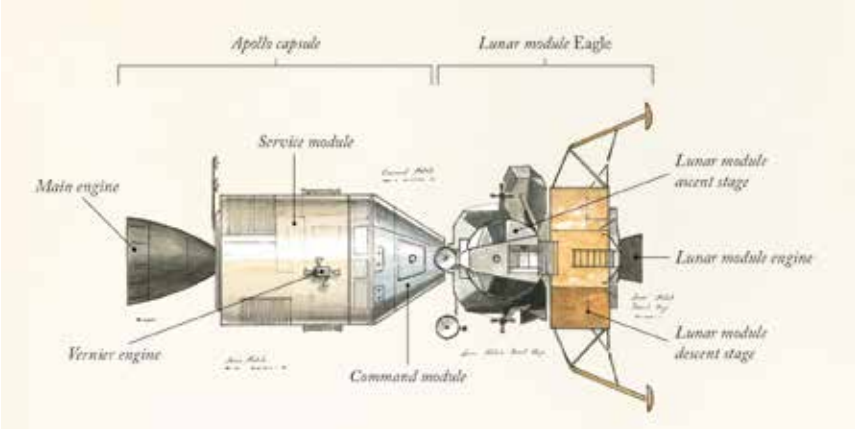


COLLABORATIVE RESEARCH PROJECTS-

1. Create a Power Point presentation on one of the topics below

   - ✓ Describe how Cold war tensions between the United States and the Soviet Union following World War II precipitated the "Space Race".
   - ✓ Describe the political, economic and social responses of the United States to the launch of the Sputnik satellite by the Soviet Union.
   - ✓ Identify the key events in the "Space Race" and evaluate the impact of each on the race to the moon.
   - ✓ Analyze primary sources to understand President Kennedy's "man on the moon" initiative.
   - ✓ Evaluate the successes and failures of the United States' space program from the late 1950's to the present. Create a timeline.

2. In small groups, create a play, short film, commercial, radio broadcast or other multimedia presentation for the 50th anniversary of the "First Moon Landing" in 1969.
3. Research the life and accomplishments of Neil Armstrong. Create a timeline of his life
4. Compare and contrast books written by Torben Kuhlmann; *Lindbergh, Armstrong* and *Edison* on their approaches to similar themes and topics AND compare and contrast the overall structure; chronology, comparison, cause/effect, problem/solution of events, ideas, concepts, and information from the texts.



NASA Touchdown STEM Activity

The Apollo 14 Lunar Module was the third crewed vehicle to land on the moon. It carried two astronauts, Commander Alan B. Shepard Jr. and Lunar Module pilot Edgar D. Mitchell, the fifth and sixth men to walk on the moon. Image credit: NASA

Overview

In this challenge, students will use what they know and can investigate about gravity, motion, and forces to design and build a shock-absorbing system that will protect two "astronauts" when they land. Just as engineers had to develop solutions for landing different vehicle types on the moon and Mars, students will follow the engineering design process to design and build a shock-absorbing system out of paper, straws, and mini-marshmallows; attach their shock absorber to a cardboard platform; and improve their design based on testing results.

Materials- (per lander)

1 piece of stiff paper or cardboard - approximately 4 x 5 in (10 x 13 cm)

1 8 oz - 12 oz paper or plastic cup

3 index cards - 3 x 5 in (8 x 13 cm)

2 regular marshmallows

10 miniature marshmallows

3 rubber bands

8 plastic straws

Scissors

Tape (1 meter per lander)

Background

Landing on the moon is tricky. Since a spacecraft can go as fast as 18,000 miles per hour (29,000 km per hour) on its way to the moon, it needs to slow down in order to land gently. And if there are astronauts on board, the lander needs to keep them safe, too.

Procedures

Introduce the challenge

Tell kids why a spacecraft that can land gently is important for getting astronauts to and from the moon safely.

NASA is looking for safe landing sites on the moon. Once they find one, they need to design and build a spacecraft that can land there without injuring astronauts or damaging the spacecraft. Today you'll make a lander—a spacecraft that can land safely when you drop it on the floor. As you test, you'll find ways to make it work better. Improving a design based on testing is called the engineering design process.

Show kids the spring made out of an index card.

When you jump off a high step, you bend your back and knees to absorb some of the energy and break your fall. That's what a shock absorber does—absorbs the energy of an impact. Soft things, like marshmallows, cotton balls, foam, and bubble wrap absorb shock well. You can also use paper, like this index card made into a spring by folding it like an accordion.

Brainstorm and design

What kind of shock absorber can you make from these materials to help soften a landing? Mini-marshmallows can serve as soft footpads. Cards can be folded into springs. Straws can provide a flexible structure. Rubber bands can flex and hold things together.

How will you make sure the lander doesn't tip over as it falls through the air? Making the parts below the platform weigh more than the parts on the top helps the lander fall straight down. Also, it helps to evenly distribute the weight on top of the platform.

Build, test, evaluate and redesign (35 minutes)

1. Design a shock-absorbing system - Think springs and cushions.
2. Put your spacecraft together - Attach the shock absorbers to the cardboard platform.
3. Add a cabin for the astronauts - Tape the cup to the platform. Put two astronauts (the large marshmallows) in it. Note: The cup has to stay open—no lids!
4. Test, evaluate and redesign - Drop your lander from a height of one foot (30 cm). If the «astronauts» bounce out, figure out ways to improve your design. Study any problems and redesign.

Some problems that may occur-

Tips over when it drops: Move the cup slightly away from the side that's tipping. Or, reposition the parts of the shock-absorbing system to better balance the weight.

Bounces instead of landing softly: Change the size, position, or the number of shock-absorbing parts. Kids can also add mini-marshmallows for landing-pad feet. Or, they can use marshmallows at key junctions in the lander's frame to help absorb energy.

Share-Have the kids show each other their landers and talk about how they solved any problems that came up. Emphasize the key ideas in the challenge by asking the discussion questions below.

Discussion

What forces affected your lander as it fell?
It accelerated [sped up] as it fell due to the pull of gravity. Air also pushed on it, and this air resistance slowed it down.

After testing, what changes did you make to your lander?
(Answers will vary.)

Engineers' early ideas rarely work out perfectly. How does testing help them improve a design?
Testing helps you see what works and what doesn't. Knowing this lets you improve a design by fixing the things that aren't working well or could work even better.

What did you learn from watching others test their landers?
(Answers will vary. But in general, kids will see that there are many ways to successfully tackle a challenge.)

The moon is covered in a thick layer of fine dust. How might this be an advantage? A disadvantage?
If the dust layer is soft, it would help cushion a landing. However, if it is too soft, a lander could sink into it and get stuck. Also, the lander's rocket engine could send up clouds of dust, which could get into the machinery and cause it to jam or malfunction.)