

Teacher Edition

By Dr. Laurie Boulden & Katherine Lamar

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Explorations into the US Space Program



**U.S.
ASTRONAUTS:**
*In their own
words*

**STEM
COMPONENT:**

Build Your Own
Paper Rocket

The US Space Program has had an impact on the world.

*In this booklet, we introduce elementary students to ideas, ideals, influences, and imaginations of our space program using **primary sources**. The accompanying teacher guide indicates specific standards and objectives for the booklet.*

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It is important to note that the language of the personal narratives may include terms that are not commonly used in today's culture.

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From the Library of Congress:

Primary Source – The raw materials of history,
original documents and objects which were created in the time under study

Secondary Source - accounts that retell, analyze, or interpret events,
usually at a distance of time or place.

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* Student Favorite

Warm Up: Moon Landing (10 min)

ACTIVITY:

1. Have students use magnifying glasses/hand lenses to investigate the **IMAGE** individually or in pairs.

2. **OBSERVE:** Demonstrate circling a detail.

Give students **2 MINUTES** to circle details as you read the **Guiding Questions**. Discuss observations.

Make sure students are focusing just *facts*, *not* opinions or connections.

3. **REFLECT:** Demonstrate drawing a line and captioning.

Give students **2 MINUTES** to draw lines and caption items. Discuss using the **Guiding Questions**.

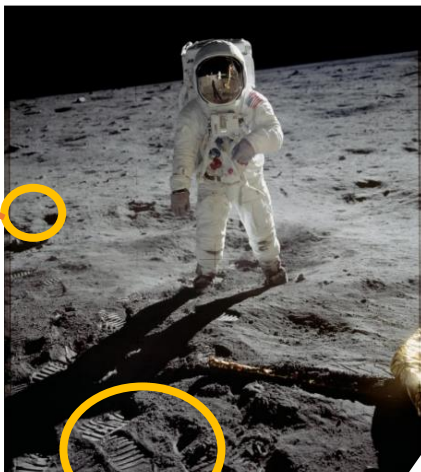
Highlight adaptations humans have made to survive in space and how this image might influence behavior.

4. **WRITE:** Have students write **an Observations, a Reflections, and 3 Questions** in the space provided.

5. **WONDER:** Use the **Guiding Questions** and discuss student questions. Refer to the **CAPTION** to correct assumptions.

Explorations into the US Space Program

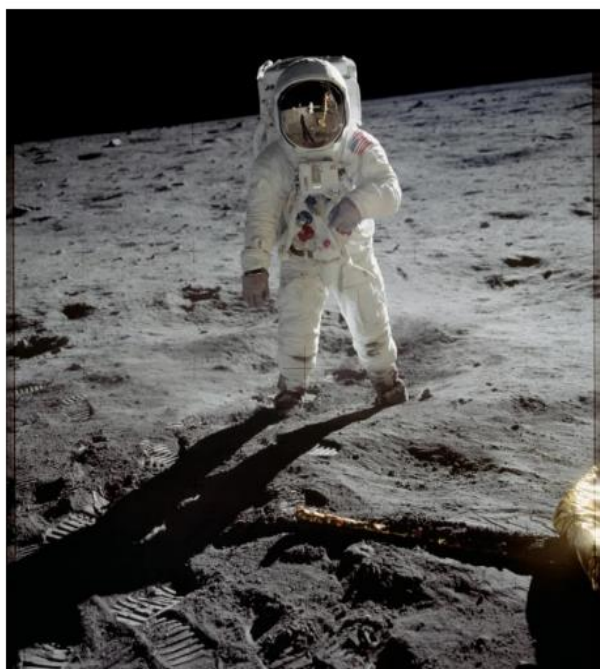
Moon
has
craters



Moon Landing Examine the image on the cover.

OBSERVE (facts & details)	REFLECT (connections)	WONDER (questions)
Circle important details	Draw lines to details that spark connections & write captions.	Compose 3 Questions.
Guiding Questions:	Guiding Questions:	Guiding Questions:
What do you notice first?	Why was this image made?	What would you ask the creator of this image?
Are there any symbols, words, or numbers?	What can you learn about the U.S. Space Program from examining this image?	What would you ask a person in this image?
What do you notice that others might miss?	What's missing from this image?	What are you wondering about right now?
What do you notice that you can't explain?	How might this image be different if it was made today?	
My Observations	My Reflections	My Questions
	image made to influence people to become astronauts.	Who is taking the picture?

Explorations into the US Space Program



CAPTION:

This is a photograph taken in July 1969 by Neil Armstrong (1st Man on the Moon) of his crewmate, Buzz Aldrin (Shuttle Pilot) on the moon. This is the first time humans have visited another celestial body. The Apollo 11 astronauts stayed on the moon for 21 hours and 36 minutes. This image shows 2 horizons – the one behind Buzz and the one behind the photographer as they stand in the “Sea of Tranquility” beside the gold colored lunar lander. The reflection in the helmet is more yellow because these visors are lined with gold to protect the astronauts’ eyes.

REFLECTION:

This photograph is often hailed as one of the greatest photos of all time. The astronaut takes the role of the “everyman”- you cannot tell whether the astronaut is a man or woman, the astronaut could be you! The photograph is complex, showing two explorers looking at each other on an alien world. It shows how humans adapt to a radically different environment.

It shows humanity changing and becoming something new...an astronaut!

OBSERVE examples:

Reflection in Helmet
Flag on Shoulder
Shadow
Footprint
Black Background
Small Rock
Gold Thing

REFLECT examples:

*This is a photograph.
This is a U.S. Astronaut.*

*Feels cold, no air, astronaut
adapts with spacesuit.*

*Dirty shoes means the
astronaut has gone for a walk.*

Proof of getting to the moon.

*Influence to join Space
Program.*

*Astronauts use machines like
jet packs.*

There are multiple Astronauts.

*The sun, earth, water, and rest
of the gold thing is missing.*

*The color of the space-suit
might be different today.*

WONDER examples

What is the gold thing?

**How long did you stay on
the moon?**

**Did you use a special
camera?**

**How did you get there?
(Rocket)**

This is a **Thinking Routine** developed by the Library of Congress called “**Analyzing Photographs & Prints: Observe, Reflect, Question.**” It addresses the following standards*:

ELA 3 R.2.3
ELA 4.R.2.3.
NCSS 2.E.

ELA 5.R.2.3.
SC 5.L.17.1
NCSS 1.C

G K12 6.2.4b
G K12 4.2.2
G K12 4.2.3d

SS 3 A.1.1
SS 5 A.1.1
VA 5 C.1.2 *see Appendix 2

Activity: Astronaut Images & Quotes (15 min)

ACTIVITY:

1. Students use magnifying glasses to examine the **PRIMARY SOURCE** images, quotes, and answer the questions.
2. DISCUSS: student findings and questions. Highlight the diversity of astronauts and the flag in each picture.
3. ASK: *Heroism means great bravery. Patriotism means loving your country.*

How do astronauts demonstrate heroism and patriotism? What do astronauts “give” to their community?

* Full Page Worksheet in Appendix 1

Page | 3
Page | 4
Page | 5

My Questions:

What does an Astronaut Look Like?

Astronauts are people who explore space. Most astronauts work for a government group called NASA: National Aeronautics and Space Administration. Some astronauts travel into space on rockets or a shuttle (from 1981-2011). Some even live and work in space at the International Space Station.

The previous page are images of astronauts. Look at them closely. See if you can find some special details.

Aeronautics- the science of studying air, traveling through it.

Administration- running an organization, making decisions, getting things done.

Examine the images. Use a hand lens. Think about what you see.

In Their Own Words

As astronauts leave the bounds of earth and step into the wonder of space, there are thoughts, ideas, ideals, and ponderings they share about their experiences. Read the quotes and complete the activities. Let your imagination soar.

Neil Armstrong: I believe every human has a **finite** number of **heartbeats**. I don't intend to waste any of mine.

Sally Ride: The stars don't look bigger, but they do look brighter.

Sunita Williams: I think that when we really leave the planet— we all go as humans, not as people from one country or another. We are humans; we work together. This is our only planet as human beings that we know of. So we all should have an interest in **preserving** it.

Kalpana Chawla: The path from dreams to success does exist. May you have the vision to find it, the courage to get on to it, and the **perseverance** to follow it.

Which astronaut quote on this page do you find most interesting? Why is that?

Finite - limited number, not going to last forever

BIG IDEA: Finite number of heartbeats means our hearts will only beat for so long.

Astronaut Armstrong wants to do as much as he can with his lifetime. What do you want to do with your lifetime?

Preserving - saving

Astronaut Williams says we should act to save the Earth.

Perseverance - Keep going even if you are tired

Astronaut Chawla says when you have a goal, keep going to achieve your goal.

Analyzing these **Primary Sources** addresses the following standards*:

ELA 3.R.1.3
ELA 4.R.1.3
ELA 5.R.3.3

SS 3 AA 1.1
SS 4 AA.1.1
SS 4 A.1.1 & 2

NCSS 10.a
G K12 1.3.1

SS 3 A.1.1
SS 5 A.1.1
*see Appendix 2

SPACE PROGRAM TIMELINE:

1957 – The Soviet Union launched Sputnik, the 1st Satellite, into space. Laika – a dog – became the first cosmonaut.

1958 – NASA is created
Explorer 1 was the 1st U.S. Satellite

1961 – Russian Cosmonaut Yuri Gagarin was the 1st Human in Space. Alan Shepard was the 1st U.S. Astronaut in space.

1969 – Neil Armstrong and Buzz Aldrin are the 1st Men on the Moon

1983 – **Sally Ride is the first female astronaut, Guion “Guy” Bluford is the 1st African American in space**

1998 – The International Space Station is launched

2010 – Space X is the 1st private company to successfully launch and land a space craft

2019 – U.S. Space Force created

Highlighting Minorities:

Women, African Americans, and other minority individuals have played key roles in the Space Program

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My Questions:

Key to Astronaut Images

John Glen	Nick Hague	Sunita Williams
Joseph Acaba	Neil Armstrong	Stephanie Wilson
Jonny Kim	Anil Menon	Jeanette Epps

What does an Astronaut Look Like?

Astronauts are **heroic** scientists and pilots who explore space. Some have special knowledge about medicine and machines. Most work for a government group called **NASA: National Aeronautics and Space Administration**. Astronauts can travel into space on rockets or a space shuttle (from 1981-2011). Some even live and work in space at the International Space Station.

Look at them closely at the images of astronauts. Can spot some special details?

Heroic – very brave

Aeronautics–

the science of studying how to traveling through air

Administration–

running an organization; making sure tasks gets done

Patriotic – love of country



Analyzing Images	Examine the images of astronauts on the previous page. Use a hand lens if it helps you see details better. Think about what you observe. Answer the questions.
What are some things they all have in common?	American Flag, long sleeves, pose, patches on clothes, confident
What differences do you notice?	Age, gender, race, smiling/not, clothes color, jetpack, direction they are looking
What symbols do you notice?	NASA, stripes, orbits, wings, stars
How do these images show that astronauts are heroic and patriotic?	

IMPORTANT QUESTIONS:

Being an astronaut is **risky**. There is a chance they could experience loss or harm. **What might an astronaut lose?**

NASA is part of the EXECUTIVE BRANCH of the FEDERAL Government. **Because it is in the FEDERAL EXECUTIVE branch, who is in charge A. President or B. Governor?**

A

(The governor is the executive in FLORIDA not the USA.)

The U.S. Space Program attracts people and business into the state of FLORIDA. **Why might people and businesses come to FLORIDA?**

To be astronauts and to be tourists watching the launch

These questions fulfill the following standards:

SS 4 FL 6.1 SS 4.CG.3.1,
SS 4 E 1.2, SS 4 A.8.4

Each mission has a unique patch. This is the Apollo patch.

Students can research astronauts patches to learn more about them.

<https://www.nasa.gov/gallery/human-spaceflight-mission-patches/>

How do these images show that astronauts are heroic?

- **They show the astronauts in their space-suits.** It takes bravery to be an astronaut because it is dangerous to go into space. The space-suit shows they are going into an environment with no air.
- **They show shuttles or jet packs in the background.** The images of the big rockets and shuttle are intimidating. Astronauts are propelled by very flammable gas that comes from these tanks.
- **They show the astronauts smiling.** Smiling in the face of danger can be an example of bravery.
- **They show the "hero pose."** The "hero pose" is an image taken from a lower angle looking up at a person who is either confidently looking up or straight out (see the astronaut in the yellow space-suit).

How do these images show the astronauts are patriotic?

Every astronaut is pictured with at least one American flag. Most are smiling.

In Their Own Words

As astronauts leave the bounds of earth and step into the wonder of space, there are thoughts, ideas, ideals, and ponderings they share about their experiences. Read the quotes and complete the activities. Let your imagination soar.

Neil Armstrong:

I believe every human has a **finite** number of **heartbeats**. I don't intend to waste any of mine.

Sally Ride:

The stars don't look bigger, but they do look brighter.

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BIG IDEA:

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Astronaut Armstrong wants to do as much as he can with his lifetime. What do you want to do with your lifetime?

Preserving - saving

Astronaut Williams says we should act to save the Earth.

Perseverance - Keep going even if you are tired

Astronaut Chawla says when you have a goal, keep going to achieve your goal.

Buzz Aldrin:

I still say 'shoot for the moon, you might get there.'

Yuri Gagarin:

I see Earth! It is so beautiful.

Jim Lovell:

There are people who make things happen, there are people who watch things happen, and there are people who wonder what happened. To be successful, you need to be the person who makes things happen.

Scott Kelly:

The Earth is a beautiful **planet**. The **space station** is a great **vantage point** to observe it and share our planet in pictures. It makes you more of an **environmentalist**.



Planet - circular object at least 2000 km wide that orbits the sun. Earth is one of 8 planets orbiting our Sun.

Vantage Point - a place where you are able to see clearly

Astronauts in space are able to see Earth like we are able to see the Moon.

Environmentalism - Person who cares for an area of land, water, plants, and animals.

When you stand in a field you are standing in an environment.

Astronaut Kelly says seeing Earth from space makes him care more about the environment and Earth as a whole.

The International Space Station allows astronauts from many countries to live and work in space for weeks, months, and even years!

What do astronauts "give" to their community?

What character trait helps astronauts succeed?

What can you do to develop these traits in yourself?

Individually, pages 5 and 6 take 3-5 minutes.

It may be used as an extension while more thoughtful students focus on the previous questions.

You may also identify THEMES in each quote (ELA.3.R.1.2):

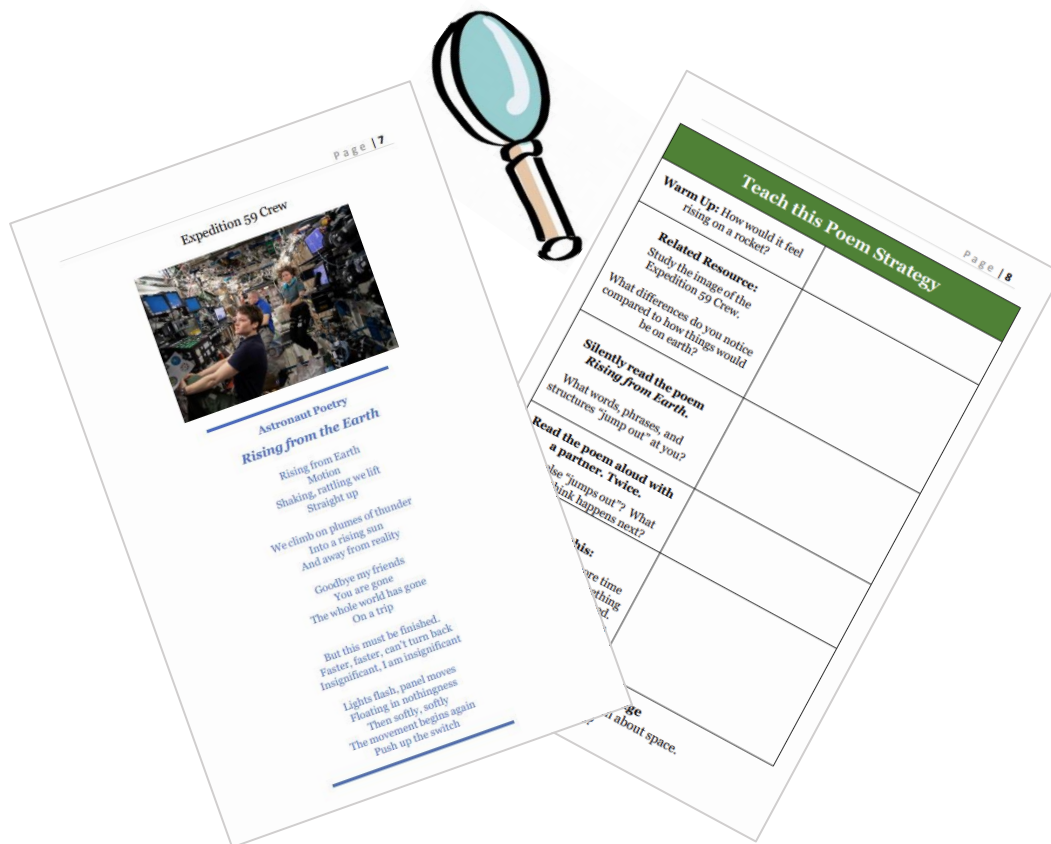
- Being Finite or the Fleeting Nature of Life (Armstrong),
- Perspective (Ride, Chawla),
- Unity (Williams),
- Perseverance (Chawla, Kim),
- Being Proactive (Lovell),
- Preservation (Williams, Kelly),
- Courage (Chawla, Lovell).

Poem: Rising From The Earth (15 min)

ACTIVITY:

1. **CLASS:** Briefly discuss the Warm Up.
2. **INDIVIDUALS:** Use magnifying glasses to examine the **PRIMARY SOURCE** images, quietly read the poem and answer the questions in the spaces provided.
3. **PAIRS:** Read the poem together and complete the “Teach this Poem” Organizer.
4. **DISCUSS** student discoveries and questions.

* Full Page Worksheet in Appendix 1.



Completing the **Teach This Poem Strategy** addresses the following standards*:

NCSS 4.g.
NCSS 4.h
NCSS 6.g

ELA 3 R.1.4
ELA 4 R.1.4
ELA 5 R.1.4

ELA 3 C.1.2
ELA 4 C.1.2
ELA 5 C.1.2

ELA 3 R.2.1
SS 3 A.1.1
SS 5 A.1.1

IMAGE ANALYSIS

What role does technology play in this image?

How might this technology contribute to problems?

How may it help solve problems?

These questions fulfill the following standard:
NCSS 6.g

STRUCTURE

Is this poem an example of
A. chronological order or
B. comparison?

A.

Why did the poet choose to make the poem structure long and skinny?

To match the content,

To make it look like a space shuttle or the cloud left behind after lift-off

This shape makes the poem more meaningful!

These questions fulfill the following standards:
ELA 3.R.2.1
ELA 4.R.1.4

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Expedition 59 Crew**Astronaut Poetry*****Rising from the Earth***

Rising from Earth
Motion
Shaking, rattling we lift
Straight up

We climb on plumes of thunder
Into a rising sun
And away from reality

Goodbye my friends
You are gone
The whole world has gone
On a trip

But this must be finished.
Faster, faster, can't turn back
Insignificant, I am insignificant

Lights flash, panel moves
Floating in nothingness
Then softly, softly
The movement begins again
Push up the switch

FORMAT

Is this poem an example of Haiku, Rhymed Verse or Free-Verse?

Free-Verse:

(ELA 3.R.1.4)

FIGURATIVE LANGUAGE

"plumes of thunder"

INTERPRETATIONS:

Plume – something resembling a feather
With this definition, "thunder" becomes a bird and the astronaut can climb on its back.

Plume – a cloud from a volcano With this definition, the sound of thunder is so loud it seems visible and solid to the astronaut.

"Plumes of thunder" is an example of A personification or B. metaphor?

B

This fulfills the following standard:
ELA 4.R.3.1
ELA 5 R.1.4

Why does the astronaut respond in this way?

"I am insignificant" Possibility: In comparison with the overwhelming speed the astronaut feels he can't turn back or stop the launch even if he wanted to. In comparison with the launch experience and the vastness of space the astronaut feels small.

"Push up the switch" Possibility: The astronaut is beginning his job after the launch, he is significant again. The astronaut wants to keep moving.

This fulfills the following standard: NCSS 4.g.

Teach this Poem Strategy	
Warm Up: How would it feel rising on a rocket?	Bumpy, Exciting, Scary, Adventurous, Exhilarating
Analyze: <i>Study the image of the Expedition 59 Crew.</i> What differences do you notice compared to how things would be on Earth? How might the technology you see contribute to or help solve problems?	They are floating. They are surrounded by computer monitors and wires they might bump into. The technology could help them survive space. There are multiple women in a tiny room. The technology might keep them busy so they don't noticed being cramped as much.
Silently read the poem <i>Rising from Earth.</i> What words, phrases, and structures "jump out" at you?	Varies: Rising, insignificant, plume of thunder, floating in nothingness. switch
Read the poem aloud with a partner. Twice. What else "jumps out"? What do you think happens next?	Varies
Illustrate: Read the poem one more time and draw a picture of something the author saw or experienced.	Pictures can be from inside or outside the shuttle.

Poetic Challenge

- Write your own poem about space.
Include adjectives and a countdown sequence.

WRITING A POEM ABOUT SPACE.

Use adjectives and descriptive words.

Include a sequence.
 This may be a countdown or use the words

"First, Next, Then".

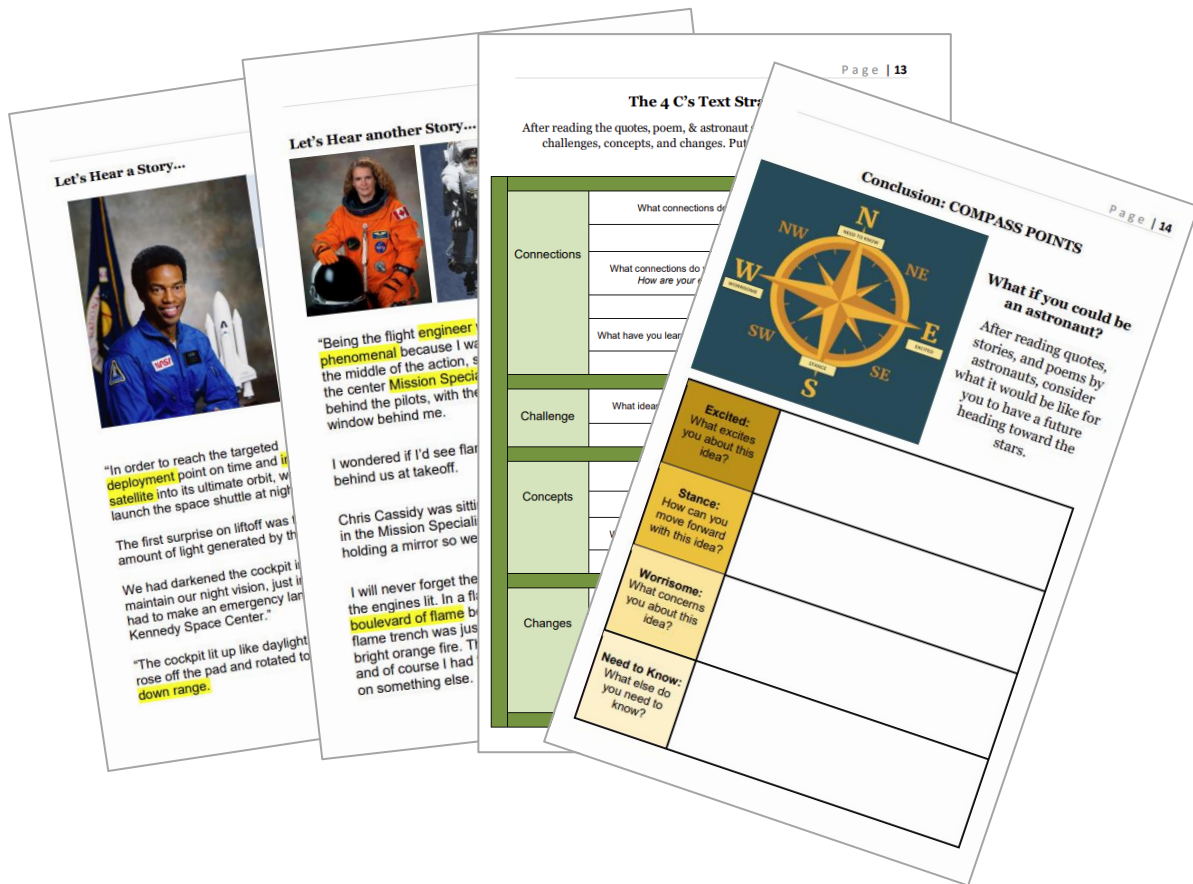
This fulfills the following standards:
 ELA 3.C.1.2
 ELA 4.C.1.2
 ELA 5.C.1.2

Narratives: In Their Own Words (40 min)

ACTIVITY:

1. **CLASS:** Read aloud narratives from Astronaut Guy Bluford Jr. and Astronaut Juliet Payette, pausing to clarify and ask the questions in blue.
2. **INDIVIDUALLY:** Complete the **4 Cs Text Strategy (15 minutes)** and the **Compass Points (5 minutes)** and

** Full Page Worksheet in Appendix A.*



Reading the **Primary Source Narratives** and completing the **4Cs** and **Compass Points** conclusion addresses the following standards*:

SS 4.A.1.1
SS 4 A.1.2
SS 4 AA.1.1

ELA 3 R.3.3
ELA 4.R.2.3
NCSS 2.c.

SS 3 A.1.1
SS 5 A.1.1
NCSS 8.c

**see Appendix 2*

Guion "Guy" Bluford Jr.

(1st African American Astronaut in Space)

Bio:

Bluford, originally from Philadelphia, grew up in a family who raised him to believe he could do anything he wanted. Racial social restrictions were not going to stop him!

His love for science and math led him to Penn State University to earn a degree in aerospace engineering. He also joined the air force and learned to fly. He fought in the Vietnam War as part of a fighter squadron. Once he returned safely home, he learned to fly a lot of other types of aircraft.

Bluford wasn't done learning. He earned his master's and doctoral degrees from **the Air Force Institute of Technology**. In 1978, he applied to **NASA** to join the first group of people to be trained for the Space Shuttle Program. Out of 8,000 applicants, Bluford was one of only 35 selected candidates.

Contributions:

"I wanted to set the standard, do the best job possible so that other people would be comfortable with Africans flying in space and African Americans would be proud of being participants in the space program"
– Dr. Bluford

Let's Hear a Story...



Guy Bluford Jr. was the first African American to fly in space. Hear his account of the first shuttle night launch.

Deployment-
to be sent out

Inject-
push something into something else

Here they pushed a satellite into space.

Satellite-
1) A machine built by people that is sent into space.
2) a natural body that orbits a planet

The moon is a satellite.

SRBs- solid rocket boosters



"In order to reach the targeted **deployment** point on time and **inject** the **satellite** into its ultimate orbit, we had to launch the space shuttle at night.

The first surprise on liftoff was the amount of light generated by the **SRBs**.

We had darkened the cockpit in order to maintain our night vision, just in case we had to make an emergency landing at Kennedy Space Center."

"The cockpit lit up like daylight as we rose off the pad and rotated to go **down range**.

Five years later, on August 30, 1983, Dr. Guion "Guy" Bluford became the first African American to launch into space. As the mission specialist, his responsibilities included sending an Indian communications-weather satellite into orbit around earth, perform biomedical experiments on the space shuttle, and test a 50-foot robotic arm. That must have been a packed six days! Later he would fly 3 more missions in space and be the 1st African American awards the U.S. Air Force Command Pilot Astronaut Wings. His story on pages 8-9 tells us what the experience was like.

Details come from <https://airandspace.si.edu/stories/editorial/quietly-soaring-history-first-african-american-space>

It looked like we were inside a fireball with the bright glow flooding through the windows...

The ride up on the SRBs and the three main engines of the shuttle was thrilling-- very noisy and bumpy as the **G-forces** increased to around 2.5g's, like we were driving a pickup truck over **railroad ties**.

I remember thinking: "This thing moves! Like riding the simulator but it moves!"

The next surprise was the brilliant flash of light just after two minutes from the firing of **pyros** at **SRB separation**.

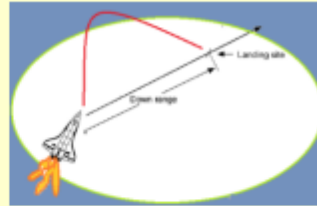
It took me several hours to get my "space legs" as I floated **clumsily** around the cockpit...

I found that due to **zero-g**, I was almost 2 inches taller in space, and both of my thighs were one inch thinner due to the fluid shift in my body."



What happens to an astronaut's body in space?

Down-Range- the horizontal distance traveled by a space-craft after it launches up



G-Force- the push that happens when something moves really fast (like a rocket)

Railroad ties - small pieces of wood that support the 2 metal rails on a train track

Pyros- bolts that connect two pieces of space-craft and EXPLODE to separate them.

SRB Separation- when the booster rockets separate from the shuttle and fall back to Earth

Clumsily- To drop things or fall down easily

Zero-G- In space, astronauts no longer feel the pull of gravity on their bodies.

ACT IT OUT

Students can role play in their chairs "G Forces" (*pull your face back towards the floor – the direction of gravity*).

Students can role play in their chairs "driving a pickup truck over railroad ties" (*bumping up and down*).

Answer:

The astronauts' body is no longer responding to Earth's gravity (*pulling towards the center of the earth*) or Earth's high level of air pressure.

Without gravity vertebrae in your back stretch out to make you taller.

The fluid in your body is no longer being pulled down by Earth's gravity. Fluid redistributes to make your bottom half thinner and your face fatter (see the image).

Juliet Payette

(Canadian Engineer & Astronaut)

Bio:

Juliet Payette is a Canadian Astronaut who came to work with NASA for a few years during the Space Shuttle Program.

Though a love for math and science has led her to become a scientist, she is so much more! Runner, skier, scuba diver, pilot, speaks six languages, and has sung professionally around the world.

What degrees has she earned? International Baccalaureate from Wales, UK, electrical engineering from McGill, Computer engineering from University of Toronto, corporate governance and administration from University Laval, and cybersecurity from York University. Being a woman has not kept her from achieving her dreams!

Contributions:

2nd Canadian Woman to go to space. The first female in space was Russian cosmonaut Valentina Tereshkova.

She demonstrated the cooperation between countries within the U.S. Space Program

Let's Hear another Story...



Juliet Payette is a Mission Specialist on space shuttle Endeavor's July 2009 trip to the International Space Station.

"Being the flight engineer was phenomenal because I was right in the middle of the action, seated on the center Mission Specialist 2 seat behind the pilots, with the overhead window behind me.

I wondered if I'd see flame shoot out behind us at takeoff.

Chris Cassidy was sitting to my right in the Mission Specialist 1 seat, holding a mirror so we could see.

I will never forget the moment when the engines lit. In a flash, I saw this boulevard of flame below us, the flame trench was just a mass of bright orange fire. Then we took off, and of course I had to concentrate on something else.

Engineer- someone who designs and builds things

Phenomenal- wow!

Boulevard of flame- when a rocket lifts off, burning fuel looks like a long street of fire.

Extended- made as long as it can be

Flexing- able to bend, like your elbow

Swivel- able to turn back and forth, like your shoulder

Payette flew twice with NASA. Her first mission – 10 days with the STS-96 - took her and the team to the International Space Station to deliver equipment and test the Canadarm robotic arm. Her second mission – 16 days with the STS-127 - returned to the ISS to complete construction of the Kibo Japanese Experiment Module. In her story on pages 11 and 12, hear what it was like working in the strange environment of space.

Being an astronaut isn't the only accomplishment of Payette's career. In 2017, she became Canada's 29th Governor General, which means she represented the Canadian government and its monarch (i.e. the king or queen) to Canadians at home and to other countries.



Once docked at the ISS, we used the Station's Canadarm2 to reach out to the batteries at the very end of the P6 trusses. Those batteries are massive, and the EVA crew had to go on the carrier platform to retrieve a spent battery and replace it with a fresh one.

Because the arm was so fully extended, every single time they'd get on or off the platform, the arm would start flexing, swinging dangerously close to Station Structure and every time that arm started to swivel, I got a little scared; we engaged the breaks on the arm joints and quickly floated down to the Kibo module porthole where we were able to see the actual distance between the tip of the arm carrying the battery platform and the end of the Station Structure.

It was close. We continued, but asked the guys to be careful.

Where is the "platform" and what almost happened?

The International Space Station (ISS) orbits Earth. Astronauts from around the world work there together for up to a year at a time

Canadarm2 is a robotic arm on the ISS.



Mission Specialists - astronauts who lead the other astronauts in experiments or spacewalks.

Kibo Module Porthole window inside the ISS where astronauts can see what is happening outside in space.

EVA crew -

group of astronauts who go on spacewalks outside the shuttle or space station.

EVA stands for "Extra Vehicular Activity." This means they are outside of the space station!

Mission Specialist:

Astronaut who has special knowledge.

This knowledge could be related to medicine, a machine like the Canadarm, or about a particular scientific experiment.

All astronauts are scientists.

Most are pilots and have military experience.

Some astronauts are Commanders.

Answer:

The platform is on the International Space Station.

The robotic arm almost hit the Space Station.

That could have broken the arm making it impossible to move the batteries.

It might have also pierced the Station or damaged the platform. They could have lost valuable time and resources.

IF STUDENTS GET STUCK, ASK:

Have you ever seen a rocket launch?

Have you ever been almost blinded by a brilliant light?

Have you ever gone really really fast while riding backwards?

Have you ever looked behind you using a mirror?

Have you ever replaced batteries using tweezers or something else to help you?

Have you ever gone on a trip at night?

BIG IDEAS:

This could be a **THEME** like man overcoming nature or teamwork triumphs

This could be a universal **CONCEPT** like love, fun, progress, or power.

The 4 C's Text Strategy

After reading the quotes, poem, & astronaut stories, explore connections, challenges, concepts, and changes. Put your thinking to the test.

Connections	What connections do you draw between the texts?
	<i>Astronauts describing launch, experiences, & surprises in space.</i>
	What connections do you draw between the texts and your life? <i>How are your experiences similar to Guy or Juliet?</i>
	<i>I have worked in a group where something almost went wrong.</i>
	What have you learned from the text? What did Guy and Juliet learn? <i>Juliet learned the difficulty of using the arm with a team.</i>
Challenge	What ideas do you want to challenge or argue with in the text?
	<i>Various: Bluford should have launched in the daytime!</i>
Concepts	What BIG IDEAS are important in the texts?
	<i>Finite Nature of Life, Courage, perseverance, teamwork, launches</i>
	What ideas are worth holding onto? (*Hint: focus on the quotes) <i>Various</i>
Changes	What changes in attitude are suggested by the texts? <i>How did Guy or Juliet's feelings or expectations change?</i>
	<i>They were surprised and thrilled.</i>
	How has exploring space changed the way we think?
	<i>They were surprised and thrilled.</i>

Conclusion: COMPASS POINTS**What if you could be an astronaut?**

After reading quotes, stories, and poems by astronauts, consider what it would be like for you to have a future heading toward the stars.

Excited: What excites you about this idea?	
Stance: How can you move forward with this idea?	
Worrisome: What concerns you about this idea?	
Need to Know: What else do you need to know?	

**Reproducible
handout in
Appendix 1.**

Individually, pages 5 and 6 take 3-5 minutes.

It may be used as an extension while more thoughtful students focus on the previous questions.

Students with additional time may illustrate their ideas.

Identify NASA as a federal governmental agency.

Discuss the impact this development might have on the **water system**.

**Reproducible
handout in
Appendix 1.**

Extension 1: Changes

*The US Space Program is important to the United States. There are 20 locations across the country. Anywhere a Space Force Station is built, NASA and the **federal government works with local groups** to make sure the water and wildlife are protected. Private companies have begun using NASA locations. **Manned and unmanned rocket launches are increasing every year.** This impacts the environment and local communities. Let's explore!*



Kennedy Space Center (KSC) is in **Florida**.

These images show **before, during construction, and after** area was built.

KSC attempts to limit the damage to the environment. It has made the surrounding land into a **protected wetlands habitat**.



What changes do you notice?

How are those changes positive?

How are those changes negative?



What might be the impact on the local community?

If you were an alligator, what would you think about a rocket launch?

This **EXTENSION** addresses the following standards*:

NCSS 8.b
NCSS 2.c
NCSS 3.h

SS 4.G.1.1
SS 4.A.8.3
NCSS 3.j

SS 4 CG.2.1
SC 4 L.17.4
*see Appendix 2

SS 3 A.1.1
SS 5 A.1.1

Extension 2: Rocket Gardens



Houston Space Center Rocket Garden Image



Kennedy Space Center Rocket Garden Image

Compare and Contrast Primary Sources

Study the two images. What do you notice first?	
How are these images similar?	
How are these images different?	
Why did the space centers build rocket gardens?	

These gardens were created to reflect ideas and culture.

Ideas like the importance of recycling and remembering accomplishments.

A culture that values science and has gone to space.

**Reproducible
handout in
Appendix 1.**

This **EXTENSION** addresses the following standards*:

NCSS 8.b
NCSS 2.c

SS 3 A.1.1
SS 5 A.1.1

NCSS 3.g
*see Appendix 2

Extension 3: Charting Progress

The US Space Program means a lot to Florida. Use the chart below and respond to the prompts on the next page.

Why is this event happening?
(use economic terms to explain)

The Space Program has **supplied** the Florida economy with **jobs** and **revenue** from employee **wages**.

This question fulfills standard:
NCSS 7.i



This **EXTENSION** addresses the following standards*:

SS 4 A.6.1
SS 4 A.8.3
SS 3 A.1.1
NCSS 7.d.

SS 4 E.5.5
SS 3 G.1.1
SS 3 G.1.4
NCSS 7.i

ELA 3 R.3.2
ELA 4 R.3.2
ELA 5 R.3.2

SS 5 A.1.1
ELA 3 R.2.3
ELA 5 R.2.2

Charting Progress

What is this chart about?
Florida's economy related to the U.S. Space Program.
Why did someone make the chart?
<p>To advertise for Florida Space Day.</p> <p>To entice more businesses to invest in Florida.</p> <p>To demonstrate how the Space Program is a positive influence.</p>
In my own words, what is it saying?
Summary
How do the pieces relate?
<p>They are all tied to space. There are lots of dollar amounts.</p> <p>There are different companies that deal with space. It shows employees make money in the Space industry.</p>
Has this chart been a positive or negative influence?
Positive. It demonstrates growth and influences people to come to Space Day.
What questions do I have about the chart?
varies

Extension 4: Hidden Layers

How do these two images relate to each other?

DISCUSS “HOW THESE IMAGES RELATE” AS A CLASS!

EXAMPLES

Pairs of Instructions & dogs

Circle for the window and helmet

Non-human Living Things that shouldn't be there

Orange and white window hatch mirrors the orange and white shuttle

Onion is looking down on the Earth where the photo is taken

Patches & Portals

Humor/Humans bringing a smile to your face

Photos from the Space Program



This photograph is a living onion “looking out into space.” It is not supposed to be there.

Cosmonaut Oleg Artemyev smuggled it on board. This is the second onion he has grown on the International Space Station – where fresh vegetables are very rare.

Information from
<https://www.cbsnews.com/news/international-space-station-sprouting-onion-oleg-artemyev/>

This photograph is Astronaut Leland D. Melvin with his 2 rescue dogs, Jake and Scout. They are not supposed to be there.

In college, he was a football wide receiver who majored in chemistry and has a specialty in fiber-optics. He flew 2 missions on the space shuttle Atlantis.

In 2009, he snuck his dogs in to the portrait session because they were not allowed at the NASA facility. He **hid them** in the back of his van.

This photo became the cover of his autobiography, “Chasing Space.”

Information from
https://www.huffpost.com/entry/eland-melvin_n_6681106

This **EXTENSION** addresses the following standards*:

VA 3 C.1.2

VA 4.C1.2

VA 5 C.1.2

ELA 5.R.3.3

VA 3 C.3.1

VA 4 C.3.1

SS 4 AA 1.1

VA 3 H.2.1

VA 4 H.2.1

VA 5 H.2.1

VA 3.O1.1

VA 4 O1.1

VA 5 O1.1

Circle the letter or the LAYER that appeals to you first.

- A. **Narrative** (the stories the image tells)
- B. **Connections** (how this image connects to other things)
- C. **Aesthetic** (the beauty of this image)
- D. **Dynamic** (the power, emotions, and movement in this image)

Choose an **IMAGE**: _____

Choose a **red layer** and a **blue layer**.

Explore the image with those **LAYERS**.



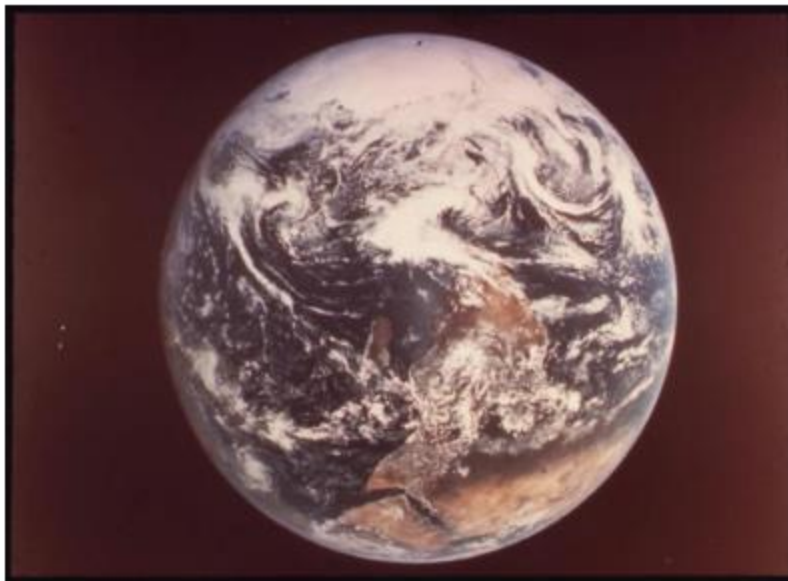
Narrative 1 sentence each		Connections 2 + bullet points each	
The Story	The Backstory (how they got here)	Connections to other works	Connections to History
The Hidden Story (whose story still needs to be told)	The Moral of the Story (Message this image sends)	Connections to ME!	Other Connections (ex. To Math, Science)
My Question			

Assessment
Option:

Grade the 10
boxes students
write in.

Aesthetic (Beauty)		Dynamic (Power & Movement)	
Appeal What is appealing about this image?		Surprise What surprised you about this work?	
Reward What reward - <i>feeling or knowledge</i> - do you get from observing this image?		Tension What points of tension, stretching, conflict, or friction do you see?	
Skill/Mastery What skills are required in order to create this image?		Emotion Which emotions are embedded in or emitting from this work?	
New/Unusual What is new or unusual about this image?		Movement Who or what is moving?	
My Question			

Reproducible
handout in
Appendix 1.

Extension 5: Inspiring to Reality

This **EXTENSION** addresses the following standards*:

ELA 3 R.2.3
ELA 4 R.2.3
ELA 5 R.2.3

ELA 4 R.2.1
NCSS 3.b

Beginning, Middle, End

The image on top was drawn around 1918 by Wladyslaw Benda, a Polish illustrator showing his imagination of what the earth might look like from space.

The second image is a photograph of earth taken from space in 1972 during the last Apollo mission to the moon.

Beginning	Middle	End
<p>Which image is the beginning (the one made first)?</p> <p>What stands out the most?</p> <p>Why was this image made?</p> <p>What might they have wanted?</p>	<p>What stands out about the second image?</p> <p>Why did someone take this photo?</p> <p>What might they have wanted?</p> <p>What happened before they took the photo?</p> <p>What might happen next?</p>	<p>50 years later, people are still interested in space.</p> <p>What might the end of space exploration be like?</p> <p>Will that really be the end, or will it lead people even farther?</p> <p>Draw a picture illustrating your answer.</p>

STEM: Exploring Rockets & Fins (50 min)

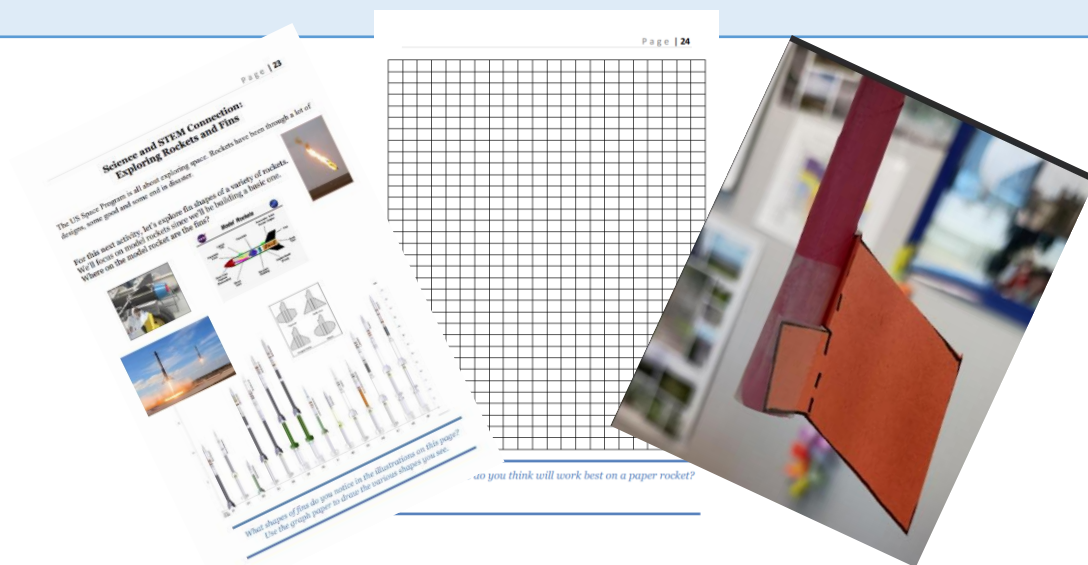
ACTIVITY:

1. **CONNECT WITH STUDENTS:** Ask: have you ever witnessed a rocket launch? Seen signs of a rocket launch? What did you see? Where do you think the rocket was going? Do rocket launches always go the way we expect?
2. **WITH A HAND LENSE:** Investigate the images. Where are the rocket fins located?
3. **DRAW** the different shape of fins on the graph paper. Put a star next to the shape you will use on a rocket.
4. **CONSTRUCT** and test a **paper straw rocket**. Make changes and record results. Compete and compare.
5. **DISCUSS:** What does it take to create a successful rocket? Which helped you create a better rocket – working together or competing with other rocket builders?

*Space X – a private company – and NASA – a government agency- **work together** to launch rockets. Other new private companies like Blue Origin, Space Perspectives, and Virgin Galactic **compete** in building and launching space-travel vehicles. Which do you think will lead to more growth in Florida – cooperation or competition?*

Florida launches many rockets near Kennedy Space Center. Launches set off car alarms 5 miles away, rattle windows over 8 miles away, and are seen 25 miles away. How might this affect the experiences and beliefs of children in Florida? How might the growth of the space program in Florida affect children around the world?

**See Lesson Plan in Appendix 3*



This **STEM LESSON** addresses the following standards*:

ELA 4.R.1.2
ELA 4.R.1.3
ELA 4.R.2.1.
ELA 3.C.1.2

ELA 4 R.2.2
SS 4 E.1.2
SC 5 P 13.1
ELA 4.C.1.2

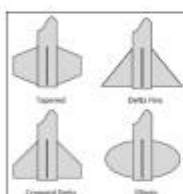
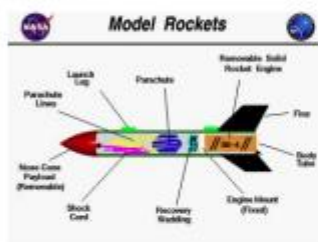
3 – PS2-2
SS 4 A.8.3
SC K12 CTR 7.1
SS 4 E.1.2

NCSS 5.f.
NCSS 6.f
NCSS 8.a
NCSS 9.c

Science and STEM Connection: Exploring Rockets and Fins

The US Space Program is all about exploring space. Rockets have been through a lot of designs, some good and some end in disaster.

For this next activity, let's explore fin shapes of a variety of rockets. We'll focus on model rockets since we'll be building a basic one. Where on the model rocket are the fins?



*What shapes of fins do you notice in the illustrations on this page?
Use the graph paper to draw the various shapes you see.*

MATERIALS:

Pencils/Markers

Strips of Construction Paper
(pre-cut for students)

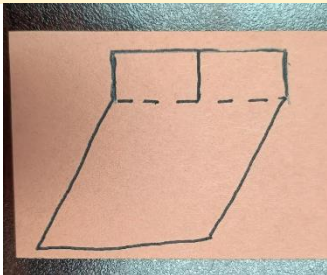
Tape

Scissors

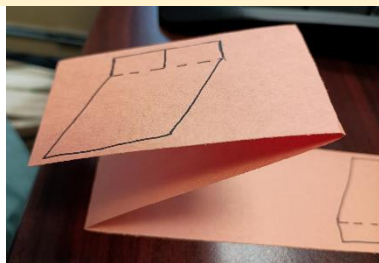
Rulers/Tape Measures

Scientific Journal Papers

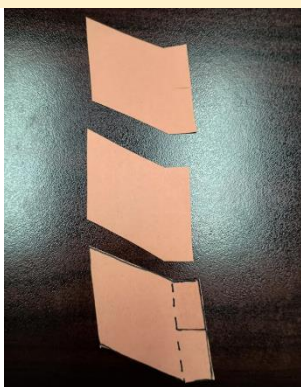
Create your fin on a long strip of construction paper.



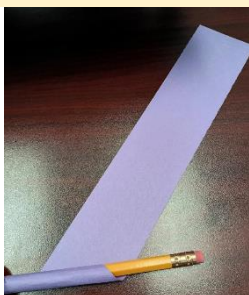
Fold it so you can cut 2 or 3 out at a time.



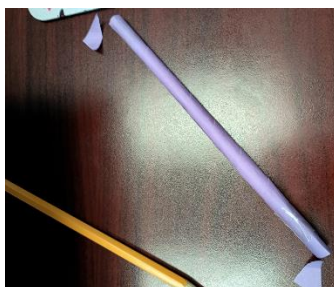
Make sure there is a dotted piece for taping to your rocket body



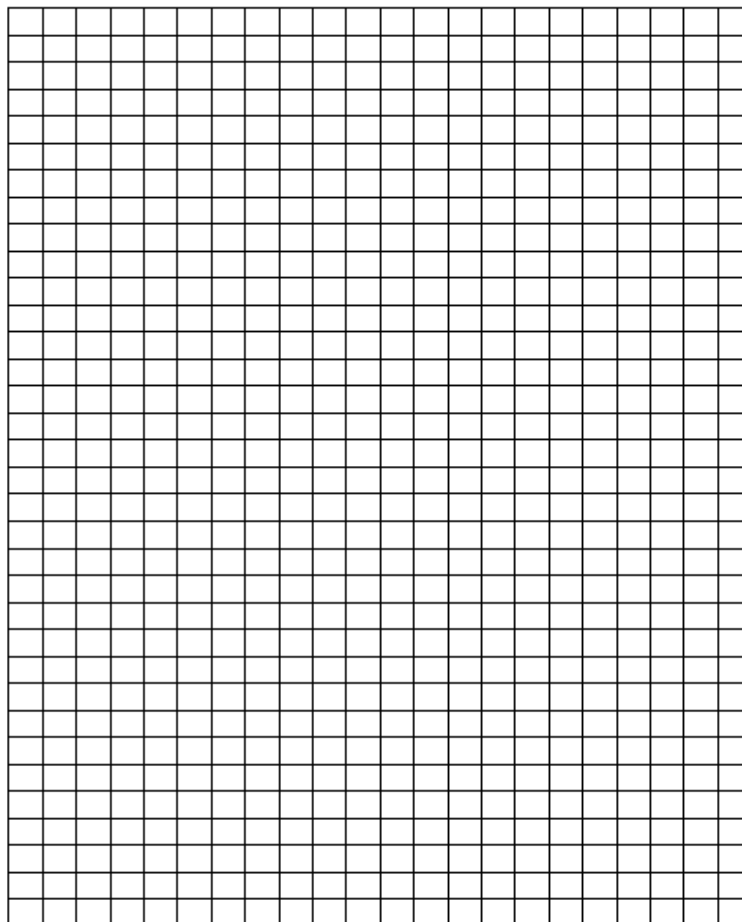
Create a paper-straw rocket body, wrap paper around pencil and tape.



Remove pencil when taped to make a body you can launch with your breath.



Snip the small line of the fin. Bend paper in both directions to make 2 "feet". Tape the "feet" to the rocket body and repeat.



Which fin shape do you think will work best on a paper rocket?

How many fins will you use, 2 or 3?

My Process:

For my first creation, I used _____

The first launch was (good fair awful). **Circle One.**

It traveled (distance) _____.

I was surprised by _____.

To improve my rocket, I then changed _____.

I entered a competition with a rocket that was a little different. The other rocket had _____.

In the competition, my rocket _____.

It traveled (distance) _____.

which was (more about the same less) than the other.

I wanted to enter another competition. I improved my rocket by _____.

The new and improved rocket (won tied lost) and traveled (distance) _____. I was _____.

I named my rocket _____.

- ☐ After the competition, we engineers discussed how our rockets were similar and different.

My Conclusions:

I learned _____

What it takes to create a successful rocket:

- ☐ _____
☐ _____
☐ _____

It was (working together racing against other rockets) that MOST helped me create a successful rocket!

Space X – a private company – and NASA – a government agency- **work together** to launch rockets. Other new private companies like Blue Origin, Space Perspectives, and Virgin Galactic **compete** in building and launching space-travel vehicles. Florida launches many rockets near Kennedy Space Center. They set off car alarms 5 miles away, rattle windows 8 miles away... and can be seen 25 miles away. I wonder where I can launch my next rocket....

STEM QUESTIONS

Which do you think will lead to more growth in Florida: **cooperation** or **competition**? Explain.

How might the Space Program **affect the experiences and beliefs of children in Florida**?

How might the growth of the Space Program in Florida **affect children around the world**?

Assessment Options:

Traditional Grade: (100% - 5 pts per blank/box): There are 15 blanks and boxes on page 25.

There are 5 sections on page 26 (which may be taken home for homework).

Rubric	Excellent (10 pts)	Satisfactory (8pts)	Needs Work (6 pts)	Absent (0pts)
Construction	Participated, Created, Competed, and Improved	Participated, Created, Competed 1x	Participated, Partial Creation	Poor Participation
Journal	Complete and Thoughtful	Some questions missing	About ½ done	None or No Effort Exhibited

Appendix 1:

Full-Page Handouts

Astronaut Images, Quotes, & Poetry

Name _____

Analyzing Images	Examine the images of astronauts on the previous page. Use a hand lens if it helps you see details better. Think about what you observe. Answer the questions.
What are some things they all have in common?	
What differences do you notice?	
What symbols do you notice?	
How do these images show that astronauts are heroic and patriotic ?	

QUESTIONS ABOUT QUOTATIONS:

**Which astronaut quote on this page do you find most interesting?
Why is that?**

What do astronauts “give” to their community?

What character trait helps astronauts succeed?

What can you do to develop these traits in yourself?

Teach this Poem Strategy

<p>Warm Up: How would it feel rising on a rocket?</p>	
<p>Analyze: <i>Study the image of the Expedition 59 Crew.</i></p> <p>What differences do you notice compared to how things would be on Earth?</p> <p>How might the technology you see contribute to or help solve problems?</p>	
<p>Silently read the poem <i>Rising from Earth</i>.</p> <p>What words, phrases, and structures “jump out” at you?</p>	
<p>Read the poem aloud with a partner. Twice.</p> <p>What else “jumps out”? What do you think happens next?</p>	
<p>Illustrate:</p> <p>Read the poem one more time and draw a picture of something the author saw or experienced.</p>	

Poetic Challenge: Write your own poem about space.

Include adjectives and a countdown sequence

The 4 C's Text Strategy

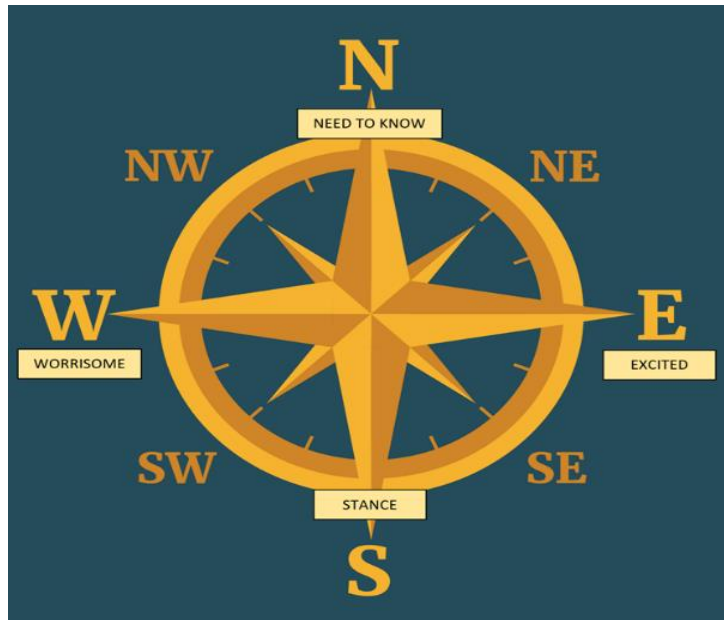
After reading the quotes, poem, & astronaut stories, explore connections, challenges, concepts, and changes. Put your thinking to the test.

Connections	What connections do you draw between the texts?
	What connections do you draw between the texts and your life? <i>How are your experiences similar to Guy or Juliet?</i>
	What have you learned from the text? <i>What did Guy and Juliet learn?</i>
Challenge	What ideas do you want to challenge or argue with in the text?
Concepts	What BIG IDEAS are important in the texts?
	What ideas are worth holding onto? (<i>*Hint: focus on the quotes</i>)
Changes	What changes in attitude are suggested by the texts? <i>How did Guy or Juliet's feelings or expectations change?</i>
	How has exploring space changed the way we think?

Conclusion: COMPASS POINTS

What if you could be an astronaut?

After reading quotes, stories, and poems by astronauts, consider what it would be like for you to have a future heading toward the stars.




Excited: What excites you about this idea?	
Stance: How can you move forward with this idea?	
Worrisome: What concerns you about this idea?	
Need to Know: What else do you need to know?	

Extension 1: Changes

Name _____

Instructions: Explore the pictures. Read the captions. Answer the questions.

What changes do you notice?	
☺ How are those changes positive?	☹ How are those changes negative?
What might be the impact on the local community	
	If you were an alligator, what would you think about a rocket launch?

Extension 2: Rocket Gardens

Instructions: Explore the pictures. Answer the questions.

Compare and Contrast Primary Sources	
Study the two images. What do you notice first?	
How are these images similar ?	
How are these images different ?	
Why did the space centers build rocket gardens?	

Extension 3: Charting Progress

Name _____

Instructions: The US Space Program means a lot to Florida.
Investigate the chart and respond to the prompts below.

What is this chart about?
Why did someone make the chart?
My Own Words: What is this chart saying?
How do the pieces (inside this chart) relate to each other?
Has this chart been a positive or negative influence?
What questions do I have about the chart?

Extension 4: Hidden Layers

Name _____

Instructions: Explore the pictures. Answer the questions.

1. **Circle** the letter or the LAYER that appeals to you first.

- A. **Narrative** (the stories the image tells)
- B. **Connections** (how this image connects to other things)
- C. **Aesthetic** (the beauty of this image)
- D. **Dynamic** (the power, emotions, and movement in this image)

Choose an **IMAGE**: _____.

Choose a **red layer** and a **blue layer**.

Explore the image
with those **LAYERS**.



Narrative 1 sentence each		Connections 2+ bullet points each	
The Story	The Backstory (how they got here)	Connections to other works	Connections to History
The Hidden Story (Whose story still needs to be told?)	The Moral of the Story (The message this image sends)	Connections To ME!	Other Connections (ex. To Math, Science)
My Question			

Aesthetic (Beauty)		Dynamic (Power & Movement)	
Appeal What is appealing about this image?	 	Surprise What surprised you about this work?	
Reward What reward - feeling or knowledge- do you get from observing this image?	 	Tension What points of tension, stretching, conflict, or friction do you see?	
Skill/Mastery What skills are required in order to create this image?	 	Emotion Which emotions are embedded in or emitted from this work?	
New/Unusual What is new or unusual about this image?	 	Movement Who or what is moving?	
My Question			

Extension 5: Inspiring Reality

Name _____

Instructions: Explore the pictures. Answer the questions.

Beginning, Middle, End.

The image on top was drawn around 1918 by Wladyslaw Benda, a Polish illustrator showing his imagination of what the earth might look like from space. The second image is a photograph of earth taken from space in 1972 during the last Apollo mission to the moon.

Beginning	Middle	End
<p>Which image is the beginning (<i>the one made first</i>)?</p> <p>What stands out the most?</p> <p>Why was this image made?</p> <p>What might they have wanted?</p>	<p>What stands out about the second image?</p> <p>Why did someone take this photo?</p> <p>What might they have wanted?</p> <p>What happened before they took the photo?</p> <p>What might happen next?</p>	<p>50 years later, people are still interested in space.</p> <p>What might the end of space exploration be like?</p> <p>Will that really be the end, or will it lead people even farther?</p> <p>Draw a picture illustrating your answer.</p>

Scientific Journal Page Engineer: _____

My Process:

For my first creation, I used _____.

The **first launch** was (good fair awful). **Circle One.**

It traveled (distance) _____.

I was surprised by _____.

To improve my rocket, I then changed _____.

I entered a competition with a rocket that was a little different.

The other rocket had _____.

In the competition, my rocket _____.

It traveled (distance) _____.

which was (more about the same less) than the other rocket.

I wanted to enter another competition. I improved my rocket by _____.

The new and improved rocket (won tied lost) and traveled (distance) _____.

I named my rocket _____.

- ☐ After the competition, we engineers discussed how our rockets were similar and different.

My Conclusions:

I learned _____.

What it takes to create a successful rocket:

- ☐ _____
- ☐ _____
- ☐ _____

It was (working together racing against other rockets)
that MOST helped me create a successful rocket!

*Maybe someday I will work as an engineer or pilot in the U.S. Space Program or in a private company. I know Space X – a private company – and NASA – a government agency- **work together** to launch rockets. Other new private companies like Blue Origin, Space Perspectives, and Virgin Galactic **compete** in building and launching space-travel vehicles. Florida launches many rockets near Kennedy Space Center. I've heard they set off car alarms 5 miles away, rattle windows 8 miles away, and can be seen 25 miles away. I wonder where I can launch my next rocket....*

STEM QUESTIONS	
Which do you think will lead to more growth in Florida: cooperation or competition ? Explain.	
How might the Space Program affect the experiences and beliefs of children in Florida ?	
How might the growth of the Space Program in Florida affect children around the world ?	

Appendix 2:

Standards

STANDARDS COVERED

ASTRONAUT BOOKLET

NATIONAL STANDARDS (NCSS)

Culture

1.C Describe ways in which language, stories, folktales, music, and artistic creations serve as expressions of culture and influence behavior of people living in a particular culture.

Time, Continuity & Change

2.C. Compare and contrast different stories or accounts about past events, people, places, or situation. Identify how they contribute to our understanding of the past.

2.E Demonstrate an understanding that people in different times and places view the world differently.

People, Places, & Environments

3.G Describe how people create places that reflect ideas, personality, culture, and wants and needs as they design homes, playgrounds, classrooms, and the like (i.e. gardens).

3.H. Examine the interaction of human beings and their physical environment, the use of land, building of cities, and ecosystem changes in selected locales and regions.

3.J Observe and speculate about social and economic effects of environmental changes and crises resulting from phenomena such as floods, storms, and droughts.

Individual Development & Identity

4.G. Analyze a particular event to identify reasons individuals might respond to it in different ways.

4.H Work independently and cooperatively to accomplish goals.

Individuals, Groups, and Institutions

5.f Give examples of the role of institutions in furthering both continuity and change

Power, Authority, & Governance

6.F. Identify and describe factors that contribute to cooperation and cause disputes within and among groups and nations.

6.G. Explore the role of technology in communications, transportation, information-processing, weapons development, or other areas as it contributes to or helps resolve conflicts

Production, Distribution & Consumption

7.D Give examples of the various institutions that make up economic systems such as families government agencies, and small businesses.

7.I Use economic concepts such as supply, demand, and price to help explain events in the community and nation.

Science, Technology, & Society

8.A Identify and describe examples in which science and technology have changed the lives of people, such as homemaking, childcare, work, transportation, and communication.

8.B Identify and describe examples in which science and technology have led to changes in the physical environment, such as the building of dams and levees, offshore oil drilling, medicine from rain forests, and loss of forests due to extraction of resources or alternative uses.

8.C Describe instances in which changes in values, beliefs, and attitudes have resulted from new scientific and technological knowledge, such as conservation of resources and awareness of chemicals harmful to life and the environment

Power, Authority, & Governance

9.C Examine the effects of changing technologies on the global community

Civic Ideals & Practices

10.A Identify key ideals of the United States' democratic republican form of government, such as individual human dignity, liberty, justice, equality, rule of law, and discuss their application in specific situations.

FLORIDA STANDARDS (CPALMS)

Social Studies

SS 3 AA.1.1

Identify African Americans who demonstrated heroism and patriotism

SS 4 AA.1.1

Identify African American community leaders who made positive contributions in the state of Florida.

SS (3,5) A.1.1

Analyze primary and secondary sources.

SS 4 A.1.2

Synthesize information related to Florida history through print and electronic media

SS 4 A.6.1

Describe the economic development of Florida's major industries.

SS 4 A 8.3

Describe the effect of the U.S. Space Program on Florida's Economy & Growth

SS 4 CG 2.1

Identify and describe how citizens work with local and state governments to solve problems.

SS.4.E.1.2

Explain Florida's role in the national and international economy and conditions that attract businesses to the state.

SS (3,4).G.1.1

Use thematic maps, tables, charts, graphs, and photos to analyze geographic information

SS 3 G.1.4

Name and identify the purpose of maps (physical, political, elevation, population)

Language Arts

ELA (3-5) C 1.2

Write personal or fictional narratives using a logical sequence of events, appropriate descriptions, and effective use of techniques, etc.

ELA 3 R 1.3

Explain different characters perspectives in a literary text.

ELA 4 R 1.3

Identify the narrators' point of view

ELA 3 R 1.4

Identify types of poems, free verse, rhymed verse, haiku, and limerick

ELA 4 R.1.4

Explain how rhyme and structure create meaning in a poem

ELA 5 R.1.4

Explain how figurative language and other poetic elements work together in a poem

ELA (3,4) R.2.1

Explain how text features contribute to meaning and identify the text structures of chronology comparison & cause/effect

ELA (4,5) R 2.2

Explain how relevant details support the central idea, implied or explicit

ELA (3-5) R.2.3

Explain and analyze the author's purpose and/or perspective toward a topic in an informational text.

.ELA (3-5) R.3.2

Summarize a text to enhance comprehension

ELA 5 R 3.3

Compare and contrast primary and secondary sources related to the same topic

Science

SC 4 E.5.5

Investigate and report the effects of space research and exploration on the economy and culture of Florida.

SC 4 L.17.4

Recognize ways plants and animals, including humans, can impact the environment

SC 5 L.17.1

(Humans Adapting With Spacesuits) Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments

SC 5 P 13.1

Identify familiar forces that cause objects to move like gravity.

SC k12 CTR 7.1

Solve real-life problems in science and engineering using computational thinking.

Gifted

G K23 1.3.1a

Identify personal strengths that may contribute to the field.

G K12 4.2.b

Understand multiple viewpoints of a problem

G K12 4.3d

Use multiple sources to affect change in generally accepted knowledge and attitudes.

G K12 6.2.4b

Analyze assumptions in relation to specific historical and cultural context.

Visual Arts

VA (3-5) C.1.2

Reflect on and interpret works of art, using observation skills, prior knowledge, and experience.

VA(3,4) C.3.1

Critique ones own and others artwork and identify the use of structural elements of art and organizational principles

VA (3-5) H.2.1

Compare differences or similarities in artworks across time and culture.

VA (3-5) O 1.1

Demonstrate how the organizational principles of design are used to arrange the structural elements of art.

Appendix 3:

Lesson Plans

Title: **Exploring Rockets and Fins: TPS and STEM**

Overview: Using Explorations into the US Space Program Booklet, students explore being an astronaut, draw conclusions after reading several accounts of astronaut thoughts, and design rockets to test flight of different styles of fins.

Objectives: Students will be able to:

- Analyze images
- Compare and contrast visuals, text, and charts
- Identify rocket fin shapes
- Design and test model rockets

Time Required: The opening activity takes approximately 10 minutes. The core activities that involve reading and analyzing images with the 4C's text strategy and Compass Points takes approximately 50 minutes. The extension activities take approximately 50 minutes. The STEM activity then takes about 40 minutes.

Recommended Grade Range: The content is geared toward 4th grade Florida standards, but is useful with 3rd through 5th grades.

Subject/ Content Area: Interdisciplinary unit with science, STEM, and social studies focusing on US Space Program and its impact on Florida

Standards:

- Language Arts
 - ELA4R1.2- explain a stated or implied theme
 - ELA4R1.3- Explain how rhyme and structure create meaning in a poem
 - ELA4R2.1- explain how text features contribute to the meaning of text
 - ELA4R2.2- explain how relevant details support the central idea
- Science
 - SC4E5.5- Investigate and report the effects of space research and exploration on the economy and culture of Florida
 - SC5P13.1- Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects
 - 3-PS2-2 Motion and Stability: Forces and Interactions- make observations and measurements of an objects motion to provide evidence that a pattern can be used to predict future motion
- Social Studies
 - SS4A8.3- describe the effect of the US space program on Florida's economy and growth

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PREPARATION

Materials Used:

- Explorations into the US Space Program (download to personal student devices)
- Hand lens per student
- Copies of worksheets for students to complete
 - o Moon Landing TPS tool
 - o Analyzing Astronaut Images
 - o Teach this Poem strategy
 - o The 4 C's Text strategy
 - o Compass Points
 - o Any extensions for students to complete as well
- Per student- Strip of construction paper (2-3 inch width by 11 inches long)
- Per student- Pencil
- Share with small group- Tape
- Share with small group- Measuring tape
- Share with small group- Scissors

Resources Used:

The primary sources are included in the booklet. The reference list provides source information. This lesson will focus on the rocket fin analysis and design for testing. A teacher guide for the booklet explains how to use the various activities.

Description of Procedure:

1. Connect with students- Ask students- Have you ever witnessed a rocket launch? Seen signs of a rocket launch? What did you see? Where do you think the rocket was going?
2. Observe the first image on page 23. Do rocket launches always go the way we expect?
3. We are going to explore model rockets today. Take a look at the diagram of the model rocket on page 23. An important part of the rocket is the fins. Where are the fins located?
4. Use your hand lens and explore the variety of fins on the different rocket images on page 23. Use graph paper to draw the different shapes of fins.
5. We are going to design a basic model rocket. Which fin shape do you think will work best on a paper rocket?
6. Teachers, if you aren't sure how to make a paper rocket, here are some links you can check out:
<https://www.jpl.nasa.gov/edu/learn/project/make-a-straw-rocket/>
7. Wrap the strip of paper around a pencil at an angle. Tape the top and bottom.
8. Cut the top and bottom so it is straight.
9. Fold over the narrower end to form the nosecone. (You can have students try different shapes for the nosecones as well.)
10. Choose the fin shape to test and decide if you want 2 or 3 fins. Draw your fin on a strip of paper. Be sure to include a tab for taping to the rocket (see pictures).
11. Fold the strip and cut out the fins. Attach fins to the rocket.
12. Prepare to launch. Place a straw in the open end of the paper model. Choose an area without obstructions to launch. Place the measuring tape on the ground. Use a puff of air through the straw and launch.
13. Observe how well the paper rocket launches and how far. Record observations in a science journal. Measure the distance traveled.

14. Consider how to improve your design. Can you make it fly farther? Consider different rocket lengths and fin shapes or sizes.
15. Make one change at a time and record your observations in your science journal.
16. Choose someone to go up against. Test your paper rockets, record your observations, and then discuss how the rockets are similar and different.

Evaluation:

Teacher observation:

- Students make and revise rocket
- Students measure using measuring tapes correctly

Student evaluation:

- Write and draw their plans in their science journals
- Explain how they revised their initial design
- Discuss how their rocket flew and possible reasons why it flew that way



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