

Welcome Teachers and Administrators!

With great excitement, we present this year's All Pikes Peak Reads curriculum! There have been many changes in the lesson structure this year. Primarily, we have simplified the lessons, with three over-riding goals:

1. To provide teachers with lessons that are manageable with regard to both time and materials;
2. To create lessons that are relevant to the Colorado State Standards; and
3. To create lessons that engage students in the Space subject overall and with the chosen books in particular.

If you catch yourself wishing for more material, you will find it on the PPLD website (www.ppld.org/appr). At this site, you can get a calendar of all of the APPR events that run from September 20-October 30, including information about visits from David Silver of the Heinlein Society and Homer Hickam, author of *Rocket Boys*. You will also find links to sites that give more information about the authors and the books chosen for APPR this year (www.heinleinsociety.org www.homerhickam.com).

Also at the PPLD website, you can download any and all APPR lessons. In other words, if you are teaching at the 6-8 level and need to differentiate for a struggling student, you can go right to the 3-5 level. If you need to differentiate for an advanced student, check out the 9-12 work. (In fact, all APPR lessons are free and available to the public.)

Another exciting feature of this year's curriculum is that the K-5 lessons are designed to allow for an **all-school read!** (A hearty thank-you goes to APPR writer Kelly Moeller for this awesome idea!) The K-2 lessons align very nicely with those written for the 3-5 students. We hope that this structure allows for a community experience with such things as book discussion groups, shared activities, science fairs, and school-wide displays of student work.

Writing standards-based lessons that are engaging for students throughout the Pikes Peak region is no easy task! You may find spots where we miss the mark, but we truly hope that the new lesson format will serve you and your students. Feel free to send feedback directly to those of us involved in the writing and editing of the work (see info below), or send your feedback to PPLD.

Best of luck in Space this year!
Cheri Colburn

Lesson Structure

Where possible, the lessons are arranged so that the first page contains the standards, the lesson overview, and the lesson objectives—a fairly comprehensive preview of the lesson. Here is a description of each of those elements:

State standards

Every lesson begins with Colorado State standards for the targeted subject areas (either ELA and Social Studies or Math and Science). Next comes Art or Music standard and the Writing standard that the lesson addresses. The art and music information is provided to appeal to all types of learners; the writing information is provided to allow for writing-across-the-curriculum opportunities. Along with the standards, benchmarks are identified. You may notice that for better fit on the page, we often removed “for example” statements from the standards/benchmarks.

Lesson Overview

This section provides a brief summary of the lesson. The overview is step-by-step, but it is very general.

Learning Objectives

This section articulates the connection between the lesson activities and the standards being addressed.

The Lesson: Before, During, and After

Lessons are divided into three sections. The **Before** section provides information about the APPR books. (For example: “Students read (or listen to) pages 1-30 in the nonfiction book *Space*.”) This section also introduces any vocabulary that may prove problematic. (Vocabulary is not leveled with regard to literacy/grade levels but is instead focused on comprehension.) Finally, the Before section identifies materials that should be on hand and teacher prep work that will need to be completed prior to beginning the lesson.

The **During** section provides a step-by-step breakdown of the activity. Some teacher scripting and expected student responses are included. These features are designed to be pragmatic. We have included them where we thought they might be useful, but you won’t find them at every step in every activity. (Teacher scripting is printed in italics to distinguish it from the rest of the lesson.)

The **After** section usually provides some kind of whole-group activity designed to help summarize and deepen the learning and to allow for sharing of student products.

Differentiation

This section suggests simple ways that the lesson can be differentiated for advanced students and for struggling students.

ELL Feature

Here we note how the lesson already addresses the learning needs of English Language Learners or how it can be differentiated for ELLs.

Other Space Titles

The hope here is that students will want to investigate the subject of Space more deeply. If they do, they can find other space titles that should be manageable for students at the lesson level. Notes are provided that describe the suggested books.

Space Websites

Again, we are hoping students will want to delve deeper. These websites provide more Space content. A description of the website is provided.

Notes from the Writing Team

Dee Vazquez: APPR Co-Chair

Each year as we look at the wealth of information we can use to build projects and study modules for our program, we encounter wonderful people who wish to contribute and fantastic resources that we can include. It is our wish that you would find exactly what you need to become involved in the Read: in the classroom, in your home, or in your community group. Please take a moment and share your thoughts or your experiences with us. You will find a form on the All Pikes Peak Reads web page or email us directly at appr@ppld.org.

Cheri Colburn: Managing Editor

I have worked for several years in the educational publishing industry, and during that time, I've worn many hats—copy editor, content editor, writer, and managing editor. With the APPR project, I have worn each of these hats at different times. It has been a pleasure to work with the fine people involved in this project and to help to develop the new lesson structure for APPR. I truly hope the new approach will allow for region-wide participation in All Pikes Peak Reads. I'd love to hear from you! Please send comments, questions, and suggestions for next year to: colburnwordsmithing@hotmail.com

Kelly Moeller: Math and Science

"What I did on my summer vacation" has taken on a whole new meaning this year! As an 11-year veteran of science teaching at Timberview Middle School in Academy District 20, I have learned a lot about the writing side of curriculum development. I hope you find the math/science lessons easy to use, with very few alterations necessary. Please drop me a line, kelly.moeller@asd20.org, to let me know much your kids enjoyed the activities. I am excited to attend the special events planned for All Pikes Peak Reads!

Travis Duncan: ELA and Social Studies

The first building I ever walked into in Colorado Springs was the East Library, right after the kick-off of the first All Pikes Peak Reads. *To Kill a Mockingbird* displays and information about APPR were everywhere. Attending book discussion groups and other APPR-related programs was great way to meet people in town. Now, seven years later, I consider it a real privilege to have been involved in shaping the curriculum guide for this year's APPR. I'd love to hear your comments and questions. E-mail me at travisduncan23@gmail.com. (Travis wrote in alongside and with the assistance of his wife, Frances Gomez, who is currently enrolled at the University of Colorado, Colorado Springs in the school counseling program. She has studied comprehensive curriculum instruction, and her contributions were essential to the quality lessons that Travis produced. You can contact Frances Gomez at: fgomez@tangle.com.)

K-2 APPR Curriculum

ELA and History

Lesson 1: Imagine Yourself as an Astronomer

ELA Standard 1: Students read and understand a variety of materials.

History Standard 1: Students understand the chronological organization of history and know how to organize events and people into major eras to identify and explain historical relationships. 1.3 Students use chronology to examine and explain historical relationships

Writing Standard 1: Students write and speak for a variety of purposes and audiences.

Art Standard 1: Students recognize and use the visual arts as a form of communication.

Lesson 2: Plant Your Flag on the Moon

ELA Standard 2: Students write and speak for a variety of purposes and audiences.

History Standard 3: Students understand that societies are diverse and have changed over time. 3.2 Students understand the history of social organization in various societies.

Writing Standard 2: Students write and speak for a variety of purposes and audiences.

Art Standard 1: Students recognize and use the visual arts as a form of communication.

Lesson 3: Inventing the Future

ELA Standard 4: Students apply thinking skills to their reading, writing, speaking, listening and viewing.

History Standard 4: Students understand how science, technology, and economic activity have developed, changed, and affected societies throughout history. 4.1 Students understand the impact of scientific and technological developments on individuals and societies.

Writing Standard 2: Students write and speak for a variety of purposes and audiences.

Art Standard 1: Students recognize and use the visual arts as a form of communication.

Math and Science

Lesson 1: Moon Buggy Model Design and Presentation

Math Standard 4: Students use geometric concepts, properties and relationships in problem-solving situations and communicate the reasoning used in solving these problems.

Science Standard 1: Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

Art Standard: Students know and apply visual arts materials, tools, techniques, and processes.

Writing Standard 2: Students write and speak for a variety of purposes and audiences.

Lesson 2: Impact Craters

Math Standard 1: Students develop number sense and use numbers and number relationships in problem-solving situations and communicate the reasoning used in solving these problems.

Science Standard 4: Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. (*Focus: Geology, Meteorology, Astronomy, Oceanography*)

Writing Standard 4: Students apply thinking skills to their reading, writing, speaking, listening, and viewing.

Art Standard 1: Students recognize and use the visual arts as a form of communication.

Lesson 3: Film Canister Rockets

Math Standard 5: Students use a variety of tools and techniques to measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems.

Science Standard 1: Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

Art Standard: Students know and apply visual arts materials, tools, techniques, and processes.

Writing Standard 2: Students write and speak for a variety of purposes and audiences

All Pikes Peak Reads

K-2 ELA and History

Lesson 1: Imagine Yourself as an Astronomer

Texts: *Midnight on the Moon* by Mary Pope Osborne
Space by Will Osborne and Mary Pope Osborne

ELA Standard

Standard 1: Students read and understand a variety of materials.

Benchmark

- Using text to self strategies, materials such as directions, nonfiction material, rhymes and poems, and stories.

History Standard

Standard 1: Students understand the chronological organization of history and know how to organize events and people into major eras to identify and explain historical relationships.

1.3 Students use chronology to examine and explain historical relationships

Benchmark

- Identifying cause-and-effect relationships in a sequence of events.

Writing Standard

Reading and Writing Standard 2: Students write and speak for a variety of purposes and audiences.

Benchmark

- generating topics and developing ideas for a variety of writing and speaking purposes (for example, telling a story, publishing a class newsletter, writing a letter to an adult, writing or orally presenting a book report, creating and producing a play, introducing a speaker or an event, narrating a presentation)

Art Standard

Standard 1: Students recognize and use the visual arts as a form of communication.

Benchmarks

- Identifying visual images, themes, and ideas for works of art;
- Selecting and using visual images, themes, and ideas to communicate meaning; and
- Comparing the use of visual images and ideas.

Lesson Overview

1. With teacher assistance, students construct a timeline representing their lives.
2. With teacher assistance, students construct a timeline that shows the scientific discoveries outlined in *Space* (pages 13 – 21).
3. Students work in groups of four to illustrate the major milestones from the scientific timeline and include captions that identify important discoveries.
4. Students present their work to the class.
5. As time allows, students put one group's drawings in order.

Learning Objectives

1. use text to self strategies to understand the reading.
2. understand how historical scientists have shaped our knowledge of the world
3. summarize the lesson using an illustration with a caption

Before

1. Students read (or listen to) pages 13-21 in the book *Space*.
2. Students read (or listen to) pages 1-17 of *Midnight on the Moon*,
3. Students become familiar with the concept of timelines by—as a group—constructing one that represents the milestones in their lives.
4. **Preview vocabulary:**
From *Space*
astronomy (p. 14): the science that deals with the material universe beyond the earth's atmosphere.
astronomer (p. 14-21): an expert in astronomy; a scientific observer of the celestial bodies.
telescope: an optical instrument for making distant objects appear larger and therefore nearer.
gravity (p. 20): the force of attraction by which terrestrial bodies tend to fall toward the center of the earth.
From *Midnight on the Moon*
satellite (p. 12): a natural body that revolves around a planet.
5. **Gather materials:**
White board and markers or
Chart paper
Paper or learning log for students to write

During

The First Timeline: Self-to-Text

1. Explain how a timeline works. Say: *Today we are going to build a graphic organizer called a timeline that lets us see things in the order that they happened.*
2. Explain chronological order. Say: *When things are in order from the first thing that happened to the last, we say they are in chronological order.*
3. Help students construct a timeline showing shared milestones. Begin with birth, then say: *What other important things have happened to you?* (walking, talking, going to school).

The Second Timeline: Chronology and Cause/Effect

1. Divide the students into groups of 4 and give students each a number (1-4).
2. Place the 4 scientists on the timeline, noting their discoveries (as follows).
3. Have each student draw a picture showing an astronomer (corresponding to their number) and write a caption that explains the astronomer's discovery.

1. Ptolemy

- *What did Ptolemy believe?* (Earth was at the center of everything.)
- *What might be a good picture you could draw to represent Ptolemy?*

2. Copernicus

- *What did Copernicus discover?* (Earth and other planets travel around the sun.)
- *What might be a good picture you could draw to represent Copernicus?*

3. Galileo 1564 – 1642

- *What did Galileo use to look at the night sky?* (Telescope)
- *What were telescopes used for before Galileo?* (Seeing people in war.)

- *What did Galileo believe that was different from astronomers who came before? (Galileo thought the Earth was not the center of everything.)*
- *What might be a good picture you could draw to represent Galileo?*

4. **Sir Isaac Newton**: 1643 – 1727

- What did Newton discover? (The law of gravity, the invisible force that kept the moon traveling around the Earth and the planets traveling around the sun.)
- *What can you draw to represent Newton?*

Bonus: *What was the “big mistake” these astronomers made? (They thought that everything in space traveled around the sun.)*

After

1. Have the students show their drawings to the class and talk about the important information they showed about the astronomer they drew.
2. As time allows, have the group in front of the class get out of order then have the rest of the class put them into chronological order according to the scientists they have drawn.

Differentiation

Teachers can differentiate this lesson by having more advanced students create their timeline and present their discovery to the class on their own, without help from a group. Struggling students can dictate captions for their illustrations, and the teacher or other students can write what they say.

ELL Feature

Using illustrations (especially student-created illustrations) helps to support new English vocabulary.

Other Space Titles

There’s No Place Like Space!: All about Our Solar System by Tish Rabe

Dr. Seuss, Aristides Ruiz (Illustrator)
 Publisher: Random House Childrens Books
 ISBN-13: 9780679891154

This 48-page Dr. Seuss book is suitable for children from 4 to 8 years old and teaches children, in rhyming couplets, all about the planets of our solar system.

Magic School Bus Takes A Moonwalk by Joanna Cole

Bruce Degen (Illustrator), Carolyn Bracken (Illustrator)
 (*Magic School Bus Series*)

Publisher: Scholastic, Inc.
 ISBN: ISBN-13: 9780439684002

This 32-page fiction book is suitable for children from 4 to 8 years old. Learn about the moon and outer space when Ms. Frizzle takes her class on another adventure.

Space Websites

http://www.kidsastronomy.com/solar_system.htm

Summary: This site is visually appealing and gives good basic information about all of the planets in our solar system.

http://www.kidsastronomy.com/explore_index.htm

Summary: This Flash-based site has good information about space exploration to give teachers and students ideas for what the future of space exploration may hold.

All Pikes Peak Reads

K-2 ELA and History

Lesson 2: Plant Your Flag on the Moon

Texts: *Midnight on the Moon* by Mary Pope Osborne
Space by Will Osborne and Mary Pope Osborne

ELA Standard

Standard 2: Students write and speak for a variety of purposes and audiences.

Benchmarks

- Generating topics and developing ideas for a variety of writing and speaking purposes
- Organizing their speaking and writing;
- Choosing vocabulary that communicates their messages clearly and precisely;
- Revising and editing speech and writing; and

History Standard

Standard 3: Students understand that societies are diverse and have changed over time.

3.2 Students understand the history of social organization in various societies.

Benchmarks

- Identifying reasons for living in social groups
- Describing important components of the cultural heritage of the United States; and
- Recognizing that there are families and cultures around the world.

Writing Standard

Standard 2: Students write and speak for a variety of purposes and audiences.

Benchmark

- generating topics and developing ideas for a variety of writing and speaking purposes (for example, telling a story, publishing a class newsletter, writing a letter to an adult, writing or orally presenting a book report, creating and producing a play, introducing a speaker or an event, narrating a presentation)

Art Standard

Standard 1: Students recognize and use the visual arts as a form of communication.

Benchmarks

- Identifying visual images, themes, and ideas for works of art;
- Selecting and using visual images, themes, and ideas to communicate meaning; and
- Comparing the use of visual images and ideas.

Lesson Overview

6. Students generate topics and develop ideas about what they believe are important and good ways to behave in their family, in their country, and on planet Earth. (Sharing, working together, good manners, not stealing, etc.)
7. Students identify reasons for living in families, in countries, and social groups in general.
8. Students work in small groups to organize and edit the lists “good behaviors” in families, our country, and social groups.
9. Students create a placard to accompany their four flags.
10. Students will draw their own moon flag with pictures that illustrate the good behaviors they have chosen.
11. Students present their work to the class.

Learning Objectives

4. use text-to-world strategies to comprehend the reading and develop ideas
5. identify reasons for living in social groups
6. work in groups to understand there are differences between families and cultures

Before

6. Students read (or listen to) pages 87-95 in the book *Space*.
7. Students read (or listen to) pages 18-39 of *Midnight on the Moon*,
8. Students watch short video of astronauts placing the American flag on the moon at: <http://www.youtube.com/watch?v=RMINS7MmT4>

9. **Preview vocabulary:**
From *Space*
probe (p. 88): an unmanned spacecraft designed to explore the solar system and transmit data back to earth.
module (p. 92): any of the individual, self-contained segments of a spacecraft, designed to perform a particular task: *the spacecraft's command module; a lunar module.*
From *Midnight on the Moon*
spacesuit (p. 19): a sealed and pressurized suit designed to allow the wearer to leave a pressurized cabin in outer space or at extremely high altitudes within the atmosphere.

10. **Gather materials:**
Pencils, crayons, markers
Construction paper
Paper for students to write on

During

Social groups: Self-to-World

4. Have students break into groups of 4. Say: *Remember how the first astronauts as well as Jack and Annie both left signs that said they came in peace? Why do you think they did that? What message did they want to convey to anyone from outer space that saw it?*
5. *Today we are going to make our own sign that shows others where we come from and that tell something about the good ways that we work and live together.*
6. *In your group, discuss one rule of good behavior in your family. Write at least one sentence on your own sheet describing this rule.*
7. *Now that your group has written what you think is good behavior in your family, discuss what ways of behaving we think are good in our country. Write at least one answer on your own sheet.*
8. *Now that your group has written about what behaviors we think are good in our country, discuss and write down what behaviors we think are good as a planet. What are some behaviors that we think are good that people in other countries also probably think are good? What is important for aliens to know about us?*
9. Have each group of 4 students create a moon flag by dividing up a rectangular piece of paper into four quadrants. Each student should draw/color a picture depicting one "good behavior" that was generated by their group.

After

3. Have the students show their drawings to the class and talk about what behaviors they value about being in a family, being an American, and being an Earthling.
4. As time allows, have the group in front of the class answer questions about why they chose the “good behaviors” they did. Ask if they think children from another state might have chosen different values for family. Or from another country. Or from another planet. Have students plant their flag on a classroom wall or as part of your school’s Space display. End the lesson by reviewing similarities between what each group thought was important to family, country and the planet. Discuss how our families, and countries (and even our planet) ultimately shape what we value.

Differentiation

Advanced students create an informative sign for aliens from another planet, telling aliens some important things about us and how we behave here on Earth. Struggling students can dictate their sentences instead of writing them down.

ELL Feature

Using illustrations (especially student-created illustrations) helps to support new English vocabulary. Working in peer groups also helps to increase English vocabulary.

Other Space Titles

Moonshot: The Flight of Apollo 11

By Brian Floca

Publisher: Simon & Schuster Children’s Publishing

ISBN-13: 9781416950462

This 48-page book is suitable for children from 4 to 7 years old. It has excellent illustrations and packs information on the 1969 moon landing into free verse that is easy for children to digest.

What the Moon Is Like

By Franklyn M. Branley, True Kelley (Illustrator)

Publisher: HarperCollins Publishers

ISBN-13: 9780064451857

This 40-page book is suitable for children from 5 to 9 years old. It discusses the history of people’s curiosity about the moon and what we know about it now after having landed on it.

Space Websites

<http://www.nixonlibrary.gov/forkids/speechesforkids/moonlanding.php>

This site poses some interesting questions about whether the United States should have used its flag, a United Nations flag, or any flag at all. Good background information for teachers using this lesson.

<http://video.google.com/videoplay?docid=1416393771637021814>

This video is a great overview of the first moon landing suitable for children to view.

All Pikes Peak Reads

K-2 ELA and History

Lesson 3: Inventing the future

Texts: *Midnight on the Moon* by Mary Pope Osborne
Space by Will Osborne and Mary Pope Osborne

ELA Standard

Standard 4: Students apply thinking skills to their reading, writing, speaking, listening and viewing.

Benchmarks

- Recognizing an author's point of view
- Differentiating between fact and opinion in written and spoken forms
- Responding to written and oral presentations as a reader, listener, and articulate speaker
- Formulating questions about what they read, write, hear, and view
- Using listening skills to understand directions

History Standard

Standard 4: Students understand how science, technology, and economic activity have developed, changed, and affected societies throughout history.

4.1 Students understand the impact of scientific and technological developments on individuals and societies.

Benchmarks

- Comparing the lives of hunters and gatherers to the lives of people who cultivated plants and raised domesticated animals for food
- Describing the impact of various technological developments on the local community and the state (for example, irrigation, transportation, communication)
- Identifying individual achievements of scientists and inventors from many cultures and describing their achievements.

Writing Standard

Standard 2: Students write and speak for a variety of purposes and audiences.

Benchmark

- generating topics and developing ideas for a variety of writing and speaking purposes

Art Standard

Standard 1: Students recognize and use the visual arts as a form of communication.

Benchmarks

- Identifying visual images, themes, and ideas for works of art;
- Selecting and using visual images, themes, and ideas to communicate meaning; and
- Comparing the use of visual images and ideas.

Lesson Overview

12. With teacher assistance, students discuss how the technological achievement of launching the first satellite into space by the Russians impacted the United States.
13. With teacher assistance, students identify the major achievements of Russians and Americans in the "space race."
14. Students work in groups of four to create an invention that will aid future astronauts.
15. Students present their work to the class.

Learning Objectives

7. use text-to-world strategies to recognize the author's point of view
8. identify the first satellite sent into space, the first person to travel in space and the first person to walk on the moon
9. work in groups to create an invention that will aid future astronauts

Before

11. Students read (or listen to) pages 77-97 in the book *Space*.
12. Students read (or listen to) pages 1-24 of *Midnight on the Moon*,

13. Preview vocabulary and historical figures:

From *Space*

Sputnik (p. 80): the first man-made satellite, launched October 4, 1957.

Astronauts (p. 81): a person engaged in or trained for spaceflight. From text: American term which means "travelers to the stars."

Cosmonaut (p. 81): A Russian or Soviet astronaut. From text: Soviet term which means "travelers to the cosmos" or "universe."

Yuri Gagarin (p. 82): 1934–68, Russian astronaut: first human being to make an orbital space flight (1961).

probe (p. 88): an unmanned spacecraft designed to explore the solar system and transmit data back to earth.

Neil Armstrong (p. 93): born 1930, U.S. astronaut: first person to walk on the moon, July 20, 1969.

14. Gather materials:

- Pencils, crayons, markers
- Construction paper
- Paper for students to write on

During

Social groups: Self-to-World (Discussion Questions)

10. *Who remembers what the space race was? (A race between the United States and the Soviet Union to explore outer space.)*
11. *What started it? (Have students write: The launch of the first satellite by Russians on October 4, 1957. It was called "Sputnik.")*
12. *Who was the first person in space? (Cosmonaut Yuri Gagarin, April 12, 1961)*
13. *How did these achievements affect the United States? (pg. 81: President John F. Kennedy said America was losing the space race and challenged Americans to put a man on the moon before the end of the 1960s.)*
14. *Who was the first person to walk on the moon? (Astronaut Neil Armstrong, July 20, 1969)*
15. *Neil Armstrong gets credit for being the first person to set foot on the moon, but there were many other people back on Earth who made that achievement possible. Who can name some of them?*
16. *It's been estimated that it took around 400,000 people to make Armstrong's first step on the moon possible. Work with your group to invent something that will aid future space travelers.*
17. Have students draw a picture of their invention and write a caption that explains it.

After

Have the students show their drawings to the class and talk about how their invention will aid future space travelers.

Differentiation

Teachers can differentiate this lesson by having more advanced students write about whether inventions should be shared with other countries. Struggling students can draw their invention and dictate their captions to the teacher or a learning partner.

ELL Feature

Using illustrations (especially student-created illustrations) helps to support new English vocabulary.

Other Space Titles

Team Moon: How 400,000 People Landed Apollo 11 on the Moon

By Catherine Thimmesh

Publisher: Houghton Mifflin Books for Children

ISBN-13: 978-0618507573

This 80-page book gives great background information on those who worked behind the scenes to make the first moon landing possible.

About Space by Jana Carson

Read pages 27-34 in Jana Carson's About Space. This section provides more good information about some of the equipment needed to survive in outer space.

Space Websites

<http://www.fi.edu/pieces/hiley/history.htm>

Summary: A kid-friendly site that provides lots of information about the history of the space suit.

<http://www.youtube.com/watch?v=SmC2v4G5zq0>

A fun video of life aboard a space station that may get students' minds churning on what is fun and challenging about living and working in space.

All Pikes Peak Reads
K-2 Math and Science
Lesson 1: Moon Buggy Model Design and Presentation

Texts: *Midnight on the Moon* by Mary Pope Osborne
Space by Will Osborne and Mary Pope Osborne

Math Standard

Standard 4: Students use geometric concepts, properties and relationships in problem-solving situations and communicate the reasoning used in solving these problems.

Benchmarks

- recognize shapes and their relationships (for example, symmetry, congruence) using a variety of materials (for example, pasta, boxes, pattern blocks);
- identify, describe, draw, compare, classify, and build physical models of geometric figures;

Science Standard

Standard 1: Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

Benchmarks

- use their senses to make and describe careful observations
- record data, report on findings and explain with reasons

Writing Standard

Reading and Writing Standard 2: Students write and speak for a variety of purposes and audiences.

K-4 Benchmark

1. generating topics and developing ideas for a variety of writing and speaking purposes

Art Standard

Standard : Students know and apply visual arts materials, tools, techniques, and processes.

Benchmarks

- identifying and describing different materials, tools, techniques, and processes
- using materials, tools, techniques, and processes to make works of art.

Lesson Overview

1. Students work cooperatively to list the components of a moon buggy and the geometric shapes that make it up.
2. Students draw a moon buggy based on the components identified during the brainstorming session.

Lesson Objectives

1. Students draw a model of a moon buggy.
2. Students use their senses to describe their moon buggy, identifying its geometric shapes.
3. Students write (or dictate) sentences explaining their reasoning for their particular design.

Before

1. Students read (or listen to) the first five chapters of *Midnight on the Moon*.
2. Students review page 96 from the nonfiction book, *Space*. This page has information and a drawing of a moon buggy. Show the students the picture, and discuss the various parts of the moon buggy, their shape, and their use.
3. Allow students to review the video of the Apollo 15 lunar mission. The astronaut in this video makes large 'rooster tails' by spraying moon dirt as he drives.
4. http://starchild.gsfc.nasa.gov/docs/starchild/space_level2/apollo15_rover.html
5. If time allows, download the NASA PDF that outlines the history of the lunar rover. <http://history.msf.nasa.gov/lunar/LRV.pdf>

6. Preview Vocabulary

engineer: scientist who designs machines, engines, or buildings

7. Gather materials

Chart paper for brainstorming lists
Drawing paper
Pencils
Colored pencils, crayons, and/or markers
Geometric figures to use as examples.
Colored highlighters

During

1. Students should brainstorm a list of features to include on their moon buggy and how those features help the astronauts explore the moon. (This can be done as a whole group, small group, or individual activity.)
2. Consider requiring students to include specific tools in their drawings.
3. Students should use the geometric figures in their drawings.
4. When students are finished drawing, they use their senses to write or dictate sentences describing why they used specific shapes their drawings.

Possible guiding questions to use before students begin to draw:

- *Jack and Annie were excited to find a moon buggy when they ventured out of the moon base. If you went to the moon and found a moon buggy what do you think it would look like? What shape would you use for the biggest part of your moon buggy?*
- *How would you steer the moon buggy? What shape will you use?*
- *How many seats would be on your moon buggy? What shapes will you use?*
- *Cars have spare tires and tools so that if they get a flat tire, they can be fixed on the road. Would your moon buggy need any tools in case it breaks down? Where would you store the tools? What shape is your toolbox?*
- *What tool would you use to talk to other astronauts in your group or to people back on Earth? What shapes are used in that tool?*
- *Lots of moon buggies have cameras on the outside of them. Where will you put your cameras, and what shapes will you use to make them?*
- *Would you paint your moon buggy a certain color? Would you use more than one color?*

After

Ask students to use their finger to find particular shapes. As students point to each shape, walk around the classroom and recognize students who are successful. If you have a student who is proud of his or her drawing, have the student stand up and identify the shapes used and why they chose that shape for that job.

Differentiation

Advanced students should include more advanced geometric shapes into their design (rhombus, hexagon, etc.). Struggling students can be paired with others to support their success.

ELL Feature

The visual aid provided by making the drawing will help ELLs to deeply understand and internalize the names of geometric shapes.

Other Space Titles

If You Decide to Go to the Moon by Faith McNulty

ISBN-13: 9780590483599

Publisher: Scholastic, Inc.

This book, written for children age 4-8, takes the reader on a journey from the Earth to the moon.

Moonwalk: The First Trip to the Moon by Judy Donnelly

(Step Into Reading Books Series: A Step 5 Book)

ISBN-13: 9780394824574

Publisher: Random House Children's Books

This book chronicles the Apollo 11 flight to the moon. Second-grade reading level.

Space Websites

<http://antwrp.gsfc.nasa.gov/apod/astropix.html>

This website offers "Astronomy Picture of the Day." A professional astronomer explains a different space picture each day. The description often provides links for more information on the terminology used.

All Pikes Peak Reads

K-2 Math and Science

Lesson 2: Impact Craters

Texts: *Midnight on the Moon* by Mary Pope Osborne
Space by Will Osborne and Mary Pope Osborne

Math Standard

Standard 1: Students develop number sense and use numbers and number relationships in problem-solving situations and communicate the reasoning used in solving these problems.

Benchmarks

- 2. read and write whole numbers and know place-value concepts and numeration through their relationships to counting, ordering and grouping
- 3. use numbers to count, to measure, to label and to indicate location

Science Standard

Standard 4: Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. (*Focus: Geology, Meteorology, Astronomy, Oceanography*)

Benchmarks

- 2. there are major features of Earth's surface (*for example: mountains, rivers, plains, hills, oceans, plateaus*)
- 6. objects can be readily observed in the daytime and nighttime sky (*for example: the Sun, Moon, stars*)

Writing Standard

Reading and Writing Standard 4: Students apply thinking skills to their reading, writing, speaking, listening, and viewing.

Benchmark

- differentiating between fact and opinion in written and spoken forms; using listening skills to understand directions.

Art Standard

Standard 1: Students recognize and use the visual arts as a form of communication.

Benchmark

- Selecting and using visual images, themes, and ideas to communicate meaning

Lesson Overview

1. Students build a model of impact craters.
2. Students use whole numbers to measure the impact craters and their rays.
3. Students write (or dictate) a sentence stating a fact from the experiment and a sentence stating an opinion or a new question they have following the experiment.

Learning Objectives

1. model impact craters, a major feature of Earth's surface
2. use whole numbers to measure
3. write (or dictate) sentences describing their craters

Before

1. Students read (or listened to) the first chapter six of *Midnight on the Moon*.
Say: *Remember when Jack and Annie were trapped by a meteorite that landed right in front of them?*
2. **Preview vocabulary:**
impact crater: formed when pieces of asteroids or comets or a meteor hit the surface of a planetary body. Say: *On Earth many craters cannot be seen because they are under the ocean or because rain and wind wear them away over time. On the moon there aren't oceans or weather so the craters, like the astronauts footprints, stay there forever.*
meteor: a meteor is a large rock travelling through space.
meteorite: a meteor that has landed on a planetary surface—for example, the Earth or the moon. (See *Space* pages 51, 52, and 53 for more information and a picture.)
ray: the lines that extend from the center of the impact craters. Draw a sunburst (but don't call it a sunburst) on the board and say: *Do you see these lines coming out from this circle? These are called 'rays'. Today when you make your crater you will measure the length of one of the rays.*
3. **Gather materials**
Student science logs
Large trays or sturdy boxes – approximately 8-10 cm deep, 50 cm x 50 cm; 1 per group
Dry Material: Baking soda or flour—enough to fill each pan to a depth of 3 centimeters
Dry tempera paint—enough for a thin layer to cover the dry material (red and blue work best)
Spheres made from different materials (steel, glass, wood, etc)
4. **Prepare the trays**
 - Evenly place 3 cm of dry material in the bottom of the tray
 - Sprinkle a thin layer of powdered tempera paint over the dry material (just enough to cover the dry material); using a kitchen strainer to distribute the paint makes it easier to make a uniform layer (wear a dust mask over nose and mouth)
 - Place another *very thin* layer (2-3 mm) of dry material over the tempera paint
 - Optional: Sprinkle a thin layer of different colored tempera paint over the second layer of dry material and cover with a third, thin layer of dry material.

During

1. Say: *What happened when the meteor landed on the moon in front of Jack and Annie?* Student responses should include the cloud of dust and the ground trembling as described on pages 41 and 42.
2. In small groups students make observations about the masses of their different spheres (for example: the steel marble is the heaviest, the wooden marble is the lightest). Students should record (dictate) these observations in their student science logs.
3. Place each tray on the floor and drop the different spheres from the same height onto the prepared tray. It may be easiest for students to kneel on a backwards facing chair and hold their arms out straight to achieve the same height each time.

4. Students make and record (or dictate) observations about the craters formed on the prepared tray (for example: the dry material goes up in a puffy cloud, the tempera paint can be seen around the marble, etc.). Students sketch and label an image of the created crater to help them communicate the meaning of their observations.
5. Students measure the length of the ray produced by the sphere to the nearest whole centimeter, placing the zero mark at the center of the impact crater and following along the ruler to the end of the longest ray. Students record their measurements on a data table.

Sphere	Distance (cm)

6. Students compare their observations and measurements to with those of their group members. (This can also be a whole-group discussion.)

After

The teacher leads a discussion of facts and opinions students supply orally after the experiment. The teacher writes a list of the facts and opinions where the class can see the list and discusses the differences as a whole group.

Differentiation

Higher level students can construct a bar graph of their results. Lower level work with a teacher or a learning partner to line up their rulers and measure the ray produced by the impact crater.

ELL Feature

The use of manipulatives is an ELL strategy—students internalize the objectives when they physically measure the rays and sketch a picture of the using the terms.

Other Space Titles

Meteor Monsters by Jack Harris

Publisher: Random House Children’s Books (ISBN-13: 9780307117960)

He-Man and Skeletor battle it out after a meteor explodes.

The Long Journey from Space by Seymour Simon

Publisher: Random House Children’s Books (SBN-13: 9780517545416)

Another useful astronomy book by Seymour Simon will be a good addition to your classroom library.

Space Websites

The American Meteor Society provides the lay person with all they need to know to understand the basics of meteors. This site also has links to several other meteor websites.

<http://www.amsmeteors.org/>

All Pikes Peak Reads

K-2 Math and Science

Lesson 3: Film Canister Rockets

Texts: *Midnight on the Moon* by Mary Pope Osborne
Space by Will Osborne and Mary Pope Osborne

Math Standard

Standard 5: Students use a variety of tools and techniques to measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems.

Benchmarks

- know, use, describe, and estimate measures of length, perimeter, capacity, weight, time and temperature;
- demonstrate the process of measuring and explain the concepts related to units of measurement

Science Standard

Standard 1: Students apply the processes of scientific investigation and design, conduct, communicate about, and evaluate such investigations.

Benchmarks

- use their senses to make and describe careful observations
- conduct simple experiments using tools and technology (*for example: computers, thermometers, magnifiers, rulers, balances*)
- record data, report on findings and explain with reasons

Writing Standard

Reading and Writing Standard 2: Students write and speak for a variety of purposes and audiences.

Benchmark

- generating topics and developing ideas for a variety of writing and speaking purposes (for example, telling a story, publishing a class newsletter, writing a letter to an adult, writing or orally presenting a book report, creating and producing a play, introducing a speaker or an event, narrating a presentation)

Art Standard

Standard: Students know and apply visual arts materials, tools, techniques, and processes.

Benchmarks

- identifying and describing different materials, tools, techniques, and processes
- using materials, tools, techniques, and processes to make works of art.

Lesson Overview

1. Students conduct an experiment using a stopwatch to measure and record time.
2. Following the launch, students organize the steps using preprinted note-cards.

Learning Objectives

1. conduct a simple experiment and make careful observations
2. know, use, and demonstrate the measurement of time
3. record data gathered during the experiment

Before

1. Students read (or listened to) *Midnight on the Moon*. Say: *Jack and Annie had a magical tree house that they took to the moon. If people want to go to the moon today they would use a rocket to help them get there.*
2. **Preview vocabulary**
3. **rocket**: an engine that moves forward when gasses are pushed out. Read (or have students read) pages 78 and 79 from *Space*. Show students an example of a balloon rocket as described on page 79. Show students pictures of rockets from pages 91 and 105 also from *Space*. Say: *Scientists use rockets to send things into space. Some rockets are used to launch satellites that we use for our cell phones and TV; some rockets are attached to a Space Shuttle that takes astronauts to the International Space Station.*
4. **Gather materials**
 - Student science logs
 - Film canisters – translucent type where the lid snaps inside the canister
 - Stopwatches – one for each group; may be helpful to have a back-up timer in each group
 - Styrofoam plates – for launch pads
 - Large garbage bags – to put under launch pads for easy clean-up
 - Halved Antacid tablets – effervescent kind – 4 halves per group
 - Water – one easy to pour from container per group
5. Visual Art Activity (Optional) Create a Mission Patch
6. Mission patches can be viewed at www.nasa.gov; in the search box for that website, use 'mission patch'. The Apollo 11 and the Challenger patches can be found there. Common components of a mission patch include:
 - an image that can summarize the mission (a school mascot may be appropriate here)
 - names of the astronauts (use last names of students in the group)
 - an image of the travel vehicle (child's rendition of a rocket)

During

1. Say: *Today we are going to make and launch rockets! We will make our rockets out of these film canisters using water and antacid tablets for our rocket fuel.*
2. Place a halved antacid tablet into a clear cup of water to show students how it bubbles. Say: *When the antacid makes bubbles inside the film canister there will be so much pressure inside that the canister will explode away from the lid and shoot up into the air!*
3. Say: *It is very important to follow directions today so that we all remain safe. Please listen and watch carefully.* Demonstrate the steps in the experiment:
 - a. Show students how to snap the lid into the canister so that they have a tight fit. Have students practice snapping the lid into the canister.
 - b. Tell students that they will place the canister on the ground to launch it, and point out that it is important that the lid is down, toward the ground (upside down)
 - c. Show students that they will fill the canister about 1/3 full with water
 - d. Explain that they will then place one of the halved antacid tablets in the canister, snap the lid on very quickly and place it upside down on the launch plate (Styrofoam plate)
 - e. The students should move about 2 meters away from the launch pads to watch the launch (it takes about 10 seconds, but they should move away quickly)
 - f. The time keeper(s) in the group will need to start the stopwatch as soon as the lid is snapped on tight and the rocket is placed upside down on the launch pad.
 - g. The time keeper(s) will stop timing when the rocket leaves the launch pad

- h. Students should record the launch time in seconds on the data table.

Trial	Time (seconds)
Trial 1	
Trial 2	
Trial 3	
Trial 4	

After

1. Students organize the film canister rocket activity in chronological order. Print or write the following statements on 3x5 note-cards.
 - Get a film canister.
 - Fill the film canister 1/3 full with water.
 - Put a halved antacid tablet in the film canister.
 - Snap the lid on quickly.
 - Place the canister on the ground with the lid side down.
 - Time keeper starts stopwatch.
 - Step back two meters.
 - When the rocket leaves the ground the time keeper stops the stopwatch.
2. Mix the note-cards and have students place them in chronological order.

Differentiation

Advanced students can write out their own step-by-step directions. For struggling students, reduce the number of note-cards students organize chronologically.

ELL Feature

Take pictures of the each of the above steps of the film canister rocket activity and have the student put the pictures in chronological order along with labels. The visuals will help students to internalize new vocabulary.

Other Space Titles

The Rocket Book by Peter Newell

ISBN-13: 9780804805056

Publisher: Periplus Editions (HK) Ltd.

Children aged 5 – 9 will delight in the story of what happens as a rocket launched in the basement travels through 20 apartment floors.

Rocket! How a Toy Launched the Space Age by Richard Maurer

ISBN-13: 9780517596289

Publisher: Random House Children's Books

Plenty of pictures and diagrams to help readers of all levels understand the concepts of rocketry

Space Websites

Space Rocket Guide: Students and teachers will be able to learn about rockets from different countries and times in history. This website links to several other space websites including histories of many aspects of space exploration and links to military space and space businesses.

<http://www.aerospaceguide.net/spacerocket/index.html>