



# ***Aldrin Family Foundation: You Are the Next Space Explorers***

***Launch into space and the history of space exploration, the technological and human innovations that have transformed it into what it is today, and the imagination and STEM skills that will advance it into the future! Curious, creative, and collaborative students will have many opportunities to join in and contribute to future space missions. Their work will likely reap benefits not only for space explorers but also for those who remain here on Earth.***

## ***Mission 1: Exploring Space***

- **Introduction: “But Why, Some Say, the Moon?”** - Apollo Missions: What challenges were overcome? What sacrifices were made? What have we learned? What accomplishments are celebrated even today?
- **Lesson 1: Our Place in Space** - How have we come to know our place in space? What new unexpected things will we learn from astronomers and astronauts today, tomorrow, and in the months and years to come?
- **Lesson 2: Full Moon** - What is the relationship between the Earth, the Moon, and the Sun? Where did the Moon come from? What is the Moon really made of? And when we return to the Moon, where should we set up residence?
- **Lesson 3: The Red Planet** - What have we learned about Mars as it has been flown by, orbited, crashed into, radar inspected, rocketed onto, as well as bounced upon, rolled over, shoveled, drilled into, baked, and even laser blasted. When will humans live there?
- **Conclusion: Space Program Spin-Offs** - How might the space program help us better understand and even improve life here on Earth? How have technologies created by those in the space industry changed our daily lives forever?

## ***Cross-Curricular Connections***

### **Reading & Writing for Technical Subjects:**

LST.1: Read and comprehend science and technical texts independently and proficiently and write effectively for a variety of discipline-specific tasks, purposes, and audiences

LST.2: Extract and construct meaning from science and technical texts using a variety of comprehension skills

LST.2.2: Determine the central ideas or conclusions of a text; provide an accurate, objective summary of the text.

LST.2.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

LST.3.1: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to texts and topics.

LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LST.7.1: Conduct short research assignments and tasks to answer a question (including a self-generated question), or test a hypothesis, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

**Literature Selections:** *Rocket Boys, The Martian*

**Math:** Algebraic Problem Solving, Using Ratios, Creating and Analyzing Graphs (Bar, Pie, Best-Fit Line), Unit Conversions, Scale Size

**Social Studies:** Establishing new communities, Global Exploration, Space Race & President John F. Kennedy

**Art:** Modeling, Drawing & Design

## Grades 4-5 Science Content & Engineering Standards

- 4.PS.1** Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion. (Lessons: Intro, 2, 3, Conclusion)
- 4.PS.2** Investigate the relationship of the speed of an object to the energy of that object (Lessons: Intro, 1, 2, 3, Conclusion)
- 4.ESS.1** Investigate how the moon appears to move through the sky and it changes day to day, emphasizing the importance of how the moon impacts the Earth, the rising and setting times, and solar and lunar eclipses. (Lessons: 1, 2)
- 5.ESS.1** Analyze the scale of our solar system and its components: our solar system includes the sun, moon, seven other planets and their moons, and many other objects like asteroids and comets. (Lessons: 1, 2, 3, Conclusion)
- 5.ESS.2** Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. (Lessons: 1, 2)
- 3-5.E.1** Identify a simple problem with the design of an object that reflects a need or a want. Include criteria for success and constraints on materials, time, or cost. (Lessons: Intro, 1, 2, 3, Conclusion)
- 3-5.E.2** Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. (Lessons: Intro, 1, 2, 3, Conclusion)
- 3-5.E.3** Construct and perform fair investigations in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. (Lessons: Intro, 1, 2, 3, Conclusion)

## Grades 6-8 Science Content & Engineering Standards

- 6.PS.1** Distinguish between the terms position, distance, and displacement, as well as, the terms speed and velocity (Lessons: Intro, 1, 2, 3, Conclusion)
- 6.PS.2** Describe the motion of an object graphically showing the relationship between time and position (Lessons: 1, 2, 3)
- 6.ESS.1** Describe the role of gravity and inertia in maintaining the regular and predictable motion of celestial bodies (Lessons: 2, 3)
- 6.ESS.2** Design models to describe how Earth's rotation, revolution, tilt, and interaction with the sun and moon cause seasons, tides, changes in daylight hours, eclipses, and phases of the moon. (Lesson: 2)
- 6.ESS.3** Compare and contrast the Earth, its moon, and other planets in the solar system, including comets and asteroids. (Comparisons should be made in regard to size, surface features, atmospheric characteristics, and the ability to support life.) (Lessons: 1, 2, 3, Conclusion)
- 6-8.E.1** Identify the criteria and constraints of a design to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (Lessons: Intro, 1, 2, 3, Conclusion)
- 6-8.E.2** Evaluate competing design solutions using a systematic process to identify how well they meet the criteria and constraints of the problem. (Lessons: Intro, 1, 2, 3, Conclusion)
- 6-8.E.3** Analyze data from investigations to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. (Lessons: Intro, 1, 2, 3, Conclusion)
- 6-8.E.4** Develop a prototype to generate data for repeated investigations and modify a proposed object, tool, or process such that an optimal design can be achieved. (Lessons: Intro, 1, 2, 3, Conclusion)
- 7.PS.4** Investigate Newton's first law of motion (Law of Inertia) and how different forces (gravity, friction, push and pull) affect the velocity of an object. (Lessons: 1, 2, 3)
- 7.PS.6** Investigate Newton's third law of motion to show the relationship between action and reaction forces. (Lessons: 1, 2, 3)
- 7.PS.7** Construct a device that uses one or more of Newton's laws of motion. Explain how motion, acceleration, force, and mass are affecting the device. (Lessons: 2, 3, Conclusion)

## Grades 9-12 Science Content Standards

- ES. 1.1** Construct an explanation detailing how space can be studied by observing all frequencies of the electromagnetic radiation with differentiated telescopes and observational tools. (Lessons: 1, 2, 3, Conclusion)
- ES.2.2** Describe the characteristics of the various kinds of objects in the solar system including planets, satellites, comets, asteroids, and protoplanets. Recognize that planets have been identified orbiting stars other than the sun, or exist outside of solar systems orbiting no sun at all. Describe the organization of our solar system including terrestrial and Jovian planets, asteroid belts, and the Oort Cloud. (Lesson: 1)
- ES. 2.4** Use mathematical and/or computational representations to demonstrate the motions of the various kinds of objects in our solar system including planets, satellites, comets, and asteroids. Explain that Kepler's Laws determine the orbits of those objects and know that Kepler's Laws are a direct consequence of Newton's Law of Universal Gravitation together with his laws of motion. (Lessons: 1, 2, 3)
- ES. 4.7** Create diagrams or models to demonstrate the effect of the gravitational pull of the sun and moon on Earth's oceans. Explain the difference between daily (high and low) tides and monthly (spring and neap) tides. Explain how monthly tides relate to the revolution of the moon, and therefore its phases. (Lesson: 2)