



# *Space Racers*<sup>TM</sup> Curriculum Document

## OVERVIEW

*Space Racers*<sup>TM</sup> provides 3-to 6-year-old children with exposure to key aspects of a STEM (Science, Technology, Engineering and Mathematics) curriculum. By focusing on *science* and *technology* concepts, information, methods and practices, the series helps to set the stage for future success in these critical academic areas.

Set in a rich and compelling world with space as its focus, the series also promotes the idea that space exploration helps us to learn new things, understand the world we live in, and make it a better place. Each episode will tap into children's curiosity and excitement about this important topic, laying the foundation for a positive attitude that can carry over into early school experiences with this content area.

Finally, *Space Racers*<sup>TM</sup> is built on the premise that scientific exploration and investigation are often highly collaborative processes, where knowledge building requires working with others, respect for differences, and an open mind. With an underlying theme of teamwork and cooperation, the series models a range of useful strategies, thought processes, and approaches, helping young children to develop these essential, age-appropriate skills. This collaboration guides the series' storytelling, highlighting specific behaviors that can help to make one an effective and valuable member of a team.

Please note that each 11-minute episode will include *one primary goal* and *one secondary goal* from those outlined below. Critical information will be repeated throughout the episode, providing viewers with multiple opportunities to engage with the content and master the material presented.



## PRIMARY EDUCATIONAL OBJECTIVES

### I. SCIENTIFIC INQUIRY

- A. **Exploration and Investigation**: We obtain information and learn about the world through exploring objects and investigating how things work. Conducting scientific investigations, engaging in hands-on experiences, and asking open-ended questions can foster greater conceptual understanding of our world.
1. Explore new things as a way to broaden one's understanding of the world.
  2. Use prior knowledge and experiences to develop specific questions that will lead to information, solutions, and answers.
  3. Form theories/hypotheses/predictions to explain how and why things happen.
  4. Design and carry out simple cooperative investigations that apply learning from past experiences and support new discoveries.
  5. Discuss the findings of investigations.
- B. **Observation**: Looking carefully is one way to learn about things around us. (Note: Reflects American Association for the Advancement of Science [AAAS] Standards for K-2 re "The Nature of Science: Scientific Inquiry.")
1. Use any of the senses or a combination of multiple senses to gain information.
  2. Take note of a variety of properties and describe as accurately as possible (e.g., number, shape, size, length, color, texture, weight, motion, temperature, other physical characteristics, etc.).
  3. Scan/analyze an object or event from multiple positions in order to capture different perspectives.
  4. Make comparisons to identify similarities and/or differences.
  5. Inspect/investigate in detail in order to sort, group, classify, or sequence according to size or other characteristics.
  6. Monitor objects to detect changes over time or patterns.
  7. Develop questions and predictions based on observations.
  8. Communicate findings verbally or by using pictures, graphs, charts, and/or representations.
- C. **Experimentation**: Sometimes more can be learned by actually doing something to things and taking note of what happened. (Note: Reflects AAAS Standards for K-2 re "The Nature of Science: Scientific Inquiry.") We use scientific testing and experimentation to seek reasons and evidence in an attempt to prove or disprove our ideas and hypotheses, to discover new information, and to draw conclusions.

1. Form hypotheses/make predictions using prior knowledge and past experiences.
  2. Perform tests and observe any new findings.
  3. Collect data: e.g., ask questions, make observations, perform simple measurements using standard and/or non-standard units of measure, make estimations, etc.
  4. Organize data: e.g., log info in notebook, create a chart, etc.
  5. Analyze data: e.g., compare, contrast, sort, classify, etc.
  6. Describe things as accurately as possible in terms of their number, shape, texture, size, weight, color, motion, etc.
  7. Draw conclusions/discover new information; compare conclusions to original hypotheses.
  8. Communicate findings using pictures, graphs, charts, representations, and/or words.
  9. Model safe behaviors while experimenting.
- D. **Tools:** Tools can be used to help us obtain more information about things. (Note: Reflects AAAS Standards for K-2 re “The Nature of Science: Scientific Inquiry.”)
1. Understand that the purpose of tools is to enable us to do things better, or to do some things that otherwise could not be accomplished at all. (Note: Reflects AAAS Standards for K-2 re “The Nature of Technology: Technology and Science.”)
  2. Define a goal in a given situation or experiment and compare tools to determine which would be most helpful in achieving the goal.
  3. Examples of tools:
    - a. *Computers:* Help us to gather information, learn new things, problem solve, and communicate.
    - b. *Telescopes:* Help us to see things in our solar system that are far away.
    - c. *Rockets:* Used to carry people and things into space.
    - d. *Satellites:* Spacecrafts that collect information, measurements, and pictures from a planet and send them back to Earth.
    - e. *Robots:* Can help us to carry out tasks (e.g., collect information, take pictures, etc.) as we explore.
    - f. *Basic Household Tools:* Common tools, such as scissors, pencils, hammers, wrenches, and screwdrivers can help us to complete tasks.
- E. **A Team Approach:** Collaborating with a team and then sharing what one has learned is often useful. (Note: Reflects AAAS Standards for K-2 re “The Nature of Science: The Scientific Enterprise.”)
1. Understand that scientists work as individuals and in groups to investigate the natural world, emphasizing evidence and communicating with others.



2. Recognize that scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.
  3. Share observations and findings through pictures, graphs, charts, representations, and/or words.
  4. Communicate effectively with members of one's own team, as well as others outside the team.
- F. **Ongoing Learning**: What we know can change over time, as we are always learning new things and modifying our understanding.
1. Model flexible thinking and openness to new information.
  2. Be open to unexpected discoveries.

## **SECONDARY EDUCATIONAL OBJECTIVES: SUPPORTIVE CONTENT**

### **II. KEY FACTS ABOUT SPACE AND SPACE EXPLORATION**

#### **A. The Sun**

1. The Sun is a star.
2. The Sun is the star closest to Earth (though it is still very far away).
3. The Sun is bigger than the Earth; it is the biggest object in the Solar System.
4. The Sun is important to life on Earth: it provides light, heat, energy.
5. The Sun is very hot.
6. The Sun warms the land, air, and water. (Note: Reflects AAAS Standards for K-2 re "The Physical Setting: Energy Transformations.")
7. The Sun is made of gas; it's not solid.
8. Everything in the Solar System (including Earth) revolves around the Sun.
9. The Sun can be seen only in the daytime. (Note: Reflects AAAS Standards for K-2 re "The Physical Setting: The Universe.")
10. Solar eclipse: When the Moon goes in front of the Sun and blocks most or all of the Sun's light from the Earth.
11. Solar storms / solar flares / solar wind

#### **B. Moon**

1. Characteristics of our Moon's surface (e.g., no air, very fine dust, etc.).
2. There are different phases of the Moon that make it appear a little different every day, but it looks the same again about every four weeks. (Note: Reflects AAAS Standards for K-2 re "The Physical Setting: The Universe.")
3. Other planets have moons.
4. The Moon can be seen sometimes at night and sometimes during the day.



(Note: Reflects AAAS Standards for K-2 re “The Physical Setting: The Universe.”)

C. **Stars**

1. Stars are balls of very hot gas.
2. Constellation: A group of stars that seems to make a picture in the sky.
3. There are countless stars in the sky, and they are all different from one another. (Note: Reflects AAAS Standards for K-2 re “The Physical Setting: The Universe.”)

D. **Planets**

1. There are eight planets in our solar system.
2. Names of planets.
3. Planets travel around the Sun.
4. Planets are shaped like a round ball.
5. Defining characteristics of planets.
6. Positions of planets relative to one another.

E. **The Solar System**

1. The Solar System consists of the Sun and everything that travels around it (i.e., all the planets, moons, comets, asteroids, dust, gas, etc.).
2. There are different types and locations of ice in space (e.g., Martian polar ice cap, a comet, asteroid belt, Jupiter moon Europa, Saturn’s rings, etc.).

F. **Asteroids**

1. Space is a rocky place; the biggest space rocks are asteroids.

G. **Comets**

1. Comets are big chunks of ice, rock and gas.
2. Comets have “tails.”

H. **Earth**

1. Earth is comprised of rocks, soil, and water.
2. We can learn about the Human Footprint by viewing Earth from space:
  - a. The Earth is not dark at night.
  - b. The light seen from space is both natural and made by humans (e.g., light pollution).
  - c. Light clusters give us information about how crowded an area might be.
  - d. Images from space show us where mining has taken place.



- e. Images from space give us information about the weather (e.g., impending storms).
3. It is important to protect the Earth's environment, including land and water resources.

I. **Gravity**

1. A force that causes all matter to be attracted to all other matter; this is the reason things fall down, instead of up!
2. Gravity keeps everything (including the air we breathe) from drifting off into space.
3. Gravity controls the ocean's tides.
4. Gravity causes hot air to rise, while cold air falls, which causes wind.
5. In the beginning of the universe, gravity pulled atoms together to make stars and planets.
6. Gravity keeps planets in orbit around the stars.
7. Gravity keeps moons orbiting around planets.
8. On each planet that is large enough, gravity keeps atmosphere around the planet.
9. Gravity works the same way everywhere in the universe, on all kinds of different objects, of all different sizes.
10. The bigger an object is and the closer you are to it, the stronger its gravitational pull is.
11. Gravity is different on different planets.
12. Gravity can be a helpful force, but also sometimes a harmful one.
13. The power of gravity can be used to assist us.

J. **Space Flight / Aeronautics**

1. Lift off.
2. Flight.
3. Fuel.