Space Exploration & Rocket Science

I. Introduction:

Lesson 1: How to Explore Space
Learning Objectives:
• Learn why we explore space
• Learn what is needed to explore space
• Learn how large complicated projects are accomplished

Lesson 2: Rocket Science Projects
Learning Objectives:
• Learn about the rocket launch projects and materials

Lesson 3: Space Pioneers Part 1
Learning Objectives:
• Learn about space writers and rocket scientists
• Learn about the inventor of the first liquid fuel rocket
• Learn about the designer of the R-7 Rocket

Lesson 4: Space Pioneers Part 2
Learning Objectives:
• Learn about Wernher von Braun
• Learn about the U.S. Space and Rocket Center

Lesson 5: Review & Space Pioneers Part 3
Learning Objectives:
Review of key learning objectives
Learn about pioneers of space travel

II. Human Spaceflight

Lesson 6: Project Mercury
Learning Objectives:
• Learn about NASA's first human space flight program
• Learn how the astronauts were selected

Lesson 7: Project Gemini
Learning Objectives:
• Learn about NASA's second human space flight program
• Learn about the first space walk
• Learn about the first spacecraft docking mission
• Learn about the first aborted emergency landing mission

Lesson 8: Project Apollo
Learning Objectives:
• Learn about the history of the Apollo Program
• Learn how the Apollo 11 spaceflight mission took place

Lesson 9: Skylab
Learning Objectives:
• Learn about NASA's first space station
• Learn about NASA's first in-space major repair mission

Lesson 10: Space Shuttle Program
Learning Objective:
• Learn about the history of the Space Shuttle Program
• Learn about the Challenger and Columbia shuttle disasters

III. Rocket Science

Lesson 11: Rocket Science: Laws of Motion
Learning Objectives:
• Learn about Newton's Laws of Motion
• Learn how space rocket engines work
• Learn how rockets orbit the earth and reach the moon

Lesson 12: Rocket Science: Chemistry & Physics
Learning Objectives:
• Learn about the chemistry and physics of rocket propulsion
• Learn why jet engines are useless in space
• Learn about the components of gunpowder
• Learn how unstable rockets are stabilized
• Learn why some rockets have fins
• Learn how rocket parachutes are deployed
• Learn the difference between solid and liquid rocket fuels
• Learn about hypergolic propellant (for very reliable rockets)
• Learn about hybrid rockets (solid and liquid propellants)

Lesson 13: Rocket Science: Rocket Parts
Learning Objective:
• Learn about the function of important rocket parts

Lesson 14: Rocket Science: How Rockets Reach the ISS
Learning Objective:
• Experience what it's like in a spaceship
• Learn how spaceships catch and dock onto the ISS
• Learn the basics of orbital mechanics

Lesson 15: Model Rockets & Rocket Safety
Learning Objectives:
• Learn how to build a model rocket
• Learn about model rocket parts
• Learn how to find a model rocket club
• Learn about model rocket safety

IV. Rocket Launch Project

Lesson 16: Project: Rocket Research Part 1
Learning Objectives:
• Learn about rocket thrust
• Learn what determines a rocket's velocity (speed and direction)
• Learn about acceleration
• Learn how to determine a rocket's acceleration
• Learn why water rockets outperform air rockets

Lesson 17: Project: Rocket Research Part 2
Learning Objectives:
• Learn how to keep a rocket stable
• Learn why model rockets have fins
• Learn about the center of gravity and the center of pressure
• Learn how drag is minimized

**Lesson 18: Project: Build a Water Bottle Rocket Part 1**

*Learning Objectives:*
• Learn how to make a water bottle rocket and launcher
• Launch rocket

**Lesson 19: Project: Build a Water Bottle Rocket Part 2**

*Learning Objectives:*
• Learn how to make a water bottle rocket and launcher
• Launch rocket

**Lesson 20: Review and Simple Water Bottle Rocket Project**

*Learning Objectives:*
• Review key learning objectives
• Water rocket project

**V. International Space Station (ISS)**

**Lesson 21: Building the ISS**

*Learning Objectives:*
• Learn how the ISS was assembled
• Learn how the Cupola stays pressurized while the shudders open and close

**Lesson 22: Inside the ISS**

*Learning Objectives:*
• Take a tour inside the ISS
• Learn what the ISS modules are used for
• Learn how astronauts exercise in the ISS
• Learn how astronauts sleep and eat in the ISS
• Learn about space food

**Lesson 23: Scientific Experiments on the ISS**

*Learning Objectives:*
• Watch ISS scientific experiments
• Learn how astronauts conduct dangerous experiments in the ISS

**Lesson 24: Traveling to the ISS**

*Learning Objectives:*
• Learn about the parts of the Soyuz rocket
• Learn about the Soyuz rocket launch sequence
• Learn how the Soyuz rocket enters orbit
• Learn how the Soyuz rocket "catches" the ISS
• Learn how the Soyuz rocket docks onto the ISS

**Lesson 25: Traveling Back to Earth**

*Learning Objectives:*
• Learn how the Soyuz undocks from the ISS
• Learn how the Soyuz deorbits
• Learn how the Soyuz lands

**VI. Working in Space and the Future**

**Lesson 26: EVAs and the Neutral Buoyancy Lab**
Learning Objectives:
- Learn about the history of spacewalks (EVAs)
- Learn how problems were overcome
- Learn how astronauts fix their spacesuits (EMUs)
- Learn how astronauts train for spacewalks

Lesson 27: The History & Development of Spacesuits
Learning Objectives:
- Learn about the first spacesuit
- Learn about Wiley Post's spacesuit
- Learn about the most famous spacesuit - A7L Apollo
- Learn how astronauts put on spacesuits
- Learn about new generation spacesuits

Lesson 28: The Hazards of Mars Exploration
Learning Objectives:
- Learn about Mars exploration missions
- Learn about future manned missions to Mars
- Learn about the human hazards

Lesson 29: Commercial Spaceflight & the Future
Learning Objectives:
- Learn about NASA's new Space Launch System
- Learn about the SpaceX Falcon rockets
- Learn about the Dragon spacecraft

Lesson 30: Review
Learning Objective:
- Review of key learning objectives