"MILKY WAY MISSION": Tour of the Solar System

Grade Band: 6 – 8

Title: Milky Way Mission: Tour of the Solar System

Description: The audience is transformed into an alien species that is desperate to find a new place to live. The aliens stumble upon the Milky Way Galaxy and begin to explore its vast systems. Suddenly they begin to receive strange transmissions. This prompts them to survey a solar system with an array of planets and physical characteristics. Take this journey to help the alien species find a planet that is suitable for them to live. The intense visuals within this learning experience expose the audience to key grade band curriculum in an interactive and engaging environment.

Learning Goals: ESS1 and PS1-4

Materials: Portable Dome, MSi Computer, Uniview, Laser Pointer and Power Point…
"Perfect Planet"possible integration at a later date

Timing: Introduction (15 min), Uniview (35)… Optional Star Talk (10)

INTRODUCTION		
Idea/Medium	**Dialogue**	**Goal**
World Viewer	• Big Bang • Formation of Atoms • Pure Substances and Molecules • Matter in its different states/phases	The Big Bang created the Universe Atoms are made of the matter from the Big Bang Atoms make pure substances Different atoms combine to create molecules Matter exists in varied phases
Intro Scenario	• As you are teaching the class there is an announcement and warning sirens are blaring • Your world needs a group of brave and intelligent scientists to venture into the unknown to locate a planet that is suitable for life	

UNIVIEW		
Flight Path/Feature	**Dialogue**	**Goal**
• Begin at the edge of the Milky Way Galaxy	• The Scenario: You are an alien species and your home planet is becoming inhabitable. You and a group of scientists venture out to find a new home. • Identify the Milky Way Galaxy and the habitable zone • Billions of Stars	Milky Way is one of millions of Galaxies
• Travel through the Milky Way • Turn on Radio Sphere • Turn on the Ort Cloud • Travel to the Solar System • Aerial View of Planetary Orbits • Rotate to the Ecliptic	• Scenario: As you spaceship flies through the Milky Way they receive radio waves. This allows your team to head to the origin of those waves. Where there are waves, there must be life! • Radio waves are the furthest extent of humans • Ort Cloud is the gravitational extent of the Sun • All the planets are moving in an elliptical orbit (Kepler) • Newton's Laws of Motion: An object @ rest stays @ rest; an object in motion stays in motion… unless acted upon by an unbalanced force • If there wasn't gravity what would happen to the planets? The would fly away at the point of release in a straight line • Dwarf Planets: Pluto 17*, Eris 45*, Ceres 11*	Our Solar System is located inside of the Milky Way Galaxy 70 ly is the extent of human influence Earth Orbits in an Ellipse (almost a circle) 1st Law of Motion
• Fly to Pluto • Launch PIP Photos	• Size: Smaller than 7 of the Solar Systems Moons • Temperature: -229 C, -380 F • Composition: 70% Rock, 30% Ice (N) • Atmosphere: Nitrogen Trapped in Ice • Distance from the Sun: 30 – 39 AU • Revolution: ~248 years • Rotation: ~6 days (retrodgrade) • Moons: (6) Charon • Unique Characteristic: ○ Hopefully New Horizons will reach the planet in 2016	Reason for Pluto being classified as a dwarf planet
• Fly to Neptune • Launch PIP Photos	• Size: 3.88 (4) X the diameter of Earth • Temperature: -370F (-223C) • Composition: H and He; Core size of Earth (Gas Giant) "ices" and rock • Atmosphere: H/He, Methane that absorbs red light • Distance from the Sun: 2.8 billion miles (4.5 billion km) 30 AU • Revolution: ~165 years • Rotation: ~16 hours • Moons: (13) Triton • Unique Characteristic: ○ Fastest Winds in System (2000 km/hr)	Hydrogen and Helium are the atoms that make up most of the Jovian Planets Matter as a gas; still loosely attracted atoms

	○ Great Dark Spot (disappeared in 1994)	
• Fly to Uranus • Launch PIP Photos	• Size: 4 X the diameter of Earth • Temperature: -300F (-184C) • Composition: H/He, more "ices" (Gas) • Atmosphere: Hydrogen-Helium • Distance from the Sun: 1.8 billion miles (2.8 billion km) 19 AU • Revolution: ~84 years • Rotation: ~17 hours (retrograde) • Moons: 27 • Unique Characteristic: • Tilted on its side @ 98* angle • Coldest Planet	Rotates on its side
• Fly to Saturn • Launch PIP Photos	• Size: 9 X the diameter of Earth • Temperature: -300F (-184C) • Composition: Core of Fe, Ni and Rock; Layer of Metallic H; Liquid H; Outer Gas Layer • Atmosphere: Hydrogen-Helium • Distance from the Sun: 891 million miles (1.4 billion km) 9.5 AU • Revolution: ~29.5 years • Rotation: ~10.5 hours • Moons: 66 (Enceladus - ice geysers blasting from S pole) • Unique Characteristic: • Not the only ringed planet • Less Dense than Water (it could float)	Density is how tightly packed matter is… Saturn is less dense than water (it could float)
• Fly to Jupiter • Launch PIP Photos • Fly to Io • Fly to Europa • Fly to Ganymede	• Size: 11 times the diameter of Earth • Temperature: -162 to – 258F • Composition: Mostly H; 25% He; Rocky Core • Atmosphere: Hydrogen-Helium • Distance from Sun: 484 million miles (779 million km) 5.2 AU • Revolution: ~12 years • Rotation: ~10 hours (Fastest Rotation) • Moons: 63 (Io, Europa, Ganymede) • Unique Characteristic: • If it were 100X larger @ birth it could have become a star • 318X the mass of Earth, 2 ½ X the mass of all planets • Low density causes it to be 2 1/2 X the gravity of Earth	Jupiter could have become a star if it would have been larger when it was formed Its moons hold a chance for life (possibly hidden below the surface)
• Pull Back and Show the Asteroid Belt • Turn on Near Earth • Turn on Hazardous	• Discuss results of collisions and gravity • Speed Up Time to display trails	Gravity and Collisions cause asteroids to dislodge from their orbits

• Fly to Mars • Launch PIP Photos	• Size: About ½ the size of Earth • Temperature: 98F – 190F (36C to -123C) • Composition: Iron Oxide; Rust/Red Color • Atmosphere: CO_2 • Distance from Sun: 142 million miles (228 million km) 1.5 AU • Revolution: ~1.9 years • Rotation: ~24 hours (little longer than Earth) • Moons: 2 • Unique Characteristic: • There is water in the form of ice • Olympus Mons • Borealis Basin	Mars has water, but lacks the atmosphere to allow liquid water to exist
• Fly to Earth • Launch PIP Photos	• Size: • Temperature: 45F (7.2C) • Composition: Rocks, Soil, Water 70%/Land30% • Atmosphere: 78% N, 21% O, 1.2 Water, 1 Ar, CO_2, H, He • Distance from the Sun: 93 million miles (150 million km) 1 AU • Revolution: 365.256 days/1 year • Rotation: ~24 hours (23 hours, 56 min, 4.1 sec) • Moons: 1 • Unique Characteristic: • Magnetosphere protects us	Earth has a magnetosphere that allows for protection from celestial hazards Earth is in the habitable zone and has just the right chemical composition for life
• Fly to Venus • Launch PIP Photos	• Size: Almost the same size as Earth • Temperature: 850F (449C) • Composition: Volcanic Landscape • Atmosphere: Carbon dioxide, small amounts of N, Ar, O; Sulfuric Acid Clouds • Distance from the Sun: 67 million miles (108 million km) 0.7 AU • Revolution: ~7.5 months • Rotation: ~243 days (retrograde) • Moons: 0 • Unique Characteristic: • Hottest planet in the Solar System (870F) Greenhouse Effect	Venus is too extreme for life as we know it to exist
• Fly to Mercury • Launch PIP Photos	• Size: 38% the size of Earth (1/3) • Temperature: 870F - -300F (465C to -184C) • Composition: Large Core; Cratered Landscape • Atmosphere: Carbon dioxide, small amounts of N, Ar, O • Distance from the Sun: 38 million miles (58 million km) 0.4 AU • Revolution: ~3 months	Mercury lacks an atmosphere due to proximity to the Sun

	• Rotation: ~59 days • Moons: 0 • Unique Characteristic: • Mercury might have ice in craters near its poles • The planet has a comet like tail caused by solar winds	
• Fly out to show Habitable Zone of Solar System • Fly back to Earth • Launch PIP Photos and Video	• Display the Habitable Zone • Launch PIP of Various Terrain • Launch Video of ISS Fly Over	Earth is in a double habitable zone

STELLARIUM: STAR TALK		
Idea/Medium	**Dialogue**	**Goal**

"Star Talk"
Stellarium 0.10.2
	• Stellarium
	  ○ Louisville, KY; Ground Up View; Facing North; Grids Off; Atmosphere On; Planets Off
	• Day and Night (Sunrise and Sunset)
	  ○ Increase Time to show day and night
	  ○ Rises in the East and sets in the West (Cardinal Direction Posters)
	• Sunlight Warms the Earth
	• Change dates to display "height" of Sun in the sky during the different seasons
	• Have student hold light and point it at the N/S/Equator Board
	• Tilt the Board and Relate it to the different seasons
	• Have Students Look at your Light; Head represents the Earth
	• Students tilt heads back to see that light is not direct, thus causing cooler temperatures
	• Tilt head forward to see that light on the forehead would cause temperature to rise
	• Constellations On; Names On (Periodically to Show Major Constellations)
	• Constellations – Ursa Major, Ursa Minor (Asterisms – Big Dipper and Little Dipper)
	• Turn on Equatorial Grid to show Polaris as the North Star
	• Planet names on to display how they can be observed
		Orient the audience the sky to view the path of the Sun, Moon and other objects
		
		The Sun rises in the East/sets in the West
		
		Other stars make up constellations (that tell a story)
		
		The North Star (Polaris) appears to be stationary
		
		The Sun is "higher" in the sky when it is summer and "lower" in the sky during the winter

Reference(s):

National Research Council. *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* Washington, DC: The National Academies Press, 2012.

http://nineplanets.org/pluto.html