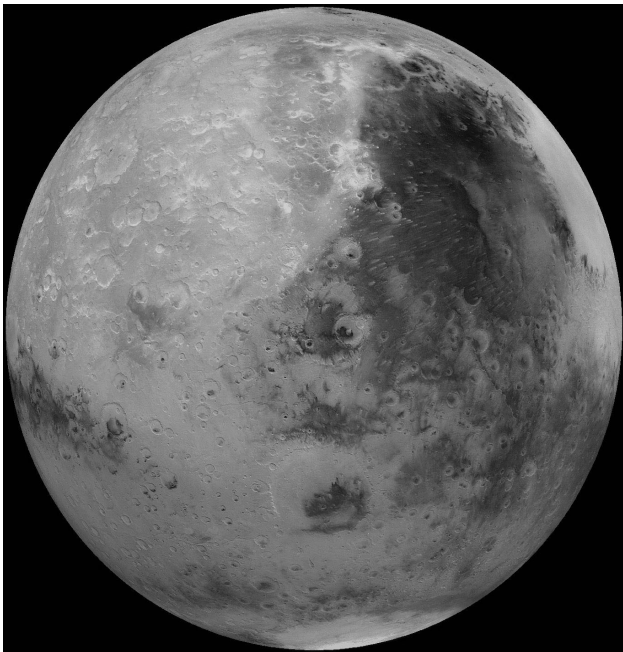


The Inner Planets

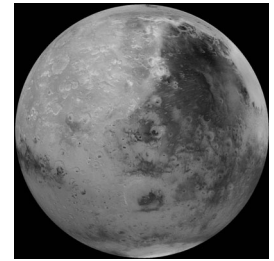
Teacher's Guide Middle School



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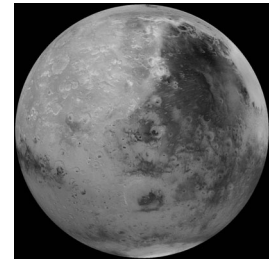
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A Message from our Company ...

Dear Educator:

Thank you for your interest in the educational videos produced by the *Visual Learning Company*. We are a Vermont-based, family owned and operated business specializing in the production of quality educational science videos and materials.

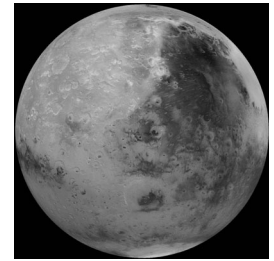
We have a long family tradition of education. Our grandmothers graduated from normal school in the 1920's to become teachers. Brian's mother was an elementary teacher and guidance counselor, and his father was a high school teacher and superintendent. This family tradition inspired Brian to become a science teacher, and to earn a Ph.D. in education, and lead Stephanie to work on science educational programs at NASA.

In developing this video, accompanying teacher's guide, and student activities, our goal is to provide educators with the highest quality materials, thus enabling students to be successful. In this era of more demanding standards and assessment requirements, supplementary materials need to be curricular and standards based - this is what we do!

Our videos and accompanying materials focus on the key concepts and vocabulary required by national and state standards and goals. It is our mission to help students meet these goals and standards, while experiencing the joy and thrill of science.

Sincerely,

Brian and Stephanie Jerome



Standards Correlations

National Science Education Standards

(Content Standards: 5-8, National Academy of Sciences, c. 1996)

Earth and Space - Content Standard D:

As a result of their activities in grades 5-8, all students should understand that:

- The earth is the third planet from the sun in a system that includes the moon, the sun, eight other planets and their moons, and smaller objects, such as asteroids and comets. The sun, an average star, is the central and largest body in the solar system.
- Gravity is the force that keeps planets in orbit around the sun and governs the rest of the motion in the solar system. Gravity alone holds us to the earth's surface.

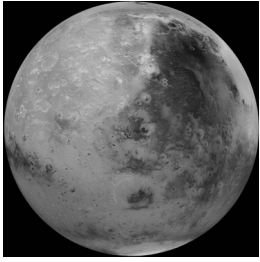
Benchmarks for Science Literacy

(Project 2061 - AAAS, c. 1993)

The Physical Setting - Processes that Shape the Earth (4A)

By the end of the 8th grade, students should know that:

- The sun is many thousands of times closer to the earth than any other star. Light from the sun takes a few minutes to reach the earth, but light from the next nearest star takes a few years to arrive.
- Nine planets of very different size, composition, and surface features move around the sun in nearly circular orbits. Some planets have a great variety of moons and even flat rings of rock and ice particles orbiting around them. Some of these planets and moons show evidence of geologic activity. The earth is orbited by one moon, many artificial satellites, and debris.



Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students should be able to do the following:

- Describe some of the characteristics of our nearest star, the sun;
- Compare and contrast features of the planets Mercury, Venus, Earth and Mars;
- Define our solar system as consisting of the sun, nine planets and their moons, and other matter orbiting the sun;
- Explain how the force of gravity keeps the planets in orbit around the sun and moons in orbit around the planets;
- Understand that our solar system is part of a large galaxy called the Milky Way Galaxy;
- Describe in basic terms The Nebular Theory of Formation;
- Diagram the path planets take around the sun and illustrate the elliptical shape of their orbits; and
- List some of the unique characteristics that allow Earth to support life.



Assessment

Preliminary Test:

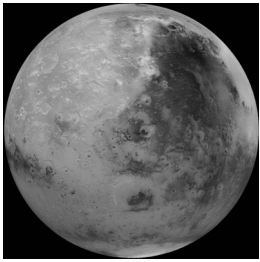
The Preliminary Test, provided in the Student Masters section, is an assessment tool designed to gain an understanding of student preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Video Review:

The Video Review, provided in the Student Masters section, can be used as an assessment tool or as a student activity. There are two main parts. The first part contains questions titled “You Decide” that can be answered during the video. The second series of ten questions consists of a video quiz to be answered at the conclusion of the video.

Post-Test:

The Post-Test, provided in the Student Masters section, can be utilized as an assessment tool following student completion of the video and student activities. The results of the Post-Test can be compared against the results of the Preliminary Test to assess student progress.



Introducing the Video

Ask students to list the names of the nine planets in our solar system. Write them on the board. At their desks have the students list the planets in order starting from the sun. Explain that the four closest planets are referred to as the “inner planets” and the five farthest planets are called the “outer planets.”

Ask students to name the closest star to Earth. Explain that our sun is a star and the center of our solar system around which all planets revolve. Ask students to explain why the sun is crucial to life on Earth. Tell students to watch the video closely to see why life exists only on Earth, and not on the other inner planets.

Video Viewing Suggestions

The Student Master “Video Review” is provided for distribution to students. You may choose to have your students complete this Master while viewing the program or to do so upon its conclusion.

The program is approximately 20-minutes in length and includes a ten-question video quiz. Answers are not provided to the Video Quiz on the video, but are included in this teacher’s guide. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.



Student Assessments And Activities

Assessment Masters:

- Preliminary Test
- Video Review
- Post-Test

Student Activity Masters:

- Weightless in Space
- Invasion from Earth
- Calculating Your Weight on Other Planets
- The Impact of Craters
- Vocabulary of *The Inner Planets*



Video Script: *The Inner Planets*

1. As we walk along a sidewalk . . .
2. . . ski on mountain trails . . .
3. . . eat at the dinner table . . .
4. . . and play different sports . . .
5. . . the planet on which we live is traveling through space at the amazing speed of about 107,000 kilometers per hour.
6. Our planet Earth, along with the other eight planets that travel around the sun is in constant motion.
7. During the next few minutes we're going to explore the ways in which the planets travel through space.
8. We'll also study some of the unique characteristics of our sun.
9. . . and then look at some of the properties of the planets located close to the sun . .
10. . . including features of the planet on which we live.
- 11. Graphic Transition – Our Solar System**
12. If you go outside on a very clear night far from bright city lights it is possible to see into our galaxy.
13. This band of white haze is a collection of stars, planets, and other matter.
14. The name of this haze is the Milky Way Galaxy.
15. It's a huge galaxy of which our solar system is just a small part.
16. Our solar system consists of the Sun, nine planets and their moons, as well as other structures travelling around the sun.
17. The sun is the central point around which all of the planets in our solar system travel.
18. How did our solar system form?
19. There are many theories as to how the solar system formed. Most astronomers believe in the nebular theory of formation.
20. According to the nebular theory, it's believed our solar system once existed as a nebula.
21. **You Decide!** What is a nebula?
22. A nebula is a cloud of dust and gas in space.
23. If you go out on a clear night you can see an example of a nebula, the Orion nebula located in the constellation Orion.
24. According to the nebular theory a nearby star exploded into a massive supernova five billion years ago.
25. This event seeded the nebula, that cloud of dust and gas in space, with various elements and chemicals.
26. The force of the explosion was so great that it disrupted the stable gas cloud of the nebula.
27. It is then believed the nebula collapsed, pulling matter toward the center, causing the nebula to spin faster.



Script (cont.)

28. The nebula flattened into a spinning disk, with a growing sun taking form in the middle.
29. Approximately 5 billion years ago the sun became hot enough for nuclear fusion to occur within it.
30. The heat radiating from the sun heated the newly emerging planets
31. . . . causing the closer protoplanets to eventually become dense spheres.
32. Keep in mind that this is a simplified theory of the way most astronomers generally believe the sun and planets in our solar system developed.
33. Undoubtedly this theory will be revised and added to in the future.
- 34. Graphic Transition – Our Nearest Star**
35. You Decide! What do we call our nearest star?
36. We refer to our nearest star as the Sun.
37. The sun is actually a star. We don't think of it as a star because it's so big and hot.
38. But because it is so close to the earth, only about 148,000,000 kilometers away, which is downright neighborly in space terms, it looks big.
39. For example, when this flashlight is far away it looks small , . .
40. . . . but it looks a lot bigger when it is closer.
41. But even though the sun is millions of kilometers from earth, it's essential to life here.
42. Life is directly or indirectly dependent on the sun.
43. Without the sun, plants could not conduct photosynthesis, which produce the foods we eat and the oxygen we breathe.
44. The sun is huge. In fact nearly one million planets the size of the earth could fit inside the sun!
45. The sun is made up of gases, which can reach temperatures of 1.7 million degrees Celsius in the outer layer, and over 15 million degrees in the center.
46. The sun produces enormous amounts of heat, light, and radiant energy.
47. Heat is produced via the process of nuclear fusion which converts matter into energy
48. Hydrogen is the major source of fuel in the process of nuclear fusion in the sun.
49. Even though the sun consumes 3.6 million metric tons of hydrogen every second, it probably won't run out for another 4.5 billion years!
50. Besides providing heat and light, the sun is also extremely important in our solar system because it serves as a gravitational anchor . . .
51. . . . around which all of the other planets revolve.
- 52. Graphic Transition – The Moving Planets**
53. For centuries people believed that the sun revolved around the earth.
54. But, in 1543, a Polish astronomer by the name of Nicolaus Copernicus stated that the earth and the other planets orbit around the sun.
55. An orbit is the path an object travels when going around another object in space.
56. Copernicus believed the planets orbited around the sun in circles, and that each planet took a different amount of time to orbit the sun.
57. Later, in the early 1600s, an astronomer named Johannes Kepler revised the theories



Script (cont.)

of Copernicus.

58. Kepler stated that the planets do not travel in perfect circles, but travel around the sun in an ellipse.
59. **You Decide!** What is an ellipse?
60. An ellipse is an oval shape, and is somewhat similar to the shape of this egg.
61. In the seventeenth century an English scientist by the name of Isaac Newton explained why the planets keep revolving around the sun.
62. He stated that objects in motion remain in motion unless acted upon by an outside force.
63. This is referred to as inertia.
64. For example, if it wasn't for the force of gravity and friction this ski jumper would keep moving endlessly.
65. The planets, similarly, are in a continual state of motion as a result of inertia imparted from the original spinning nebula.
66. The reason planets do not travel in a straight line, but travel in an ellipse is due to gravity.
67. The pull of gravity between the sun and the planets prevents the planets from flying off into space.
- 68. Graphic Transition – Rotation and Revolution**
69. Notice how this ferris wheel spins around a central point. Each time it completely spins around it is called a revolution.
70. How long does it take for the earth to make a complete revolution around the sun?
71. It takes about 365 days for the earth to make a complete revolution around the sun.
72. The other planets take differing amounts of time to revolve around the sun.
73. For example, it takes Mars 687 days to orbit the sun.
74. **You Decide!** How long does it take earth to make a complete rotation on its axis?
75. It takes earth about 24 hours, or one day to make a complete rotation on its axis.
76. Other planets differ in how long they take to complete a rotation.
77. For example, it takes Mercury about 59 earth days to rotate on its axis.
78. And it takes the planet Venus 243 earth days to make a complete rotation!
- 79. Graphic Transition – Mercury**
80. Imagine being on the closest planet to the sun . . .
81. . . . where it's so hot it could melt this piece of lead.
82. But on the dark side of the planet Mercury, temperatures can fall to minus 180 degrees Celsius.
83. This is the greatest temperature range of any planet in the solar system.
84. Mercury is the second smallest planet in our solar system, only about 1/3 the size of the earth.
85. In 1974 NASA launched the Mariner 10 spacecraft to embark on a five month journey to mercury.
86. When the spacecraft passed within nearly 700 kilometers of Mercury, the first



Script (cont.)

close-up images of the planet revealed an ancient, heavily cratered landscape.

87. Huge cliffs as high as 3 kilometers and 500 kilometers long were revealed.
88. Also large expansive plains were found.
89. Mercury travels very quickly around the sun – taking only 88 earth-days to make a complete revolution.
90. But the planet rotates very slowly, taking 59 earth days to make a complete rotation on its axis. Therefore days and nights on Mercury are very long!
- 91. Graphic Transition - Venus**
92. Earth's closest planetary neighbor is the planet Venus.
93. Venus is thickly shrouded with clouds which are five times denser than clouds on earth. For this reason, astronomers have had a difficult time understanding the surface features.
94. Specialized instruments have been used to interpret surface features.
95. Canyons, craters, and plains cover the surface.
96. Once active volcanoes also dot the landscape.
97. The dense atmosphere acts as a blanket, trapping heat, much like a greenhouse. For this reason, the dark side of the planet maintains nearly the same high temperature as the bright side.
- 98. Graphic Transition – Earth**
99. The view of earth from space reveals a very different planet from others we have just discussed.
100. The dominant blue color indicates the presence of water.
101. Water found in the form of solid ice, liquid water, and water vapor is present in greater concentrations on earth than on any other planet.
102. The atmosphere of earth is also markedly different than on other planets.
103. **You Decide!** What is the most dominant gas in earth's atmosphere?
104. Nitrogen makes up of 78 percent of earth's atmosphere, followed by oxygen which makes up 21 percent.
105. Earth maintains a relatively constant temperature, in part because the oceans cover nearly 70% of earth.
106. They play a very important role in moderating earth's temperature.
107. They also serve as a critical link in providing water vapor to the atmosphere.
108. These factors play a significant role in sustaining life on earth.
109. As far as we know, earth is the only planet in our solar system that supports life.
- 110. Graphic Transition – Mars**
111. The word martian is derived from the word mars.
112. For years people have joked about, and perhaps even hoped that the planet Mars supported life.
113. Recent evidence suggests that Mars may have once supported life – at least in simpler form.
114. However, no higher forms of life similar to animal life here on earth have been found on Mars.



Script (cont.)

115. While humans have not been to Mars, several different spacecraft have orbited, and even landed on the surface.
116. Such missions provided images of Mars' rocky terrain . . .
117. . . and they provided analysis of the soil, which contains large concentrations of red iron oxide.
118. Four massive, inactive volcanoes are located on Mars.
119. One volcano, called Olympus Mons is three times higher than Mount Everest, and is the largest volcano ever discovered.
120. Channels on the surface indicate that liquid water may have once flowed on the planet.
121. And today frozen water is found in a northern ice cap.
122. Mars has a thin atmosphere which does not retain heat from the sun well.
123. Therefore the planet is overall much cooler than earth.
- 124. Graphic Transition – Summing Up**
125. During the past few minutes we've taken a brief look at some of the fascinating characteristics of our solar system.
126. We took a look at a theory of how the solar system was created.
127. And we saw how the sun is vital to life here on Earth.
128. We took a look at some of the characteristics of the sun.
129. We investigated how the nine planets orbit around the sun in elliptical orbits.
130. And we briefly studied some of the properties of the inner planets . . .
131. . . including those of Mercury . . .
132. . . Venus . . .
133. . . the planet on which we live – Earth . . .
134. . . and the planet Mars.
135. So the next time you take a walk on a sunny day, . . .
136. . . or look up at the evening sky . . .
137. . . think about some of the things we have discussed during the last few minutes.
138. You just might look at our solar system a little differently.

Video Quiz

Fill in the blank to complete the sentence. Good luck and let's get started.

1. Our solar system is in the _____ Galaxy.
2. Most astronomers believe our solar system originated from a _____.
3. Our sun is actually a _____.
4. Nuclear _____ produces energy in the sun.
5. Planets orbit around the _____.
6. _____ is the force which holds planets in orbit.
7. It takes earth _____ days to orbit the sun.
8. _____ is the planet closest to the sun.
9. Earth is unique in that it possesses large amounts of _____.
10. Channels indicate _____ may have once existed on Mars.



Answers to Student Assessments

Preliminary Test

1. Nebular
2. energy
3. sun
4. orbit
5. Mercury
6. Venus
7. Mars
8. gravity
9. Earth
10. axis
11. true
12. true
13. false
14. true
15. false
16. true
17. true
18. false
19. true
20. true

Video Review

You Decide:

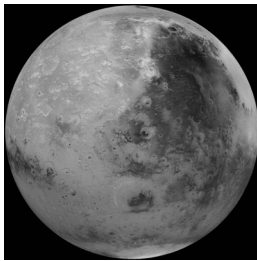
1. A nebula is a cloud of dust and gas in space.
2. The closest star to Earth is the sun.
3. An ellipse is an oval shape used to describe planets' path around the sun.
4. It takes the earth 24 hours to make a complete rotation on its axis.
5. Nitrogen is the most dominant gas in Earth's atmosphere.

Video Quiz:

1. Milky Way
2. nebula
3. star
4. fusion
5. sun
6. gravity
7. 365
8. Mercury
9. water, or oxygen
10. water

Post Test

1. true
2. true
3. true
4. false
5. true
6. true
7. true
8. true
9. false
10. false
11. orbit
12. Venus
13. Earth
14. Nebular
15. Mars
16. gravity
17. sun
18. axis
19. energy
20. Mercury



Answers to Student Activities

Weightless in Space

Part A

1. Gravity pulls the water escaping from the hole into the bucket.
2. The cup and water fall together causing the water to remain in the cup. No, the water did not spill out of the hole.
3. The cup and water are falling together just as a spacecraft and astronaut do in space.

Part B

1. Your arms feel weightless and float upwards.
2. The feeling of weightlessness on a roller coaster occurs just after the ride peaks and begins its downward progression.

Invasion from Earth

Broadcasts will vary. You may want to record the broadcasts to play back to the students.

Calculate Weight on Other Planets

Sample for 100 lb student:

Earth-100 lbs

Moon-16 lbs

Mercury-38 lbs

Venus-91 lbs

Mars-38 lbs

1. Weight is the least on the planets Mercury and Mars.
2. Weight is the most on Earth.
3. Earth has the most mass.
4. The more mass a planet has, the more gravitational pull it will create.

The Impact of Craters

Table A

Answers will vary

Table B

Answers will vary depending on marble size.

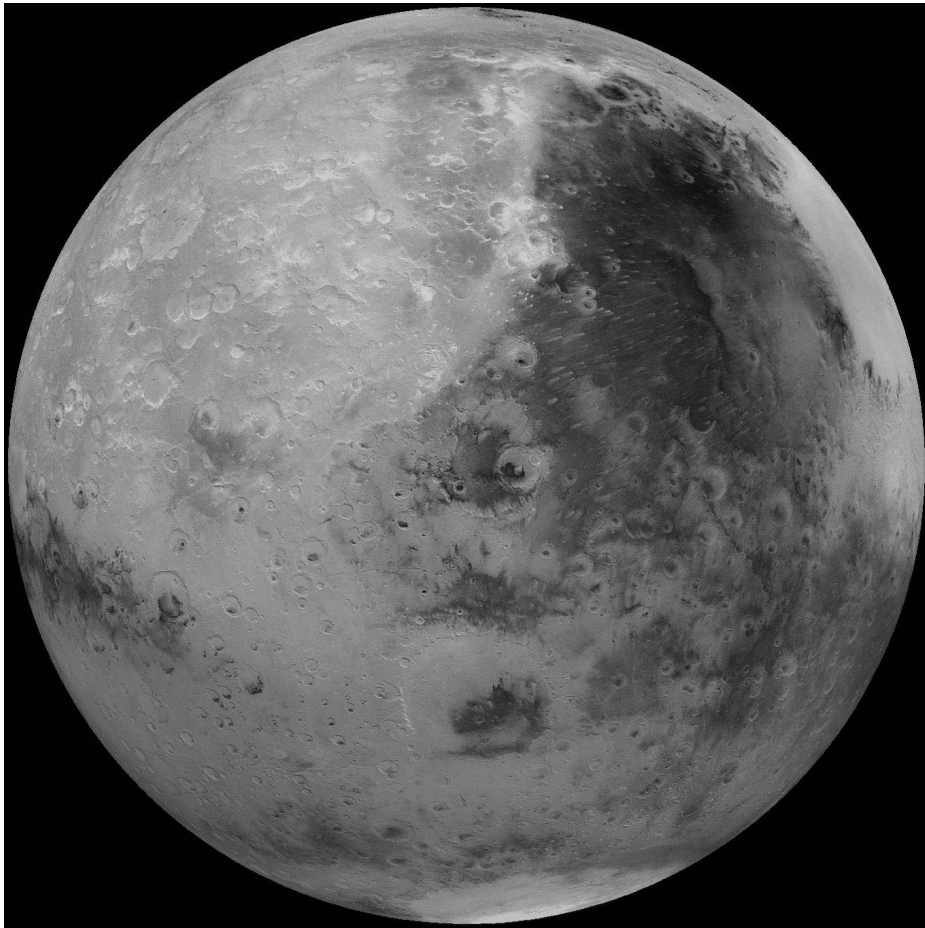
Questions:

1. The object with the most mass created the largest crater.
2. Marble Four created the largest crater.
3. The more mass an object has, the larger the crater.
4. A higher velocity will create a larger crater.
5. Crater size depends on size of the object impacting the surface and the velocity with which it travels.

Vocabulary:

1. d, Mars
2. h, orbit
3. b, Earth
4. f, gravity
5. i, Mercury
6. a, solar system
7. g, Milky Way
8. c, ellipse
9. e, nebula
10. j, inertia

Assessment and Student Activity Masters





Preliminary Test

Directions: Fill in the blank with the correct word. A list of possible answers is provided at the bottom of the page.

1. A proposed theory explaining the formation of our solar system is called the _____ Theory of Formation.
2. The process of nuclear fusion converts matter into _____.
3. The planets in our solar system revolve around the _____.
4. In space, an _____ is the path an object takes around another object.
5. _____ is the planet closest to the sun.
6. The planet closest to Earth is _____.
7. There is evidence found on the planet _____ indicating water may have once flowed on the surface.
8. _____ is the force that anchors the planets to the sun.
9. _____ is the only known planet that sustains life in our solar system.
10. It takes 24 hours for Earth to rotate on its _____.

- | | |
|----------|---------|
| rotation | energy |
| gravity | Earth |
| sun | Nebular |
| Venus | Jupiter |
| axis | orbit |
| Mercury | Mars |



Preliminary Test

Directions: Decide whether the answer is True (T) or False (F).

- | | | |
|--|---|---|
| 11. The sun is actually a star. | T | F |
| 12. Our solar system is part of the Milky Way Galaxy. | T | F |
| 13. There are eight planets in our solar system. | T | F |
| 14. The atmosphere of Earth contains oxygen. | T | F |
| 15. The sun moves in a path called an orbit. | T | F |
| 16. Planets revolve around the sun in elliptical orbits. | T | F |
| 17. Planets are held in orbit around the sun due to gravity. | T | F |
| 18. The sun produces only light. | T | F |
| 19. Earth is unique in that it contains large amounts of liquid water. | T | F |
| 20. It takes Earth 365 days to revolve around the sun. | T | F |



Video Review

Directions: During the course of the program, answer the “You Decide” questions as they are presented in the video. Answer the Video Quiz

You Decide:

1. What is a nebula? Answer _____
2. What do we call our nearest star? Answer _____
3. What is an ellipse? Answer _____
4. How long does it take earth to make a complete rotation on its axis? Answer _____
5. What is the most dominant gas in Earth’s atmosphere? Answer _____

Video Quiz:

1. Our solar system is in the _____ Galaxy.
2. Most astronomers believe our solar system originated from a _____.
3. Our sun is actually a _____.
4. Nuclear _____ produces energy in the sun.
5. Planets orbit around the _____.
6. _____ is the force which holds planets in orbit.
7. It takes Earth _____ days to orbit the sun.
8. _____ is the planet closest to the sun.
9. Earth is unique in that it possesses large amounts of _____.
10. Channels indicate _____ may have once existed on Mars.



Post Test

Directions: Decide whether the answer is True (T) or False (F).

1. Planets are held in orbit around the sun due to gravity. T F
2. Planets revolve around the sun in elliptical orbits. T F
3. The sun is actually a star. T F
4. The sun moves in a path called an orbit. T F
5. It takes Earth 365 days to revolve around the sun. T F
6. Our solar system is part of the Milky Way Galaxy. T F
7. Earth is unique in that it contains large amounts of liquid water. T F
8. The atmosphere of Earth contains oxygen. T F
9. The sun produces only light. T F
10. There are eight planets in our solar system. T F



Post Test

Directions: Fill in the blank with the correct word. Choose from the list of possible answers at the bottom of the page.

11. In space, an _____ is the path an object takes around another object.
12. The planet closest to Earth is _____.
13. _____ is the only planet that sustains life.
14. A proposed theory explaining the formation of our solar system is called the _____ Theory of Formation.
15. There is evidence found on the planet _____ indicating water may have once flowed on its surface.
16. _____ is the force that anchors the planets to the sun.
17. The planets in our solar system revolve the _____.
18. It takes 24 hours for Earth to rotate on its _____.
19. The process of nuclear fusion converts matter into _____.
20. _____ is the only planet closest to the sun.

- | | |
|----------|---------|
| rotation | energy |
| gravity | Earth |
| sun | Nebular |
| Venus | Jupiter |
| axis | orbit |
| Mercury | Mars |



Weightless in Space

Objective:

In this activity, students will learn about differences between the environment in which they live and the environment that exists in space.

Background:

Each of the nine planets in our solar system travel around the sun in what is called an orbital path. For example, Earth travels around the sun at a speed that is close to 107,000 kilometers per hour. **Gravity** is the force that acts on the planets and keeps them in their orbit so that they do not spin out into space. When a spacecraft travels in space, it enters a state of **free-fall**. This state of motion happens because everything in its immediate world is falling together, which in turn causes a feeling of weightlessness. When we see pictures of astronauts working in space they appear to be floating. The floating appearance is all due to the fact that they are actually falling! In the exercises below, you will demonstrate free-fall by using a cup of water. You will also discover, for a brief moment, how it feels to be weightless.

Materials:

Part A

Styrofoam or paper cup
Pointed object used to make a small hole
Water
Bucket

Part B

Average-sized doorway

Procedure:

Part A

1. Poke a small hole in the lower side of the cup.
2. While holding your thumb over the hole, fill the cup with water.
3. Position the bucket under the cup.
4. Stand above the bucket with the cup at waist level and let the water stream out and into the bucket.
5. Again, hold your thumb over the hole as you fill the cup with water.
6. Hold the cup up high in front of your face and drop it into the bucket below.
7. Record what happened in Steps 4 and 6 in Questions: Part A.



Weightless in Space (cont).

Part B

1. Stand in the middle of the doorway.
2. Make a fist with your hands. While keeping your arms straight by your side, press your fists hard against the sides of the doorway.
3. Slowly, count to ten.
4. Take a step out of the doorway while relaxing your arms.
5. Record results of exercise in Questions: Part B.

Questions:

Part A

1. In what way does gravity affect the water in the cup when you take your finger off the hole?
2. What happened when you dropped the cup into the bucket? Did water spill out of the hole?
3. Describe how dropping the cup into the bucket simulates free-fall.

Part B

1. What happens to your arms when you step out from under the doorway?
2. Have you ever been on a roller coaster and felt a similar sensation? At what point on a roller coaster ride do you feel the sensation of being weightless?



Invasion from Earth!

Objective:

In this activity students will write creatively about our universe and the planet Mars.

Background:

For many years, people have wondered and debated about the possible existence of life on other planets in our solar system. For a long time, many believed that Mars was the most likely of all known planets to harbor life. Scientists believed that seasonal color changes indicated possible vegetation growth during warm months followed by a dormant period in colder months. Astronomers studying the planet through telescopes discovered straight lines that crisscrossed on the surface. Some believed that these lines were irrigation canals similar to the man-made canals built on Earth. These discoveries led many to believe that not only vegetation existed on Mars, but some sort of alien life existed as well. The name “martian,” derived from the word Mars, became a common term used in reference to extraterrestrial life.

On October 30th, 1938, the United States had an encounter with alien life from Mars. Orson Welles, a famous actor and director used his radio program to perform a play adapted from the novel *The War of the Worlds*. In the form of a news broadcast, Orson Welles, and other actors, informed the public that an alien invasion from Mars had finally happened. Even though at the beginning of the program Welles stated that the broadcast was fiction, many tuned in too late and believed that the radio program was real!

Activity:

Write your own 5 minute news broadcast similar to *The War of the Worlds*, except this time you are a martian having witnessed an invasion from Earth. Find information about the environment of Mars and compare it to Earth’s environment. What devices would a human need in order to stay alive on Mars? Be aware that Mars’ atmosphere is made up of mostly carbon dioxide which is harmful for humans to inhale. Describe the spacecraft that has landed on your planet. What do the earthlings look like? What do they sound like? And what kind of food do they bring with them?

Optional:

Divide the class into groups of 3 or 4 students and have them work cooperatively on creating the broadcast. When finished, have each group present their broadcast to the rest of the class. Be creative and have fun!



Calculating Your Weight On Other Planets

Objective:

In this activity students will calculate what their weight would be on other planets, as well as on Earth's moon.

Background:

Weight is a property produced by the force called **gravity**. On Earth, your weight is the gravitational pull acting on your body. All planets have a gravitational pull that is unique to that planet. For instance, Mercury's gravitational pull is about 40% less than Earth's. In the table below, calculate your weight according to the gravitational pull by multiplying your weight by the planet's gravitational pull.

Name	Gravitational Pull	Weight x Gravitational Pull
Earth	1.0	
Moon	.16	
Mercury	.38	
Venus	.91	
Mars	.38	

- Questions:**
- 1) On what planet, or planets, is your weight the least?
 - 2) On what planet, or planets, is your weight the most?
 - 3) Which planet, or moon, has the most mass?
 - 4) How does the mass of a planet influence the gravitational pull?



The Impact of Craters

Objective:

In this activity students will model impact craters to understand the conditions which influence crater size and appearance.

Background:

Impact craters are craters that form when meteorites hit the surface of a planet or moon. They create large, deep holes on the surface of the planet or moon on which they strike. Craters are commonly found on planets in our solar system. Craters have been found on Earth, but the forces of weathering and erosion quickly erase them from the landscape. Unlike Earth, the moon’s surface has remained unaltered and looks much the same as it did 3.5 billion years ago. Geological studies of the moon’s surface indicate an ancient period of constant bombardment by meteorites. In this activity you will study craters created by different-sized projectiles, moving at different speeds that strike a planet-like surface.

Materials:

Part A

- Tray, 2 ft. and at Least 4 inches, (about 10 cm) deep.
- Fine Sand
- 3 Sphere-Shaped Objects of Different Masses
- Meter Stick

Part B

- Tray (same as above)
- Fine Sand
- 4 Marbles
- Meter Stick

Procedure:

Part A

1. Fill the tray with sand about 3 inches, (about 7.5 cm) deep.
2. Smooth the surface of the sand.
3. Fill in Table A with the type of object and its mass.
4. Drop each object from a height of 2 meters into the tray of sand.
5. Fill in the rest of Table A with the measurements of crater diameter.



The Impact of Craters (cont).

Table A

Object	Mass of Object	Crater Diameter
1.		
2.		
3.		

Part B

1. Smooth the tray of sand over so that the craters from Part A are no longer visible.
2. Drop one marble from a height of 10 cm.
3. Drop the second marble from a height of 2 meters.
4. Drop the third marble from a height of 3 meters.
5. Carefully throw the fourth marble into the sand.
6. Measure each crater and record the information in table B.
7. Answer questions 1-5 in your science notebook.

Table B

	Crater Diameter
Marble 1.	
Marble 2	
Marble 3	
Marble 4	

Questions:

1. In part A, which sphere created the largest crater?
2. In part B, which marble created the largest crater?
3. What effect does the difference in the mass of an object have on the crater size?
4. What effect did the change in velocity of the marbles have on the size of the crater?
5. What are the two most important factors in determining crater size?



Vocabulary of The Inner Planets

___ 1) samr _____

___ 2) btoir _____

___ 3) treah _____

___ 4) tvgyira _____

___ 5) cmrryeu _____

___ 6) lsora ssetmy _____

___ 7) kmlyi ywa _____

___ 8) plelesi _____

___ 9) bnluae _____

___ 10) terinai _____

a. sun, nine planets, and their moons

b. third planet from the sun

c. oval shape that describes the path each planet takes around the sun

d. planet believed to have once had liquid water on its surface.

e. cloud of dust and gas in space

f. force that is responsible for keeping the planets on their path around the sun

g. galaxy in which our solar system is located

h. path an object makes around the sun, or another object in space

i. planet closest to the sun

j. force responsible for keeping the planets in constant motion