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#10682
EXPLORATION: ASTROBIOLOGY

AIMS MULTIMEDIA, 2004
Grade Level: 9-13+
10 Minutes
6 Instructional Graphics Included

AIMS MULTIMEDIA
TEACHING MODULE

CAPTIONED MEDIA PROGRAM RELATED RESOURCES

#2618 JOURNEY THROUGH THE SOLAR SYSTEM
#10679 EXPLORATION: SPACE STATIONS

Funding for the Captioned Media Program is provided by the U.S. Department of Education

The Space Files: Exploration

INTRODUCTION TO THE AIMS TEACHING MODULE (ATM)

INTRODUCING *The Space Files: Exploration*

PREPARATION FOR VIEWING

AFTER VIEWING THE PROGRAM

Congratulations!

You have chosen a learning program that will actively motivate your students and provide you with easily accessible and easily manageable instructional guidelines and tools designed to make your teaching role efficient and rewarding.

The AIMS Teaching Module (ATM) provides you with a video program correlated to your classroom curriculum, instructions and guidelines for use, plus a comprehensive teaching program containing a wide range of activities and ideas for interaction between all content areas. Our authors, educators, and consultants have written and reviewed the AIMS Teaching Modules to align with the Educate America Act: Goals 2000.

This ATM, with its clear definition of manageability, both in the classroom and beyond, allows you to tailor specific activities to meet all of your classroom needs.

RATIONALE

In today's classrooms, educational pedagogy is often founded on Benjamin S. Bloom's "Six Levels of Cognitive Complexity." The practical application of Bloom's Taxonomy is to evaluate students' thinking skills on these levels, from the simple to the complex:

1. Knowledge (rote memory skills),
2. Comprehension (the ability to relate or retell),
3. Application (the ability to apply knowledge outside its origin),
4. Analysis (relating and differentiating parts of a whole),
5. Synthesis (relating parts to a whole)
6. Evaluation (making a judgment or formulating an opinion).

The AIMS Teaching Module is designed to facilitate these intellectual capabilities, and to integrate classroom experiences and assimilation of learning with the students' life experiences, realities, and expectations. AIMS' learner verification studies prove that our AIMS Teaching Modules help students to absorb, retain, and to demonstrate ability to use new knowledge in their world. Our educational materials are written and designed for today's classroom, which incorporates a wide range of intellectual, cultural, physical, and emotional diversities.

ORGANIZATION AND MANAGEMENT

To facilitate ease in classroom manageability, the AIMS Teaching Module is organized in three sections:

I. Introducing this ATM
will give you the specific information you need to integrate the program into your classroom curriculum.

II. Preparation for Viewing
provides suggestions and strategies for motivation, language preparedness, readiness, and focus prior to viewing the program with your students.

III. After Viewing the Program
provides suggestions for additional activities plus an assortment of consumable assessment and extended activities, designed to broaden comprehension of the topic and to make connections to other curriculum content areas.

AIMS Teaching Module written by Sylvia Alloway.

AIMS Multimedia is a leading producer and distributor of educational programs serving schools and libraries since 1957. AIMS draws upon the most up-to-date knowledge, existing and emerging technologies, and all of the instructional and pedagogical resources available to develop and distribute educational programs in videocassette and CD-ROM.

Persons or schools interested in obtaining additional copies of this AIMS Teaching Module, please contact:

AIMS Multimedia at:
Toll Free: 1-800-367-2467
Fax: 818-341-6700
Web: www.aimsmultimedia.com
Email: info@aimsmultimedia.com

FEATURES
INTRODUCING THE ATM

Your AIMS Teaching Module is designed to accompany a video program written and produced by some of the world's most credible and creative writers and producers of educational programming. To facilitate diversity and flexibility in your classroom and to provide assessment tools, your AIMS Teaching Module features these components:

Themes

This section tells how the AIMS Teaching Module is correlated to the curriculum. Themes offers suggestions for interaction with other curriculum content areas, enabling teachers to use the teaching module to incorporate the topic into a variety of learning areas.

Overview

The Overview provides a synopsis of content covered in the video program. Its purpose is to give you a summary of the subject matter and to enhance your introductory preparation.

Objectives

The ATM learning objectives provide guidelines for teachers to assess what learners can be expected to gain from each program. After completion of the AIMS Teaching Module, your students will be able to demonstrate dynamic and applied comprehension of"" the topic.

Preparation for Viewing

In preparation for viewing the video program, the AIMS Teaching Module offers activity and/or discussion ideas that you may use in any order or combination.

Introduction To The Program

Introduction to the Program is designed to enable students to recall or relate prior knowledge about the topic and to prepare them for what they are about to learn.

Introduction To Vocabulary

Introduction to Vocabulary is a review of language used in the program: words, phrases, and usage. This vocabulary introduction is designed to ensure that all learners, including limited English proficiency learners, will have full understanding of the language usage in the content of the program.

Discussion Ideas

Discussion Ideas are designed to help you assess students' prior knowledge about the topic and to give students a preview of what they will learn. Active discussion stimulates interest in a subject and can motivate even the most reluctant learner. Listening, as well as speaking, is active participation. Encourage your students to participate at the rate they feel comfortable. Model sharing personal experiences when applicable, and model listening to students' ideas and opinions.

Focus

Help learners set a purpose for watching the program with Focus, designed to give students a focal point for comprehension continuity.

Jump Right In

Jump Right In provides abbreviated instructions for quick management of the program.

After Viewing the Program

After your students have viewed the program, you may introduce any or all of these activities to interact with other curriculum content areas, provide reinforcement, assess comprehension skills, or provide hands-on and in-depth extended study of the topic.

SUGGESTED ACTIVITIES

The Suggested Activities offer ideas for activities you can direct in the classroom or have your students complete independently, in pairs, or in small work groups after they have viewed the program. To accommodate your range of classroom needs, the activities are organized into skills categories. Their labels will tell you how to identify each activity and help you correlate it into your classroom curriculum. To help you schedule your classroom lesson time, the AIMS hourglass gives you an estimate of the time each activity should require. Some of the activities fall into these categories:

Meeting Individual Needs

These activities are designed to aid in classroom continuity. Reluctant learners and learners acquiring English will benefit from these activities geared to enhance comprehension of language in order to fully grasp content meaning.

Curriculum Connections

Many of the suggested activities are intended to integrate the content of the ATM program into other content areas of the classroom curriculum. These cross-connections turn the classroom teaching experience into a whole learning experience.

Critical Thinking

Critical Thinking activities are designed to stimulate learners' own opinions and ideas. These activities require students to use the thinking process to discern fact from opinion, consider their own problems and formulate possible solutions, draw conclusions, discuss cause and effect, or combine what they already know with what they have learned to make inferences.

Cultural Diversity

Each AIMS Teaching Module has an activity called Cultural Awareness, Cultural Diversity, or Cultural Exchange that encourages students to share their backgrounds, cultures, heritage, or knowledge of other countries, customs, and language.

Hands On

These are experimental or tactile activities that relate directly to the material taught in the program. Your students will have opportunities to make discoveries and formulate ideas on their own, based on what they learn in this unit.

Writing

Every AIMS Teaching Module will contain an activity designed for students to use the writing process to express their ideas about what they have learned. The writing activity may also help them to make the connection between what they are learning in this unit and how it applies to other content areas.

In The Newsroom

Each AIMS Teaching Module contains a newsroom activity designed to help students make the relationship between what they learn in the classroom and how it applies in their world. The purpose of In The Newsroom is to actively involve each class member in a whole learning experience. Each student will have an opportunity to perform all of the tasks involved in production: writing, researching, producing, directing, and interviewing as they create their own classroom news program.

Extended Activities

These activities provide opportunities for students to work separately or together to conduct further research, explore answers to their own questions, or apply what they have learned to other media or content areas.

Link to the World

These activities offer ideas for connecting learners' classroom activities to their community and the rest of the world.

Culminating Activity

To wrap up the unit, AIMS Teaching Modules offer suggestions for ways to reinforce what students have learned and how they can use their new knowledge to enhance their worldview.

ADDITIONAL ATM FEATURES

Vocabulary

Every ATM contains an activity that reinforces the meaning and usage of the vocabulary words introduced in the program content. Students will read or find the definition of each vocabulary word, then use the word in a written sentence.

Checking Comprehension

Checking Comprehension is designed to help you evaluate how well your students understand, retain, and recall the information presented in the AIMS Teaching Module. Depending on your students' needs, you may direct this activity to the whole group yourself, or you may want to have students work on the activity page independently, in pairs, or in small groups. Students can verify their written answers through discussion or by viewing the video a second time. If you choose, you can reproduce the answers from your Answer Key or write the answer choices in a Word Bank for students to use. Students can use this completed activity as a study guide to prepare for the test.

Reproducible Activities

The AIMS Teaching Module provides a selection of reproducible activities, designed to specifically reinforce the content of this learning unit. Whenever applicable, they are arranged in order from low to high difficulty level, to allow a seamless facilitation of the learning process. You may choose to have students take these activities home or to work on them in the classroom independently, in pairs or in small groups.

Checking Vocabulary

The checking Vocabulary activity provides the opportunity for students to assess their knowledge of new vocabulary with this word game or puzzle. The format of this vocabulary activity allows students to use the related words and phrases in a different context.

Test

The AIMS Teaching Module Test permits you to assess students' understanding of what they have learned. The test is formatted in one of several standard test formats to give your students a range of experiences in test-taking techniques. Be sure to read, or remind students to read, the directions carefully and to read each answer choice before making a selection. Use the Answer Key to check their answers.

Additional AIMS Multimedia Programs

After you have completed this AIMS Teaching Module you may be interested in more of the programs that AIMS offers. This list includes several related AIMS programs.

Answer Key

Reproduces tests and work pages with answers marked.

JUMP RIGHT IN

Preparation

- Read The Space Files: Exploration **Themes, Overview,** and **Objectives** to become familiar with program content and expectations.
- Use **Preparation for Viewing** suggestions to introduce the topic to students.

Viewing

- Set up viewing monitor so that all students have a clear view.
- Depending on your classroom size and learning range, you may choose to have students view The Space Files: Exploration together or in small groups.
- Some students may benefit from viewing the video more than one time.

After Viewing

- Select Suggested Activities that integrate into your classroom curriculum. If applicable, gather materials or resources.
- Choose the best way for students to work on each activity. Some activities work best for the whole group. Other activities are designed for students to work independently, in pairs, or in small groups. Whenever possible, encourage students to share their work with the rest of the group.
- Duplicate the appropriate number of Vocabulary, Checking Comprehension, and consumable activity pages for your students.
- You may choose to have students take consumable activities home, or complete them in the classroom, independently, or in groups.
- Administer the Test to assess students' comprehension of what they have learned, and to provide them with practice in test-taking procedures.
- Use the Culminating Activity as a forum for students to display, summarize, extend, or share what they have learned with each other, the rest of the school, or a local community organization.

The Space Files: Exploration

Themes

All six programs in the Space Files: Exploration series have to do with humanity's attempts to discover, name, map and eventually reach the stars, planets and other phenomena of outer space. Originally a search for time measurement, observation of the heavens has yielded numerous scientific and technological advancements - from the calendar and the telescope, to communication satellites and space stations. Endless new challenges are still presented by the longing to broaden our horizons and perhaps even reach the ultimate goal: the ever-elusive discovery of extraterrestrial life.

Overview

Exploration: Observing the Night Sky explains the way different cultures have organized the stars into imaginary pictures called constellations. The viewer sees how the night sky seems to "change" with the seasons in both the northern and southern hemispheres, due to the movement of the Earth and how the various star patterns relate to each other in time and space. Ways of finding, observing and mapping specific stars and star groups are also presented.

Exploration: The History of Astronomy shows viewers how the ancient science of stargazing grew more accurate and useful as new knowledge and tools were developed. When the heliocentric theory of planetary movement was proved, and the Earth-centered theory - reluctantly - abandoned, the way was paved for modern discoveries such the expanding universe. Images from the Hubble telescope open a vast window on these incomprehensibly distant objects.

Exploration: A History of Space Flight examines the growth of rocket technology beginning with its Chinese inventors and their fireworks, and the major turning point reached with the switch from solid to liquid fuel. Werner von Braun's discoveries in rocketry were used both for World War II weapons and for getting the space program off the ground. The video tracks the trials and triumphs of the famed "space race," from orbiting spacecraft to the moon landing and beyond, ending with fantastic images of how space flight might be used to colonize and mine our near neighbors in the future.

Exploration: Satellites: Our Eyes in the Sky outlines uses of satellite technology on a planet "bathed in telecommunication." The viewer is shown TV, radio and telephone communication, global location and how satellites keep track of threats to crop growth, climate changes and the depth and temperature of the ocean. The multi-use orbiters' ability to detect weather patterns can save coastal and riverside populations from natural disasters. Monitoring volcanic eruptions, oil spills, forest fires and the depleted ozone layer are all in a day's work for these scientific wonders.

Exploration: Space Stations presents the often frustrating attempts, primarily by the Russians and Americans, to establish a permanent outpost in space. The Russian station, Mir, gave practical service for fourteen years until the new International Space Station, which has had numerous technical and funding problems, replaced it. Still, hopes are high that the ISS will inspire teamwork and cooperation among nations for the sake of scientific discovery. One day it may even serve as a "jumping off point" for further space exploration.

Exploration: Astrobiology deals with the ultimate astronomical quest: extraterrestrial life. The video details how and why Earth developed and supports life, and why none of our neighbor planets seems to have done so. The star dust "cocoon" that may form into planets and the technology used to find stars that may have life-supporting planets in their orbit are explained. The video concludes with a mention of plans for the highly specialized Terrestrial Planet Finder.

Objectives

- To recognize major stars, planets, and constellations
- To appreciate and understand humanity's attempts to study and reach the stars
- To discover the technology needed to conquer space
- To introduce some of the people whose efforts and inventions have furthered space exploration
- To consider what the future of space exploration might hold

Introduction to the Program

To prepare students for viewing this series, obtain a map or model of the solar system (including Earth's moon) and a star map, preferably of constellations that students can observe and recognize at their location in the current season. Several days before starting the unit, ask students to begin looking carefully at the night sky and to write down their observations.

Display the map or model of the solar system and ask students on which of these bodies humans have landed. On which have they landed machines? Of which ones have they taken pictures? Name as many as possible

of the missions, spacecraft, and people involved in these explorations. Have any of these missions ever found extraterrestrial life? Do you think any ever will? Why or why not?

Display the star map. Ask students which, if any, constellations or stars they recognize from their observations. Do you know any of their names? Point out several of the major ones (the Big Dipper, Orion, etc.). Do they look like the objects they are supposed to represent? Why or why not? Why do you think early stargazers organized the stars into constellations? What objects can we see in the skies now that weren't there before? (Elicit man-made satellites and space stations.) Why did scientists put these artificial objects into orbit? What purposes do they serve?

Introduction to Vocabulary

The following vocabulary words are pertinent to all the shows in the Space Files Exploration series. Write the words on the board. Ask students to define the ones they know, and to look up the ones they don't in the class dictionary. Write the definitions on the board and have the students copy them. Be sure that students understand the meanings by phrasing them orally in several different ways and using them in sentences.

astronomy
constellation
equatorial
habitable zone
hemisphere
orbit
ozone layer
precession cycle
rocket
satellite
space station
spectroscopy
stratosphere
telecommunication
velocity

Discussion Ideas

Ask one or more of the following questions to stimulate discussion of space exploration: What must a planet have in order to support life? (Consider how Earth supports life - water, moderate temperature range, sunlight, plants that photosynthesize, etc.) Might there be a life form that subsists under entirely different conditions? What might those conditions be? If you had been looking at the night sky all your life, but had no idea what a star or a planet was or where they came from, how might you explain the heavenly bodies and their apparent movement? Why do you think people long to explore space, both through telescopes, mathematics, etc., and by actually going there? Would you like to visit a place in space? Where? Why? What was the "space race"? Why did the countries involved think it was important?

Focus

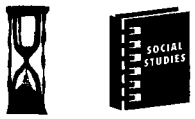
As they view the programs, ask students to note comparisons between ancient and modern ideas. What did the ancients know (or think they knew) about the stars and how did they use their knowledge? What do we of the modern age know and how do we use our knowledge? Be ready to talk about the progression of technology that has made space more and more accessible (telescopes, rocketry, satellites, space stations, etc.), and the motives behind this progress (the desire for accurate time measurement, better communication and observation of Earth, scientific challenge, planetary and lunar exploration, the search for extraterrestrial life, etc.)

SUGGESTED ACTIVITIES


30 Minutes

All Exploration Programs
Meeting Individual Needs

For each video in the series there is a comprehension check sheet in the ATM. After students have completed each sheet, review it in class to see where students' understanding of the subject matter may be incomplete. Encourage and discuss questions and/or assign students who have a good grasp of the information to tutor those who do not. If possible, use models, pictures and diagrams to explain concepts. A useful web site is http://curious.astro.cornell.edu/ask.php



Extended

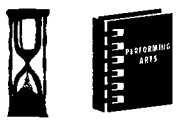
All Exploration Programs
Connection to Social Studies

One of the topics discussed in the Exploration videos is the possibility of colonizing other planets. This might be done by "terraforming," transforming a planet to make it more Earth-like. Have students research terraforming at the library or on the Internet. Then have groups of students design a "capsule city" that would enable humans to live on Mars, assuming that any technology they create can be implemented. Consider not only technology, but human needs, physical and social, and the obstacles that might interfere with fulfilling those needs. Each group should produce a one-page (400-500 typed words) description of their city and how it works and a model or poster-sized color picture of the city layout with all its elements marked. Don't forget to have students give their city an appropriate name. In addition, they may present their projects orally.

40 Minutes

All Exploration Programs
Connection to Language Arts/Writing

Individually or in groups, students may write a 500-800 word science fiction story (or longer depending on interest and ability level) set in a city on Mars. Students should interweave elements from the exploration series such as stargazing, observation satellites, extraterrestrial life, etc. into the plot. The story may concern: building the city, a new person or family coming to live in the city, a useful, but potentially dangerous new technology is brought in, etc. The teacher may wish to read or recommend stories from Ray Bradbury's *The Martian Chronicles* or other science fiction literature to the class as an example. Write an outline or first draft in class. Revise and type or re-copy for homework.



Extended

All Exploration Programs
Connection to Visual Performing Arts

Building on the preceding science fiction writing activity, have the class vote to select one original story to be produced as a class video project. Select, or ask for volunteers, to write the script from the original short story, to serve as crew members, director, performers, etc. Once the video has been shot and edited, consider screening it in class and at a special showing for students and parents.

25 Minutes

All Exploration Programs
Connection to Science/Technology and Society

One way humans can "visit" and collect data from hostile environments in space is through the use of robotic vehicles with special features that enable them to do many of the things humans would do, such as taking pictures and collecting rock samples. As a class, discuss what a robotic vehicle would need to gather information. What technology might provide "eyes" and other sensory organs (e.g. sensors for light, sound, temperature, speed, etc.)? What about legs and feet (wheels, hovercraft, etc.)? Arms and hands (robotic arms, claws, drills etc.)?

All Exploration Programs

Connection to Science/Technology and Society

Extended

Building on the preceding Technology and Society activity, divide the class into groups and ask the groups to design a vehicle that can gather information from another planet. First they must decide what information they want (pictures, sound, gas, water or rock samples, etc.) and then research the ways that a robot could be designed to do it. They will produce a detailed diagram of their robotic vehicle and explain how it works to the class. A helpful site on the subject is http://prl.jpl.nasa.gov/projects/ate/ate_index.html.

Exploration: Observing the Night Sky

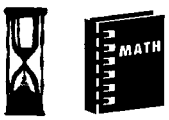
Cultural Awareness

Extended

Other cultures besides the Greeks have observed the night sky, found pictures in the heavenly bodies and told stories about them. For instance, the Chinese story of a maiden who was transported to the moon and given a rabbit for company is the focal point of a major holiday in China, the Harvest Moon Festival. The African Namaqua tribe believes that the Pleiades are the daughters of the sky god. Native American tribes such as the Wabanaki and the Algonquin have legends that explain the Milky Way and the Morning Star. Where we see the Big Dipper and a bear, the Musquakie find only the bear. Individually or in groups, have students research what other cultures have imagined about images in the sky. The students may either make illustrations for the legend and display them as they read the story to the class or turn the legend into a play or a video to present to the class.

Exploration: The History of Astronomy

Connection to Mathematics - Level One



20 Minutes

One of the reasons that astronomers saw differences in the heavenly bodies at different times has to do with the speed of light - about 300,000 kilometers per second. A light year is the distance light can travel in a year. Pose the following problem for students.

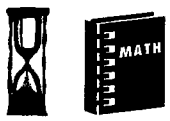
Exactly how far can light travel in a year? The speed at which light travels is 300,000 km. per second - which can also be written 3x105 km per sec. At the rate of 300,000 km. per second can you figure out the number of kilometers that light would actually travel in a year? (Try to do it without a calculator.)

Let students work for a few minutes before giving them the hint. Hint: Here is how the equation is set up: 3x105 x 60 (seconds) x 60 (minutes) x 24 (hours) x 365 (days)

Answer: 9.46x1012 kilometers , or 9460800000000 km or almost 10 million million km.

Examine and compare the algorithms students used for both correct and incorrect answers.

Exploration: The History of Astronomy
Connection to Mathematics - Level Two



20 Minutes

Pose the following problem for students.

In The History of Astronomy video we learned that Eratosthenes calculated the circumference of the Earth. He knew that at the summer solstice the sun shone directly into a well at Syene at noon. He found that at the same time, in Alexandria, Egypt, approximately 787 km north of Syene, the angle of the sun's rays was about 7.2∞. With these measurements he made his calculations. Can you do it? (Try to work without a calculator)

Let students work for a few minutes before giving them hints. Hint one: To calculate the circumference, consider the following: As the parallel light rays in Alexandria and Syene intersect the arc of the Earth, they form pairs of congruent angles. The central angle measures 7.2∞ and the length of the arc between Syene and Alexandria, 787 km. Hint two: Set up the equation as a proportion of degrees and kilometers in which C = the circumference of the Earth: 7.2 ∞ to an entire circle (360∞) and 787 km to the number of kilometers in the entire circle of the Earth (C) - 7.2 / 360 = 787 / C. Answer: C = 39350 km
Examine and compare the algorithms students used for both correct and incorrect answers.
Exploration: The History of Astronomy
Connection to Mathematics - Level Two
As an additional challenge, pose this problem for students.

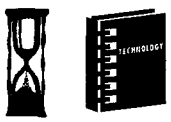
One kilometer is equal to .621371 miles. Find the circumference of the Earth in miles. Equation: 39350 x .621371 = C in miles
Answer: 39350 km = approx. 24,451 (rounded to the nearest one).
Examine and compare the algorithms students used for both correct and incorrect answers.

Exploration: A History of Space Flight
Connection to Space Science and Technology

Extended

Individually or in groups ask students to choose a space disaster (Apollo 1, Apollo 13, the Challenger, the Columbia, Beagle 2 etc.). Have them research exactly what happened and why. Students will then write a 450-500-word report on what preventive measures and technologies they think could have averted the disaster, and draw two diagrams comparing what was unsafe in the original craft with how they would make it safer.

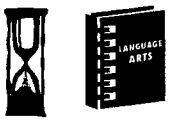
Exploration: Satellites: Our Eyes in the Sky
Connection to Technology and Society



20 Minutes

Ask students what questions they have about satellite dish technology and how it brings images to a television screen. Write them on the board where they can be saved. Invite a guest speaker from a local satellite dish company, or anyone who knows the subject well, to talk to the class about the technology, how it works, and how it compares to other technologies such as the antenna and cable television. Afterwards ask students to write a paragraph (approx. 150 words) about which television technology they think is best and why.

Exploration: Space Stations
Connection to Language Arts

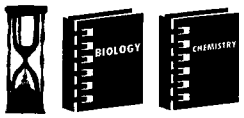


30 Minutes

Ask students to consider what they saw and heard about life on a space station, both the good parts (the beauty of the Earth from space, the various opportunities to "do science") and the bad (the difficulty of everyday tasks such as eating, sleeping and keeping fit). You may wish to show that part of the video again. Have the students write a journal page as if they were astronauts living on a space station. They are to describe a day in their life. Make it a specific day ("This morning I brushed my teeth..." rather than "In the morning I usually brush my teeth ...") Include everyday tasks like eating, sleeping and keeping clean, as well as technological tasks such as a space walk.

Exploration: Astrobiology

Connection to Biology and Chemistry



45 Minutes

How do astrobiologists test planets for microscopic life? One way is to monitor the presence of carbon dioxide in the planet's atmosphere. In groups, or as a class, perform the following experiment. For each group you will need: 1 cup of warm water, 3 sugar cubes, a 1/4 oz. packet of yeast, a half liter plastic water bottle (the kind with the open-and-close cap), and a nine inch party balloon. Put the yeast, water and sugar into the plastic bottle; close the bottle and shake thoroughly until the sugar melts; open the top and stretch the mouth of the balloon around it. The balloon will inflate to a 12" circumference in about 45minutes, then begin to deflate. Ask students questions (or let them make up their own theories) as to why this happened. Could we say that the yeast is "breathing"? For more advanced students: Let each group decide on one element of the "recipe" to change. This might be using cold or very hot water, adding vinegar or baking soda (not both) to the water, etc. Encourage students to come up with their own variations. Use the prescribed ingredients for one control bottle and compare the variations to it. Have students write down and discuss their observations.

Which conditions are most conducive to life? Why?

All Exploration Programs

Culminating Activity

Extended

Arrange for the class to go on a field trip to a planetarium or invite a traveling planetarium to your school. You may also visit a science museum with a space exhibit. If possible have a docent explain the exhibit and allow students to ask questions. Afterwards, lead the class in discussion of what they found most interesting, puzzling, amazing, etc. about the experience and about the Space Files Exploration unit. The teacher may want to ask the students to write their thoughts in an essay or a poem.

Name

ALL EXPLORATION PROGRAMS
VOCABULARY CHECK:

Fill in the number of each term next to its closest definition.

1. astronomy
2. constellation
3. equatorial
4. habitable zone
5. hemisphere
6. orbit
7. ozone layer
8. precession cycle
9. rocket
10. satellite
11. space station
12. spectroscopy
13. stratosphere
14. telecommunication
15. velocity

_____ at or near the equator

_____ one body moving in a circle or an ellipse around another

_____ an object, either natural or man-made, that orbits around another object, especially around a planet

_____ using prismatic separation to analyze light

_____ the speed and direction of a moving object

_____ the range of distance from the sun in which life is possible

_____ an object propelled into space by exploding fuel

_____ a group of stars organized into a pattern and given a name

_____ he section of Earth's atmosphere that contains the ozone layer

_____ an atmospheric layer that acts as a filtering mechanism against ultraviolet radiation

_____ an orbiting space laboratory on which people could live and work for several years or more

_____ the effect of the moon's gravity that changes the pole star every 26,000 years

_____ the branch of science which studies the celestial bodies

_____ the science and technology of communicating at a distance

_____ any half of the Earth's surface

ANSWER KEY for page 13

ALL EXPLORATION PROGRAMS
VOCABULARY CHECK:

Fill in the number of each term next to its closest definition.

1. astronomy
2. constellation
3. equatorial
4. habitable zone
5. hemisphere
6. orbit
7. ozone layer
8. precession cycle
9. rocket
10. satellite
11. space station
12. spectroscopy
13. stratosphere
14. telecommunication
15. velocity

3 at or near the equator

6 one body moving in a circle or an ellipse around another

10 an object, either natural or man-made, that orbits around another object, especially around a planet

12 using prismatic separation to analyze light

15 the speed and direction of a moving object

4 the range of distance from the sun in which life is possible

9 an object propelled into space by exploding fuel

2 a group of stars organized into a pattern and given a name

13 he section of Earth's atmosphere that contains the ozone layer

7 an atmospheric layer that acts as a filtering mechanism against ultraviolet radiation

11 an orbiting space laboratory on which people could live and work for several years or more

8 the effect of the moon's gravity that changes the pole star every 26,000 years

1 the branch of science which studies the celestial bodies

14 the science and technology of communicating at a distance

5 any half of the Earth's surface

Name

ALL EXPLORATION PROGRAMS
NAMES TO KNOW WORD SEARCH:

This word search contains names from the Space Files: Exploration series. Refer to the Word Bank below. Words can be found up, down, across, backwards and diagonally.

S N H U B B L E V T H S Y V S
U S T A R I S T O T L E R V P
C M V K S G V E N T P H I S H
I R B S L D L H B N W P M P Z
N S L N D I S I R I U S K R T
R O R T L P T G A R M S B X A
E Y S A S P L H U A R K V R B
P U G L K E C B N G V X M D S
O Z S L A R K G D A J S D X P
C B I K P H S G S G T R Q X U
H N R M O J H E U R O P A N T
K X A E L N I N O S T L P O N
N H L G L D N N P F X K T I I
G C O X O T G K M L L Y R R K
F S P T O L E M Y C A I D O Z

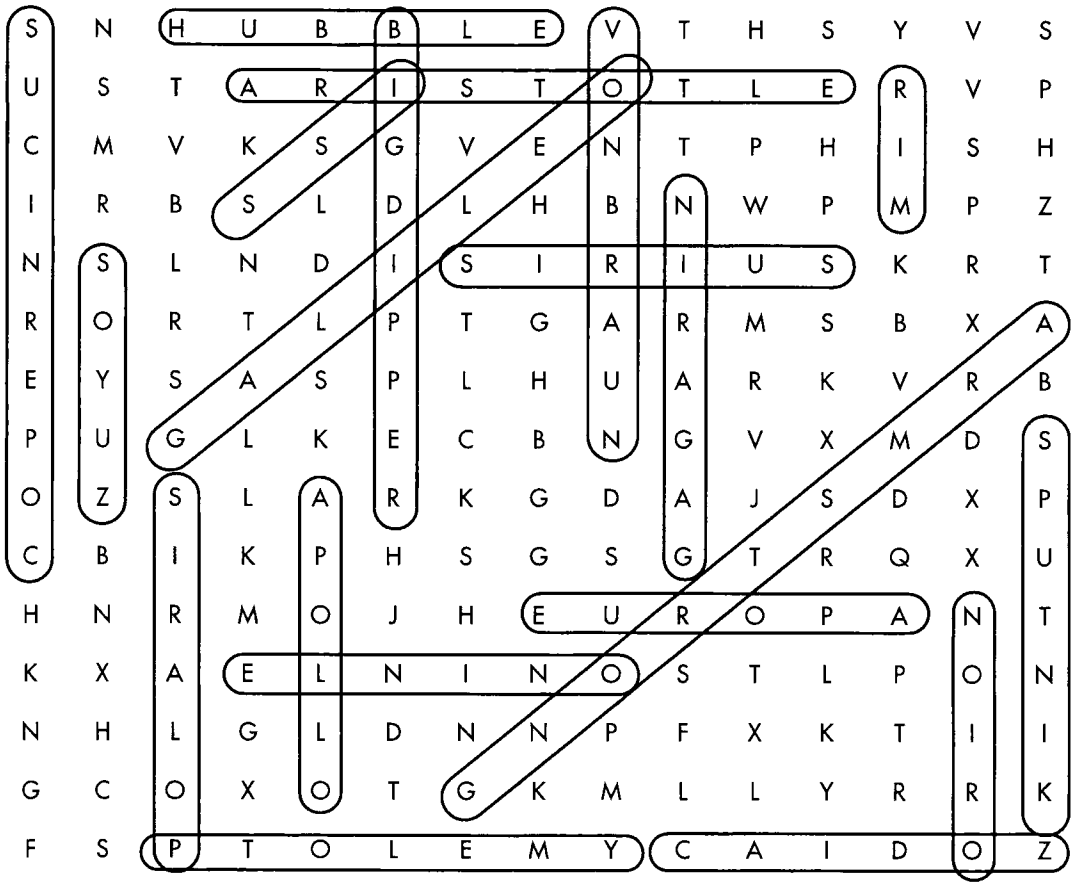
WORD BANK

Apollo
Aristotle
Armstrong
Big Dipper
Copernicus
El Nino
Europa
Gagarin
Galileo
Hubble
ISS
Mir
Orion
Polaris
Ptolemy
Sputnik
Sirius
Soyuz
von Braun
Zodiac

ANSWER KEY for page 14

ALL EXPLORATION PROGRAMS
NAMES TO KNOW WORD SEARCH:

This word search contains names from the Space Files: Exploration series. Refer to the Word Bank below. Words can be found up, down, across, backwards and diagonally.



WORD BANK

Apollo	ISS
Aristotle	Mir
Armstrong	Orion
Big Dipper	Polaris
Copernicus	Ptolemy
El Nino	Sputnik
Europa	Sirius
Gagarin	Soyuz
Galileo	von Braun
Hubble	Zodiac

Name

ALL EXPLORATION PROGRAMS
TRUE OR FALSE

Place a T next to statements that are true and an F next to statements that are false.

1. _____ The ancient Chinese called comets "broom stars."

2. _____ One of the reasons that early astronomers studied the heavenly bodies was to calculate an accurate calendar.

3. _____ John Glenn was the first man to fly into space.

4. _____ Satellites keep track of volcanic eruptions, forest fires and hurricanes.

5. _____ Newton invented the telescope.

6. _____ The crewmembers of the International Space Station live in an artificial gravity chamber.

7. _____ Galaxies are shaped like spirals.

8. _____ Ancient microscopic Earth life could not have progressed without the development of photosynthesis.

9. _____ A space walk is also called a VLT.

10. _____ Sirius is also called the "Dog Star."

11. _____ Each planet orbits at its own fixed speed.

12. _____ As far as we know, there are no planets outside our solar system.

ANSWER KEY for page 15

ALL EXPLORATION PROGRAMS
TRUE OR FALSE

Place a T next to statements that are true and an F next to statements that are false.

1. **T** The ancient Chinese called comets "broom stars."

2. **T** One of the reasons that early astronomers studied the heavenly bodies was to calculate an accurate calendar.

3. **F** John Glenn was the first man to fly into space.

4. **T** Satellites keep track of volcanic eruptions, forest fires and hurricanes.

5. **F** Newton invented the telescope.

6. **F** The crewmembers of the International Space Station live in an artificial gravity chamber.

7. **T** Galaxies are shaped like spirals.

8. **T** Ancient microscopic Earth life could not have progressed without the development of photosynthesis.

9. **F** A space walk is also called a VLT.

10. **T** Sirius is also called the "Dog Star."

11. **F** Each planet orbits at its own fixed speed.

12. **F** As far as we know, there are no planets outside our solar system.

Name _____

ALL EXPLORATION PROGRAMS
VOCABULARY TEST

Write the word that best completes each sentence in the blank.

astronomy
constellation
equatorial
habitable zone
hemispheres
orbit
ozone layer
precession cycle
rocket
satellite
space station
spectroscopy
stratosphere
telecommunication
velocity

1. The moon and Sputnik are each considered a _____

2. Earth has life because it is located in the _____.

3. A Russian _____ Mir stayed in space for fourteen years.

4. There is a hole in the _____ over the South Pole.

5. The Chinese invented the _____, which, centuries later, was used for space travel.

6. Using _____, Newton analyzed the chemical composition of light.

7. The moon, space stations and other objects _____ around the Earth.

8. To get out of the Earth's atmosphere, a spacecraft needs great _____.

9. Because of the _____, in 4,000 years Polaris will be replaced by Alderamin.

10. Very high above the Earth is the _____ layer of the atmosphere.

11. The _____ Canis Minor represents a little dog.

12. Satellites monitor weather and crop conditions in _____ Africa.

13. There are different groups of stars in the northern and southern _____.

14. The telescope is an important tool for the science of _____.

15. Many satellites receive and send signals for _____.

ANSWER KEY for page 16

ALL EXPLORATION PROGRAMS
VOCABULARY TEST

Write the word that best completes each sentence in the blank.

astronomy	*rocket*
constellation	satellite
equatorial	space station
habitable zone	spectroscopy
hemispheres	stratosphere
orbit	telecommunication
ozone layer	velocity
precession cycle	

1. *The moon and Sputnik are each considered a* **satellite**

2. Earth has life because it is located in the **habitable zone** .

3. The Russian **space station** Mir stayed in space for fourteen years.

4. There is a hole in the **ozone layer** over the South Pole.

5. The Chinese invented the **rocket**, which, centuries later, was used for space travel.

6. Using **spectroscopy**, Newton analyzed the chemical composition of light.

7. The moon, space stations and other objects **orbit** around the Earth.

8. To get out of the Earth's atmosphere, a spacecraft needs great **velocity**.

9. Because of the **precession cycle**, in 4,000 years Polaris will be replaced by Alderamin.

10. Very high above the Earth is the **stratosphere** layer of the atmosphere.

11. The **constellation** Canis Minor represents a little dog

12. Satellites monitor weather and crop conditions in **equatorial** Africa.

13. There are different groups of stars in the northern and southern **hemispheres**.

14. The telescope is an important tool for the science of **astronomy**.

15. Many satellites receive and send signals for **telecommunication** .

Name

EXPLORATION: ASTROBIOLOGY
CHECKING COMPREHENSION

Using words from the Word Bank below fill in the blanks in the following sentences. Some words will NOT be used.

3.8 billion	comets	Mars	supernovae
5 billion	Europa	nitrogen	Terrestrial Planet Finder
12 million	habitable zone	oxygen	volcanic eruptions
canals	Jupiter	photosynthesize	volcanic vents
carbon dioxide	land	prokaryotes	water
catalyst	lightning	S\solar system	"wobble"

1. The formation of life-bearing planets begins with _____.
2. Scientists can detect planets when a star has a shift in its spectrum. The video calls this the _____ method.
3. This method detects only large planets. Astrobiologists will need a _____ to discover smaller planets.
4. Life on Earth began with microorganisms called _____.
5. Life progressed when these microorganisms began to _____ and produce _____.
6. Life began around the heat caused by _____.
7. _____ may have microscopic life under its ice-covered surface.
8. Because Earth resides in the _____ of the _____, it can support life.
9. Life may have been brought to Earth by _____ or _____.
10. Evaporation from _____ may have caused the oceans to form.
11. A century ago astronomers who studied _____ thought that they saw _____ made by intelligent beings.
12. As life on Earth diversified, every _____ years, the number of species doubled.
13. _____ and _____ composed most of Earth's early atmosphere.
14. Scientists have various theories, but they are not certain what the _____ was that caused life to begin.
15. The video calls it a "great leap" when living organisms moved from the _____ to the _____.

ANSWER KEY for page 34

EXPLORATION: ASTROBIOLOGY
CHECKING COMPREHENSION

Using words from the Word Bank below fill in the blanks in the following sentences. Some words will NOT be used.

3.8 billion	comets	Mars	supernovae
5 billion	Europa	nitrogen	Terrestrial Planet Finder
12 million	habitable zone	oxygen	volcanic eruptions
canals	Jupiter	photosynthesize	volcanic vents
carbon dioxide	land	prokaryotes	water
catalyst	lightning	S\solar system	"wobble"

1. The formation of life-bearing planets begins with **supernovae** .

2. Scientists can detect planets when a star has a shift in its spectrum. The video calls this the **"wobble"** method.

3. This method detects only large planets. Astrobiologists will need a **Terrestrial Planet Finder** to discover smaller planets.

4. Life on Earth began with microorganisms called **prokaryotes** .

5. Life progressed when these microorganisms began to **photosynthesize** and produce **oxygen** .

6. Life began around the heat caused by **volcanic vents** .

7. **Europa** may have microscopic life under its ice-covered surface.

8. Because Earth resides in the **habitable zone** of the **solar system** , it can support life.

9. Life may have been brought to Earth by **lightning** or **comets** .

10. Evaporation from **volcanic eruptions** may have caused the oceans to form.

11. A century ago, astronomers who studied **Mars** thought that they saw **canals** made by intelligent beings.

12. As life on Earth diversified, every **12 million years** , the number of species doubled.

13. **Nitrogen** and **carbon dioxide** composed most of Earth's early atmosphere.

14. Scientists have various theories, but they are not certain what the **catalyst** was that caused life to begin.

15. The video calls it a "great leap" when living organisms moved from the **water** to the **land**.

_____
Name

EXPLORATION: ASTROBIOLOGY
TEST

Circle the letter of the correct answer for each question.

1.According to the video, earthly life came from _____, began in _____, and took a "great leap" to _____.

a)another planet, volcanoes, photosynthesis
b)a supernova, the ocean, the land
c)a polar ice cap, the Atlantic, the mountains
d)the sun, a dust cloud, the water

2.The earliest forms of life, called _____ were nourished by the heat from _____.

a)microbes, the sun
b)eukaryotes, water friction
c)amoebae, exploding stars
d)prokaryotes, underwater volcanic vents

3.One body in the solar system that scientists think may currently have life is _____.

a)Mercury
b)Earth's moon
c)Europa
d)Venus

4.Planets begin in _____.

a)a cocoon of dust around a star
b)clouds of nitrogen and oxygen
c)established solar systems
d)nebulae

5.Since planets that have life would most likely be similar to Earth, scientists plan to launch a/an _____ to scan the _____ around distant stars.

a)Apollo mission, dust clouds
b)Terrestrial Planet Finder, habitable zones
c)satellite, spectrum changes
d)stellar explorer, galaxies

6.Describe how planets form, and what kind of planet might have life on it.

_____

_____

_____

ANSWER KEY for page 35

EXPLORATION: ASTROBIOLOGY
TEST

Circle the letter of the correct answer for each question.

1.According to the video, earthly life came from _____, began in _____, and took a "great leap" to _____.

a)another planet, volcanoes, photosynthesis
b)a supernova, the ocean, the land
c)a polar ice cap, the Atlantic, the mountains
d)the sun, a dust cloud, the water

2.The earliest forms of life, called _____ were nourished by the heat from _____.

a)microbes, the sun
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a)Apollo mission, dust clouds
b)Terrestrial Planet Finder, habitable zones
c)satellite, spectrum changes
d)stellar explorer, galaxies

6.Describe how planets form, and what kind of planet might have life on it.

Planets form from pieces of gigantic supernovae that become "suns." The "cocoons" of dust that surround these suns eventually form planets and orbit their sun. The suns give chemicals needed for life, such as carbon and iron, to the planets, but in order for life to begin and continue, the planet must be fairly Earth-like - located in the habitable zone, having sources of water and heat, etc.

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#2881-EN-VID	*Inner Solar System: The Moon*
#2882-EN-VID	*Inner Solar System: Eclipses and Auroras*
#2883-EN-VID	*Inner Solar System: Mars*
#2908-EN-VID	*Outer Solar System: Jupiter*
#2909-EN-VID	*Outer Solar System: Pluto*
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