

Mystery of the Cosmos: Life's Place in the Universe

Teacher's Student Activities

Objectives

Completion of the suggested explorations will enable students to address the following questions:

- Is the existence of life on other planets a possibility?
- Is exploration of the unknown necessary for the continued survival of mankind?
- What impact do political tensions or considerations have on the priorities set for scientific research and exploration?
- What are the differences between science and religion, and how have these differences influenced our progress toward understanding?
- How does achievement manifest itself in different individuals?
- What role have myths played in filling the void created by lack of understanding of natural phenomena?

Using the

Pre-Program Explorations

- Prior to viewing the program, students should define any of the content-related terms that are unfamiliar, so as to improve their subsequent understanding of the presented issues.
- Research of the suggested topics will provide students with the background information necessary to discuss the program content effectively. Depending upon your time constraints and access to research materials, you may want to divide the questions amongst different student groups; findings can then be shared with the entire class. The Web sites listed in the "Reference Materials" section may be good starting points for student research efforts.
- The "Issues to Consider" provide thought-provoking questions that can be used as the basis for classroom discussions or can be answered through individual written responses. You may want to revisit these issues after the students have viewed the program, to see if their thoughts

and opinions have been modified in any way.

Using the

Post-Program Explorations

- The explorations are divided into curriculum areas; however, you will find that some of the lessons are actually interdisciplinary in scope and could easily be placed in more than one area. We have categorized these multidisciplinary studies based upon the dominant theme of each.
- Included in this section is a "Current Event Exploration", which is a Web lesson designed around a timely issue, related to the program content. The suggested Web sites will aid students in the information gathering process. The synthesis of their research efforts can be documented via written response, oral presentation, or using multimedia (e.g. PowerPoint, HyperStudio, Web page creation).
- The suggested lesson ideas can be approached in numerous ways. Many are well suited to cooperative learning methods, where members of individual student groups address different aspects of an issue, and the group then synthesizes that information to formulate an answer.
- Individual or group completion of all of the explorations provides an interdisciplinary approach to the program theme. As a result, students are able to analyze the issues from multiple perspectives. If, however, time is limited, you may choose to confine student explorations to those that directly relate to your discipline. Students, for independent study, could then investigate additional topics.
- Possible assessment methods for these explorations are varied. You may want to have students demonstrate their understanding through individual written essays, through group projects, or through classroom discussions and debates. The method(s) you choose can be tailored to learner strengths or curriculum considerations.
- The "Reference Materials" can aid in the completion of these explorations and will probably foster your own ideas for lessons. Giving students reading assignments from the print materials, or portions thereof, will enhance their knowledge base and provide them the opportunity to examine original sources, thus decreasing reliance upon textbook accounts. These resources vary in terms of their reading level; these differences may be a consideration as

reading level, these differences may be a consideration as you assign student readings.

Mystery of the Cosmos -- Pre-Program Explorations

Terms to Define

- amino acid
- asteroid
- comet
- cosmos
- evolution
- galaxy
- greenhouse gases
- inner space
- meteorite
- prebiotic

Topics to Research

- What is the Big Bang and what evidence exists for this model?
- Construct a timeline, drawn to scale, that includes the following information:
 - age of the universe
 - age of the Earth
 - when water first formed on the Earth
 - age of the oldest known bacteria
 - age of the oldest known photosynthetic cells
 - age of the oldest known multi-celled organisms
 - when vertebrates first appeared
 - age of the oldest known humans
- Describe the process of evolution and how it has resulted in a diversity of life forms.
- Trace the history of the NASA space program, from its inception in 1958 to the present, indicating major missions and areas of research.

Issues to Consider

- Do you believe that life could exist elsewhere in the universe? What is the rationale behind your views?
- If you think that extraterrestrial life does (or could) exist, what do you think it would be like chemically?

what do you think are, or would be, its characteristics?

- As we seek to understand the world around us, science and religion often play roles. What, in your view, are the specific realms that each should address?
- Is it possible for the findings of science to be reconciled with religious beliefs? Can one believe in a "higher power" without denying scientific facts?
- How should society determine its priorities for expenditures and commitments? Should exploration be one of those priorities, and if so, what benefits does it bring us?
- The featured guests are described as achievers. Does achievement differ from success, and in what ways? How would you define achievement?

Mystery of the Cosmos -- Post-Program Explorations

ACHIEVEMENT EXPLORATIONS

- Achievement Television has defined six components of achievement: vision, preparation, integrity, courage, passion, and perseverance. Choose one of the featured guests and give examples of ways in which he/she embodies these traits.
- Choose one of the individuals listed in the second science exploration, and analyze his contributions, in light of our definition for achievement. Can he be described as an achiever?

SCIENCE EXPLORATIONS

- Conduct research to determine what Thomas Brock discovered in 1967. What other evidence exists to support the feasibility of extraterrestrial life?
- Examine the contribution that each person has made to our current understanding of the universe and how it functions.
 - Nicolaus Copernicus
 - John Dalton
 - Charles Darwin
 - Democritus
 - Albert Einstein

- Galileo Galilei
 - Johannes Kepler
 - Antoine Lavoisier
 - Gregor Mendel
 - Isaac Newton
- Imagine that you are the director of NASA in the year 2010 (Daniel Goldin has retired.) You have scheduled the first manned mission to Mars for the following year. Six crewmembers will make the trip. You are to determine the optimum make-up of the crew, in terms of expertise and demographics. Provide a justification for each of your recommendations.
 - Pretend that you are the Life Optimization Director for the first colonization effort on Mars. You are to submit a report to Congress that addresses the following issues. All of the recommendations that you make to Congress must have supporting documentation to justify your position.
 - methods for making Mars habitable
 - ways to conserve and protect the environment
 - waste management
 - how food, water and air will be obtained
 - who will be sent
 - non-essentials that contribute to the overall quality of life
 - duration of stay in the colony
 - Each society has many responsibilities to its members, yet money is a finite resource. Assuming that there is not enough money to explore any and all issues, provide a list of the ten most important areas for scientific research, in ranked order. Indicate the reasons that an item is included on the list, as well as the rationale for its ranking.
 - Explore the history of women in the space program (or science in general). What contributions have been made, what obstacles exist (or existed), and how can their role be expanded?

HISTORY/SOCIAL STUDIES EXPLORATIONS

- Trace the role of Russia and the Cold War in the development of the space program in the United States.
- Through the ages, science and religion have often been at odds with one another. For each scientific statement

As you read the direction for each scientific statement listed below, provide supporting evidence for the idea; indicate religious views that are, or were, contrary to the statement; provide rationale for the religious belief; determine if any conflicts arose between the two institutions regarding this issue; list major proponents of each viewpoint; and indicate the effects of the conflict, and any resolution that has been achieved.

- Matter is composed of atoms.
- The earth is round.
- The earth orbits the sun.
- The universe was created as the result of a massive explosion billions of years ago.
- Life began, on Earth, over 3.8 billion years ago.
- All objects fall at the same rate, without regard to their masses.
- The human species evolved from other, more primitive, life forms over millions of years.

ENGLISH/LANGUAGE ARTS EXPLORATIONS

- Most early cultures developed creation myths, which attempted to explain how life and the world began. Religions also provide explanations for the world's beginnings. Explore the creation views of the following cultures or religions, comparing and contrasting the facets of each.

- Roman
- Greek
- Egyptian
- Chinese
- Native American
- Christian theology
- Hindu
- Buddhist

CURRENT EVENT EXPLORATION

(Web lesson)

John Glenn and the Science of Aging

John Glenn, Mercury astronaut and revered hero of the United States space program, was given another chance to experience

states space program, was given another chance to experience space travel. The Space Shuttle Discovery took off with Glenn and six other crewmembers on October 29, 1998, for an eight-day mission.

In this lesson, you will explore the Web to find out more about John Glenn's mission and its role in contributing to our understanding of the science of aging.

Question for Exploration

How will the results of this mission impact future studies of the aging process?

PROCEDURE

1. Collect background information. In order to formulate an answer to the "Question for Exploration", you'll need to conduct some research to gather pertinent information and data about the topics. Some suggested areas for research are listed below, but you may find that you need to answer additional questions to make an informed response. A list of Web sites is provided, at the end of the procedure section, to help jump-start your search. If you need to gather information from additional resources, be sure to evaluate their validity. Government and university sites generally have more reliable information than personal or commercial sites. Keep a record of the information you've collected, as well as the source of that material. Include both the Web site name and URL address.
 - How does the aging process impact the body?
 - How does space travel impact the body?
 - How does space travel mimic the aging process?
 - What aging experiments were conducted on Glenn's mission?
 - What information will researchers gain from these experiments?
 - Are there additional experiments that need to be conducted in space to research the aging process?
 - Are the results of these experiments applicable to the general population?
2. Synthesize the information that you've collected to develop a response to the "Question for Exploration". The format for that

response, (written, oral, Web-based, etc.) will be decided upon by your teacher.

Suggested Web sites:

[American Association of Retired Persons](#) (Modern Maturity -> Lifelines -> Medical Web Sites)

[Centers for Disease Control](#) (navigate to the Health Information link)

[CNN Interactive](#) (report on Glenn's mission)

[Human Space Flight \(NASA\)](#)

[Internet Glossary of Statistical Terms](#)

[John Glenn](#)

[MayoClinic Health Oasis](#) (search for aging)

[National Space Society](#)

[NASA Web](#)

[Statistical Significance](#)