

Asteroid Research Paper

Objectives

- Students will conduct research on a given topic
- Students will compose a research paper on the given topic
- Students will use proper writing techniques to compose the research paper
- Students will present their research paper to a given audience
- Students will create a PowerPoint presentation to accompany their research paper

Suggested Grade Level

4th-8th

Subject Areas

Science

Language Arts

Timeline

Three to five class periods

Standards

Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Earth and Space Science

- Structure of the Earth system
- Earth's history
- Earth in the solar system

Science and Technology

- Abilities of technological design
- Understanding about science and technology

Science in Personal and Social Perspectives

- Natural hazards
- Science and technology in society

History and Nature of Science

- Science as a human endeavor
- Nature of science
- History of science

Language Arts

- Students read a wide range of print and non-print texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works
- Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts
- Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- Students participate as knowledgeable, reflective, creative, and critical members of a variety of literacy communities
- Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Background

The history and future of asteroid study is fascinating. In 1801, Giuseppe Piazzi discovered the first asteroid, now classified as a dwarf planet, Ceres. If the classification of Ceres stands, then the first asteroid discovered was 2 Pallas by H. Wilhelm Olbers in 1802. In 2001, the asteroid probe NEAR Shoemaker landed on Eros showing that probes can land on asteroids. This opens up a whole new world of asteroid exploration and possible mining of its minerals in the future.

This lesson will focus on some of the people and topics that are/were instrumental in asteroid research.

Materials

Paper, pencil, computer with internet access, encyclopedias

Lesson

1. Explain to students that asteroid research has been on-going since 1801 when Giuseppe Piazzi discovered Ceres. At that time, he thought it was a “minor planet”. Later it was determined that it was a small rocky body later termed, “asteroid”. Ironically, in August of 2006, Ceres was reclassified as a “dwarf planet” and no longer classified as an asteroid. If Ceres’ classification stands, 2 Pallas will be considered the first asteroid discovered, and 4 Vesta will now be the largest asteroid.
2. Students will choose or be assigned topics under asteroid exploration and expected to do a research paper on their given topic.
3. Topics include:
 - James Van Allen’s final paper-“*Gravitational assist in celestial mechanics-a tutorial*”
 - Giuseppe Piazzi-discovered Ceres
 - Apep-Egyptian Mythology (in Greek-Apophis)
 - Asteroid/Dwarf Planet Ceres
 - Asteroid Apophis
 - Asteroid 4 Vesta
 - Asteroid Spectral Classification
 - Baron Franz Xaver von Zach-looked for “missing planet” between Mars and Jupiter
 - Titus-Bode Law-orbits of planets in the solar system follow a simple rule
 - Drake Equation-possible existence of other life in the universe
 - Carl Friedrich Gauss-named asteroid Ceres
 - Hubble Telescope
 - Max Wolf-pioneered astrophotography for discovering asteroids
 - Modern discovery methods of asteroids
 - Near-Earth asteroids
 - Asteroid Eros-NEAR Shoemaker probe landed on it
 - Asteroid 69230 Hermes-came within 0.055 au of the Earth in 1937
 - Walter Alvarez-developed the theory of dinosaur extinction due to asteroid impact
 - Comet Shoemaker-Levy 9-impacted Jupiter in 1994
 - Lincoln Near-Earth Asteroid Research (LINEAR)
 - Near-Earth Asteroid Tracking (NEAT)
 - Lowell Observatory Near-Earth-Object Search (LONEOS)
 - Catalina Sky Survey (CSS)
 - Campo Imperative Near-Earth Objects Survey (CINEOS)
 - Japanese Spaceguard Association

- Asagio-DLR Asteroid Survey (ADAS)
- Naming asteroids
- Asteroid exploration and mining
- NEAR Shoemaker probe
- Hayabusa asteroid probe
- Rosetta probe
- NASA'S Dawn mission
- Impact craters in Earth's history

Extensions

Have students create a PowerPoint presentation to accompany their research paper.

Evaluation/Assessment

Assess research project according teacher, school, and district guidelines and requirements.

Resources

National Science Standards: <http://www.nap.edu/readingroom/books/nses/>

National Language Arts Standards:
<http://www.ncte.org/about/over/standards/110846.htm>

National History Standards: <http://nchs.ucla.edu/standards/toc.html>

NASA: <http://www.nasa.gov>

Wikipedia: <http://www.wikipedia.org>