Scientific and Technological Advancements in Extraterrestrial Earth and Space Exploration.

LEARNING AREA: Scientific Concepts and Applications
EDUCATIONAL LEVEL: High School Grades 11-12
CONTENT STANDARD: Earth and Space Systems

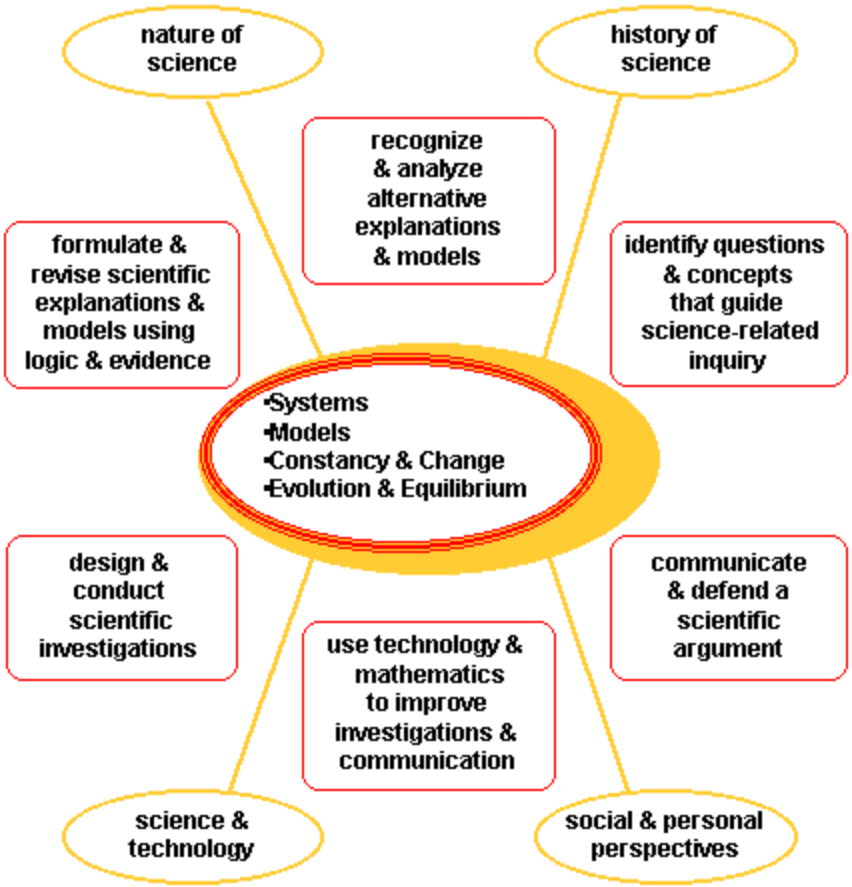
A student shall:

A. demonstrate understanding of earth and space systems by investigating and analyzing earth systems through the interaction of forces and energy, geochemical processes and cycles, theories of the origin and evolution of the universe, energy in the earth system, and the historical significance of major scientific advances.

B. demonstrate understanding:

1. of how historical and current scientific concepts and knowledge guide scientific inquiries;
2. that scientific inquiries are performed to test ideas and predictions and to learn about the natural world;
3. of how the use of various technologies influence the quality of data and the investigation;
4. of the essential role of mathematical tools and models and how they are essential to scientific inquiry;
5. of how explanations based on evidence adhere to established criteria including empirical standards, logic, openness to criticism, and reporting of methods and procedures; and
6. of how traditions govern the conduct of science, including ethics, peer review, and consensus.

Large Processes/Concepts-----



NEXT STEP: Assessment Task

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Assessment Task-----

Description:
The student will conduct an original investigation into the development and execution of an extraterrestrial mission involving a satellite or spacecraft. The student will complete the required tasks as outlined below.

Products/Evidence of Learning:

1. Research and review a list of scientific and technological resources
2. Submit a detailed written report using original research
3. Include original charts, diagrams, models or other graphic displays
4. Give a formal presentation of research to the class
5. Complete a list of sources used to conduct investigation and research

Overview:
Upon conclusion of this exercise, a student will be expected to demonstrate a substantive understanding of how technological advancements in the design and implementation of extraterrestrial spacecraft projects have made the study of the earth, our solar system and the universe more scientific and less theoretical.

Choose a spacecraft from the menu below (or, with the approval of the instructor, submit the name of another)

Viking I or II	Venera 7 and 9	Mars Climate Orbiter
Magellan	Lunar Prospector	Mars Polar Lander
Mariner (series)	Clementine	Mars Global Surveyor
Pioneer	Hubble	NEAR
Giotto	Cassini and Huygens	Stardust
Trace	ISS	Ulysses
SOHO	Wind	Deep Space One
Pluto/Kuiper Express	GOES	Mars projects 2001

1. Use a variety of scientific and technological sources (four or more) to research your topic.

2. Write an original, comprehensive paper (minimum five pages, word-processed) describing the mission and significant discoveries of the space project.

3. Include with this report original diagrams, charts, maps, models, or other visual displays that assist in explaining the purpose and objectives of the project. The materials should demonstrate the method of launch, the trajectory of the spacecraft, and a timeline illustrating significant discoveries, observations and encounters. In addition, include a survey of the on board hardware and tools that enabled (or will enable) the spacecraft to accomplish its task(s).

4. Prepare a formal presentation of your research and data to give to the class. This discussion should be at least ten minutes in length and will include a question and answer period following the presentation.

5. List your sources for this assignment. Include all references used in producing your project.

- **a.** Books or other bound reference materials (title, author and page numbers)
- **b.** Magazine or journal articles (name and date of magazine or journal, title and author of article and refer enced page numbers.)
- **c.** Internet Sites (site name and exact Internet address or URL where specific reference is located.)
- **d.** Any other references used to contribute information to your project.

NEXT STEP: Checklist

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Checklist-----

STUDENT	TEACHER	
_____	_____	Review of research
_____	_____	Completed paper
_____	_____	Diagrams, charts, maps, modals or other visual displays
_____	_____	Formal Presentation
_____	_____	List of Sources

GRADING CRITERIA-----

Advanced · 90-100 pts.

· Quality and depth of assignment demonstrates a solid understanding of spacecraft and its mission and/or purpose.

· Explains at least five objectives of the spacecraft mission, complete with illustrations of how this endeavor has improved our understanding of the earth and/or other planetary systems.

· Shows an effective use of source material indicating a relevant and comprehensive research effort.

· Project is complete, coherent, effective and timely.

Adept · 75-89 pts.

· Assignment indicates student has achieved basic understanding of spacecraft and mission, covering most major points but lacking depth and thoroughness.

· Explains at least three objectives of mission effectively using illustrations and diagrams.

· Shows a valid attempt to describe the overall effectiveness and outcome of this endeavor.

· Efficient use of source material demonstrates a satisfactory and appropriate research effort.

· Project is fairly complete, concise and timely.

Incomplete · Below 75 pts.

· Assignment demonstrates lack of basic understanding of space exploration.

· Project lacks detail and depth and/or fails to provide relevance or connection to the study of the earth and/or solar system.

· Fails to indicate purpose of spacecraft or shows no initiative in learning about space exploration.

· Shows a poor use of source material including insufficient research, irrelevant and unrelated information and/or excessive paraphrasing or copying.

· Project late, sloppy or incomplete.

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