

Design a Mission Project
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Standards:

Middle School:

- 3.b. Describe methods and equipment used to explore the Solar System and beyond.
- 3.f. Recognize that mathematical models are used to predict orbital paths and events

High School:

- 1. Physical science
 - 1. Newton's laws of motion and gravitation describe the relationships among forces acting on and between objects, their masses, and changes in their motion – but have limitations
- 3. Earth systems science
 - 1c. Analyze and interpret data regarding the history of the universe using direct and indirect evidence
 - 1e. Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate the history of the universe, solar system and Earth

21st century skills:

Creativity, collaboration, critical thinking, invention

Objectives:

Students will design a new mission to a planet. They will develop the mission objectives, design a spacecraft to complete the objectives, and write a project proposal.

Useful websites: http://marsed.asu.edu/lesson_plans/marsbound (mars mission lesson)
<http://science.nasa.gov/planetary-science/missions/> (mission descriptions)

Project:

I. Building knowledge of previous missions to planet. Example missions: Cassini, Galileo, Mariner, Messenger, Voyager. Students can explore what kind of information these missions sent back and what kinds of instrumentation were used. Link to [worksheet](#)

II. Introduction of mission design using Mars as an example

- 1. Teacher presentation: MAVEN, rovers, etc. demonstrating how missions are planned.
- 2. Use selected equipment cards to demonstrate how to choose equipment (science instruments) needed based on mission objectives. Equipment cards can be found at http://marsed.asu.edu/lesson_plans/marsbound - select the marsbound cards link

III. Mission Design Plan:

[Handout](#) with [graphic organizer](#)

IV. Project Proposal (written component)

1. Introduction

- What is it?
- Why is it worth doing?
- Objectives of mission
- Name of mission

2. Research Review

- Review research on previous missions to planet - Use <http://science.nasa.gov/planetary-science/missions/> and Missions to Planets worksheet from part I. Focus research on relevant missions.
- Sources cited

3. Timeline of mission

- Research and development
- Time to reach planet (straight line vs curved, gravity)
 - Show videos on MAVEN, Messenger paths
 - "Eyes on the solar system"
 - Research previous mission times
- Time to build components and spacecraft
- Launch windows?
- Total time

V. Class presentation:

Present project proposal to class

Contains pertinent info and visual aid (PowerPoint, prezi, poster, movie, etc)

Opportunities for differentiation:

I. Beginning students could:

- modify a past or current mission to a new planet or to include a few new objectives.
- Select few objectives, tools/instruments on the graphic organizer
- calculate distances and times for the mission based on a straight line trajectory.

II. Advanced students could:

- research new scientific instruments to gather data not collected by previous missions.
- Create their own graphic organizer
- Add components to spacecraft (power source, communication devices, etc)
- be encouraged to think curved lines and gravity (angry birds!) for trajectory between Earth and selected planet