

Satellites, Orbits and Space Junk

Author Alison Oswald-Keene
Grade Level High School
Duration 2 class periods

National Standards

GEOGRAPHY STANDARDS

The World in Spatial Terms:

1. How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information.

Environmental and Society:

14. How human actions modify the physical environment.

Element 6: The Uses of Geography

17. How to apply geography to interpret the past

18. How to apply geography to interpret the present and plan for the future

AZ Standards

SCIENCE

Earth and Space

Plus HS+E.E2U1.14 Use mathematics and computational thinking to explain the movement of planets and objects in the solar system.

ELA

Reading

Integration of Knowledge and Ideas

11-12.RI.7 Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in print in order to address a question or solve a problem.

Writing

Text Types and Purposes

11-12 W.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a style and tone appropriate to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Arizona Social Science Standards

GEOGRAPHY

The use of geographic representations and tools help individuals understand their world.

HS.G1.2 Use geospatial tools and related technologies to construct relevant geographic data to explain spatial patterns and relationships.

Human-environment interactions are essential aspects of human life in all societies.

HS.G2.1 Analyze interactions within and between human and physical systems.

HS.G2.2 Evaluate how political and economic decisions throughout time have influenced cultural and environmental characteristics of various places and regions.

HISTORY

Economic, political, and religious ideas and institutions have influenced history and continue to shape the modern world.

HS.H3.1 Analyze how societies, leaders, institutions, and organizations respond to societal needs and changes.

SIOP Elements		
<p>Preparation Adapting content Linking to background Linking to past learning Strategies used</p>	<p>Scaffolding Modeling Guided practice Independent practice Comprehensible input</p>	<p>Grouping Option Whole class Small groups Partners Independent</p>
<p>Integrating Processes Reading Writing Speaking Listening</p>	<p>Application Hands on Meaningful Linked to objectives Promotes engagement</p>	<p>Assessment Individual Group Written Oral</p>

Arizona English Language Proficiency Standards
 Stage V
 Basic
 Reading
Standard 4: The student will analyze text for expression, enjoyment, and response to other related content areas. The student will demonstrate knowledge of reading comprehension by:
 B-25: interpreting external text within nonfiction text for a specific purpose.
Writing
Standard 1: The student will express his or her thinking and ideas by using a variety of writing genres, as demonstrated by:
 B-7: writing a persuasive paragraph that states a position/claim and supports arguments with evidence.

Overview

In order to make good decisions, students need to understand how human actions affect systems here on Earth as well as outside of the Earth.

Purpose

In this lesson, the student will analyze the benefits and hazards associated with objects which have been placed into the three kinds of Earth’s orbits. They will construct a map to locate the three orbits and plot the objects located there. They will then gather information about the consequences of having humans modify space. This lesson includes strategies for teaching diverse learners.

Key Vocabulary

orbit: a circular pattern around another object
satellite: a man-made object that circles around a planet or other solar system body

gravity: the force that pulls one body toward another
launch: to send an object toward space
stable: not likely to change; firmly established
atmosphere: the gasses that surround a planet

Materials

- Projector/computer or individual computers for students
- Pink and blue highlighters (or any other 2 colors)
- Colored pencils
- Satellites and Orbits student article
- Earth In Space Map worksheet
- Scoring Guide for Earth In Space Map
- T-chart Graphic Organizer
- Scoring Guide for Writing Assignment
- Vocabulary Test and answer key
- Vocabulary Cards
- Today’s Meet or other back channel site

Objectives

The student will be able to:

Satellites, Orbits, and Space Junk

1. Identify the three kinds of Earth orbits and the amount of space junk surrounding Earth.
2. Describe the positive and negative consequences of human modifications of space.
3. Analyze what should be done in the future.

Procedures

SESSION ONE:

Engage:

a. Begin lesson by showing students short video clip on Satellite Orbit Types

<https://www.youtube.com/watch?v=6dISKhVdX7g>

(Preparation: Adapting content)

b. Explain to students that in this lesson they will be reading about the 3 kinds of orbits around Earth and what manmade objects can be found in these orbits; and then mapping this information.

c. Explain that before they read, they will need to know some space vocabulary.

d. Pass out Vocabulary Cards and have students practice explaining what the words mean with a shoulder partner. **(Grouping Option: Partners)**

Explore:

a. Divide students into groups of 3-4.

b. Distribute a sheet of paper to each student (or have them use their social studies/science notebooks). **(Grouping Option: Small groups)**.

c. Ask them to spend 3 minutes writing on their paper what they already know or think they know about satellites and orbits. **(Preparation: Linking to Background)**

d. Before sharing student ideas with the whole group, have students share within their small groups so that ELLs have an opportunity to rehearse their answers. **(Integrating Process: Speaking)**

e. Ask groups to share out their ideas. **(Integrating Process: Listening) (Grouping Option: Whole Group)** Record their ideas on the whiteboard.

Explain:

f. a. Pass out Satellites and Orbits student article. Explain that they will be reading about orbits and developing a map of the 3 orbits around Earth and what manmade objects can be found in each orbit layer. **(Application: Linked to objectives)**

b. Allow students time to read the article independently. **(Integrating Process: Reading)**

c. Now, as a group, read the article and highlight the article as follows: Earth's orbit information will be colored pink and manmade object information will

be blue. If it is possible to project the article and model the highlighting, this will be helpful for those who have problems with oral directions.

(Scaffolding: Modeling)

d. Distribute the Earth in Space Map worksheet. Have the students refer to the information in the article and map the 3 Earth orbital paths on the Earth in Space Map worksheet. Their paths should approximate the distance above the Earth's surface. They should use 3 different colored pencils to indicate the 3 major Earth orbits. Then have them approximate the concentration of satellites in each orbit layer by using dots on their map. Remind students to include a title, key (with symbols), and scale on their maps. **(Scaffolding: Independent Practice, Application: Hands-on)**

e. Share the Scoring Guide for the Space Map with the students. **(Scaffolding: Comprehensible input)**

SESSION TWO:

Teacher Note: Back channeling is a way to communicate using technology, without interrupting the lesson video. Examples include Today's Meet and Edmodo. Others can be found through an internet search. In this lesson, students will be back channeling by taking notes during several videos.

Elaborate:

a. As bell work, have students partner up and review the lesson vocabulary by quizzing each other.

(Scaffolding: Independent Practice, Grouping Option: Partners)

b. Then show the Rhett & Link Space Junk music video to introduce students to the idea of capturing space junk.

<https://www.youtube.com/watch?v=6Fy7psluJjc>

(Application: Promotes engagement).

c. Discuss with students the benefits of "back channeling" during videos. They will back channel by actively take notes during the videos, placing information in a T-chart Graphic Organizer.

Headings are *Positive Consequences* and *Negative Consequences*. Students should listen and look for information that fits each heading during the 2 video segments They should have at least 10 correct items between the two columns. There is also room for students to ask questions about the videos.

Stress that back channeling also includes asking questions. **(Integrating Processes: Listening and Writing).**

(Scaffolding: Independent Practice) (Application: Promotes engagement).

d. View the two videos Spaced Out: Episode 6: Space Junk (4:50)

<https://www.youtube.com/watch?v=mJtdid6MV0w>

Satellites, Orbits, and Space Junk

and Space Debris Story

<https://www.youtube.com/watch?v=9cd0-4qOvb0> (16:23) (**Application: Promotes engagement**)

e. Allow students a few minutes to process the information they gathered from the videos and finish their T-charts. Have students share questions with the whole class that they still do not have answers for.

f. Conduct a class discussion so students can gather ideas for the following writing assignment: "Should we continue to add to the objects orbiting in space and how should we take care of useless equipment and avoid the "trash pile" that is growing in space?"

Evaluate:

a. Assign students the writing assignment: "Should we continue to add manmade objects to space and how should we take care of useless equipment and avoid the "trash pile" that is growing in space?"

b. Remind students to support their responses with facts from the videos, the student reading and other sources of knowledge.

c. Share the Scoring Guide for the Writing Assignment. (**Scaffolding: Comprehensible input**)

Assessment

ELA and Science

The Vocabulary Quiz can be graded. A score of 80% or higher on the Vocabulary Quiz will be considered mastery.

Geography

The Space Map can be graded. A score of 80% or higher on the Scoring Guide for Earth in Space Map will be considered mastery.

ELA, Science, and Geography

The written argument can be graded. A score of 80% or higher on the Scoring Guide for the Writing Assignment will be considered mastery.

The T-chart Graphic Organizer can be checked for participation. The T-chart should have at least 10 correct items on the graphic organizer to be considered mastery.

Extensions

Students may wish to further pursue the idea of Space Junk and how we can deal with it. They can view the IMAX movie "Space Junk" (available online) and use the Engineering Process Design Process to develop a solution to the issue of Space Junk. There are additional videos on Youtube which discuss potential solutions.

Additionally, students can read the brief article at <http://www.popsoci.com/future-job-alert-space-junk-archeologist?8ELTmqTxRwqmljxU.03> and begin to develop an idea of other future jobs that relate to Space Junk.

Sources

Clip art provided copyright free from:

<http://www.clipartpanda.com>

<http://space.phillipmartin.info>

<http://cliparts.co>

<http://www.WPclipart.com>

<https://www.dreamstime.com>

Pixabay.com

Videos provided from:

<http://www.youtube.com>

Reading materials

<http://earthobservatory.nasa.gov/Features/OrbitsCatalog/page2.php>

<http://earthobservatory.nasa.gov/Features/OrbitsCatalog/>

<http://sciencelearn.org.nz/Contexts/Satellites/Sci-Media/Interactive/Satellites-and-orbits#Low-Earth>

<https://iaaweb.org/iaa/Studies/orbitaldebris.pdf>