What do we learn when we explore Earth and its neighborhood?
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Eyes on Earth: Teaching Earth Science from Space

Space Mission Lesson Plan

Attachments: Research Guide, *Solar System Scale Activity*, Collaboration and Presentation, Evaluation for Peer Review

Grade/ Grade Band: 6 Science	**Topic:** What do we learn when we explore Earth and its neighborhood?	**Timeframe:** 9-10 days in 50 minute periods or 5-6 days in 90 minute periods

Brief Lesson Description: Students will learn about Earth and its neighborhood beginning with identifying and connecting to our own neighborhoods using Google Earth. Students will view NASA Solar System Exploration https://solarsystem.nasa.gov/ and learn research best practices with the goal to present their findings to their peer review group (classroom community.) Students will be assigned one of the ten sections from "10 Things The Roundup: The latest from around your galactic neighborhood" to research. Next, students collaborate using shared Google Docs to design a presentation of their research. Finally, presentations are made to the classes for peer review which includes analyzing, questioning, and inferring. If time allows, enrichment includes student vote on funding for further research based on the presentations.

Performance Expectation(s):
MS-ESS1-3 Earth's Place in the Universe
Analyze and interpret data to determine scale properties of objects in the solar system.

Specific Learning Outcomes:

- We will use research and communication to understand how NASA helps us collect data about the Earth.
- We will broaden our perspective of the Earth by learning the specific data NASA satellites are collecting.
- We will use peer review to analyze and infer the information presented by each group on their assigned Space Mission.

Narrative / Background Information

Prior Student Knowledge:
Basic, general knowledge of our solar system such as the sun and planets.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2) Analyzing and Interpreting Data: Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing	ESS1.A: The Universe and Its Stars Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) ESS1.B: Earth and the Solar System The solar system consists of the sun and a collection of objects,	Scale, Proportion, and Quantity Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3),(MS-ESS1-4) Systems and System Models Models can be used to represent systems and their interactions. (MS-ESS1-2) Interdependence of Science, Engineering, and Technology Engineering advances have led to important discoveries in virtually every field of science

between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)	including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3) This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)	and scientific discoveries have led to the development of entire industries and engineered systems. (MSESS1-3) Scientific Knowledge Assumes an Order and Consistency in Natural Systems Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-ESS1- 1),(MS-ESS1-2)

Connections to CO Math Standards:
Scale Model of Solar System. Explain phase
Shape, Dimension, and Geometric Relationships 1. Objects in space and their parts and attributes can be measured and analyzed

Connections to CO ELA Standards:
All research, information evaluation and communication of findings in each phase
1. Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.
2. Grade Level Expectation: 1. Employ appropriate presentation and collaboration strategies to meet the needs of a given task and purpose

1. Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.
2. Grade Level Expectation: 1. Incorporate language, tools, and techniques appropriate for task and audience during formal presentations.

Possible Preconceptions/Misconceptions:
Understanding of how NASA collects data, what satellites do, the difference between NASA sending up people versus satellites as well as the purpose of those satellites.

LESSON PLAN – 5-E Model

ENGAGE: Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions:

Students download and use Google Earth to explore our neighborhoods. Through discussion, each class defines what a neighborhood is to them.
Teacher connects this definition with Earth's neighborhood, our solar system. Teacher assess prior knowledge through discussion and question generation.

Students use Google Earth
--Allow one class period for introduction, exploration, and question generation; the teacher directs the conversation to identifying what data would be useful to know about your neighborhood and how that data could be collected.
--Students write brief reflection on exit ticket for the day summarizing they are learning that day.

EXPLORE: Lesson Description – Materials Needed / Probing or Clarifying Questions:

Students learn to see Earth is in a neighborhood as the solar system structure is discussed.
Link to introduce: https://rmpbs.pbslearningmedia.org/resource/buac18-35-sci-ess-tourofgalaxy/tour-of-the-galaxy/
Teacher is able to assess prior knowledge here by asking questions as well as stop to add any review lessons needed on the planets, sun, etc.

Teacher shows following link to show students the immediate neighborhood of the Earth in approximate scale proportions. https://rmpbs.pbslearningmedia.org/resource/tdpd12.pd.sci.walkingsolar/walking-the-solar-system/#.X2qaZkVKjIU
Teacher discusses scale models.
Students complete Solar System Scale Activity
Students practice "Turn and talk" to review what has been learned about neighborhoods and the scale of the Earth's neighborhood.

Each person is assigned one of the ten sections from Solar System Exploration https://solarsystem.nasa.gov/ to research individually.
--Allow one class period for discussion, assignment of project, examples and questions. Assign and explain Research Guide. Allow for one class period to complete scale activity

Attachment: Research Guide for Students; Solar System Scale Activity

EXPLAIN: Concepts Explained and Vocabulary Defined:

Students use Research Guide to independently delve into the "Read More" page of their assigned section to learn research techniques. We identify what we know and don't know, what information we are looking for and what we want to communicate to our scientific community. Teacher individually checks in with each student to assess research needs and provide support. Allow one class period; add flexibility to stretch into day 2 for thorough research.

Vocabulary:

- Google Earth
- Scale Model
- The following have been previously introduced. They will be referenced throughout this project.
  ---Research
  ---Peer Review
  ---Analyze
  ---Infer

ELABORATE: Applications and Extensions:

Students who have the same section collaborate via shared Google doc or Meet. Students in these virtual groups will review their information and be able to finalize a presentation to the class. Teacher meets with each group two times through a period of 4 days to evaluate group progress and provide support, Allow 3-4 days for review and sharing of research answers, planning and finalizing

presentations.

Attachment: Collaboration and Presentation

EVALUATE:
Students who are in the same virtual group submit their virtual presentation to the class. Class communities participate in the peer review process using the Evaluation guidelines.

Attachment: Evaluation for Peer Review

Formative Monitoring (Questioning / Discussion):
Teacher communication throughout project with students individually assessing research needs and help. Teacher will help group focus, overcome conflict using SEL skills and direct research toward a deeper level of questioning and information analysis.
During the collaborative stage (Explain,) the teacher assigns one student of each virtual group as the group "Lead Researcher" and communicated regarding group progress, needs or teacher meets with each group at least once every other day (virtually or in class, depending on scheduling)

Summative Assessment (Quiz / Project / Report):
Student collaborative virtual group submits presentation for peer review evaluation and questioning.

Elaborate Further / Reflect: Enrichment:
Evaluation Session: Classes with time left participate in a real-world problem-solution forum:

-Presentation of "Funding" from teacher: Teacher explains that news of the students' research on the Space Missions has led to an increase in "Funding" for their "University." The students must choose a project to spend the research money on. They must choose from the questions generated during the presentations as further research was discussed. Students choose how to "Vote" on the proposed ideas (debate, submit a written proposal for teacher review, another presentation to get votes for the ideas, etc.)

Sources:
Research Guide Information: http://www.kathleenamorris.com/2018/02/23/research-filter/
NASA Space Resource: https://solarsystem.nasa.gov/
Video Link: https://rmpbs.pbslearningmedia.org/resource/buac18-35-sci-ess-tourofgalaxy/tour-of-the-galaxy/
Video Link: https://rmpbs.pbslearningmedia.org/resource/tdpd12.pd.sci.walkingsolar/walking-the-solar-system/#.X2qaZkVKjIU
Solar System Scale Activity: https://westmiamimiddle.org/ourpages/auto/2018/1/23/34953374/s3-o1-lesson-solar-system-2.pdf

Materials Required for This Lesson/Activity			
Quantity	**Description**	**Potential Supplier (item #)**	**Estimated Price**
1/student	Chromebook		
1/student	District Google Account		