MISSION BRIEFING

Activity: Mapping Local Solutions

Prep Time: 20 minutes

Activity Length: 90 minutes

Task: Participants will collect data about a specific environmental condition in a local outdoor area and use that data to create a visual map. They will then use their model to create a plan to improve that environmental condition.

Note: This activity requires participants to make observations and collect data outdoors for the first 30 minutes. Be mindful of weather conditions and participant safety while they are outdoors.

By the end of this activity participants will

be able to visually represent observations in an aerial map, making connections to data visualizations constructed using NASA Earth-observing satellite data. Participants will design data-driven action plans to improve local conditions.

Materials

- An outdoor area, such as a campus, park, or playground
- Pencils
- Paper
- Clipboards
- Poster Paper
- Markers

Preparation

1. Gather and prepare all listed supplies.
2. Ensure chosen outdoor space is safe for participants to explore/record data.
3. Choose type of environmental data participants are going to study. This can vary from location to location based on local conditions, but here are some ideas:
    a. Where litter is located within the chosen area.
    b. Surface erosion or runoff within the chosen area.
    c. Areas where grass will not grow within the chosen area.
    d. Invasive plant species within the chosen area.
    e. Standing water/poor drainage within the chosen area.

Activating Prior Knowledge:

Have you ever seen an image of Earth with information about weather conditions, sea levels, vegetation levels, drought conditions? How do you think satellites were able to get this information from space and make it into a map or image? How does having these images or models of our Earth affect us in our lives? Do we change our daily routines, the decisions we make, or the way we do business? How?

NASA Science Connections

Remote sensing is a valuable tool that NASA uses to monitor Earth from space. Remote sensing allows mapping of vegetation, climate, and atmospheric composition over large regions and lets us repeat the measurements consistently over many years. In this way remote sensing provides planetary-scale measurements of our entire Earth system, which helps us develop and validate new theories and solutions to large scale issues. The first Earth-observing satellite explicitly designed to study planet Earth was NASA's Landsat program. The program began in 1972, and it is still collecting data today! Over the years, the program has collected data on the forests, farms, urban areas, and freshwater of our home planet. Scientists across the globe use Landsat data to better understand environmental change, manage agricultural practices, allocate scarce water resources, respond to natural disasters, and more. Learn more about Landsat with engaging activities here: **Camp Landsat - Landsat Science (nasa.gov)**

MISSION GUIDANCE

GO

- Discuss ahead of time the boundaries of each participant's assigned region for data collection and create a larger map that participants will be adding their data to.
- Chosen outdoor area should be small enough for all participants to explore/map within 20-30 minutes, but the environmental issue being studied should be prevalent enough for all participants to be able to find and map data.

MAYBE

- Create and print maps ahead of time for each group to help younger participants.

NO GO

- Do not allow participants to collect data in an unsafe manner (handling potential hazardous litter or going to unsafe areas).
- Do not allow participants to be unsupervised.

Making a Map

Land Cover Activities - GLOBE Observer - GLOBE.gov

Procedure

1. Introduce the activity to the participants and tell them that they will be acting as analogs to remote sensors, collecting environmental data about the chosen area just like a satellite would. Explain to them the type of environmental data they will be collecting and that they will record that data by placing a dot on a map at each place where they find evidence that the chosen environmental issue occurs.
2. Divide the participants into groups of two or three and assign each group a specific region of the chosen area to explore and collect data.
3. Each group should make their own map of their assigned search region. To assist participants in making their maps, see the **Making a Map** activity from The Globe Program at **Land Cover Activities - GLOBE Observer - GLOBE.gov**.
4. Have groups search their assigned regions for 20-30 minutes, collecting data on their maps.
5. Have the groups come back together to compile their data. Each group will transfer their collected data from their individual maps of their assigned search region to create a larger map of the entire chosen area.
6. Discuss with participants what they can learn from having all the data together in one model. Ask them what kind of conclusions they can draw from looking at the model.
7. Divide the participants back into their groups and discuss, based on the model, what they think is causing the environmental issue within the chosen area.
8. Have each group create a basic Environmental Improvement Plan for the chosen area. It should include the following:
    a. What is the environmental issue?
    b. What is the negative impact of the environmental issue?
    c. How was data collected to make a model of the environmental issue?
    d. What conclusions were you able to draw from your model?

e. What steps do you recommend to improve the environmental issue?
f. Who should be responsible for taking these steps?
g. Why is it important to improve the environmental issue?
h. What are the expected results from improving the environmental issue?

9. Have each group present their "Environmental Improvement Plan" to the rest of the participants.

Challenge Questions

Why was it important for different groups to look at different areas at the same time?

- Satellites only have a limited field of view for their sensors, so they can only see a small area at any given time. They orbit the Earth to look at different areas and compile the data together. Sometimes multiple satellites work together to collect all the data for large areas.

Why was the data collected put on a map instead of just written down?

- Visual images such as graphs and models make it easier for us to understand data. We are able to see the data represented all at the same time, making it easier to draw conclusions from it.

If you could design a satellite-based Earth mission, what type of data would you want your satellite to be able to observe?

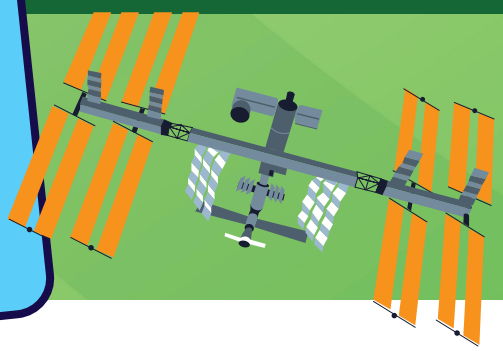
- Answers will vary by participant.

Extensions

- Allow participants to research NASA satellite-based Earth Science missions and find one that closely matches the type of environmental issue they are studying in this activity.
- Compile different aspects of each group's Environmental Improvement Plan into a single proposal and have the participants present it to a local authority (principal, organization director, city official, etc.) of your chosen area.

ISS FUN FACT!

Did you know that astronauts have produced more than one million images of Earth? Astronauts can record phenomena such as storms on Earth in real time, observe and collect images of natural events such as hurricanes, and share their thoughts and observations with scientists on the ground – something satellites can't do!



CAMP GLOSSARY

- **Aerosols** - Specks of matter that can be found in the air over oceans, deserts, mountains, forests, ice, and every ecosystem in between.
- **Air pollution** - Particles and gases that are suspended in the air. These particles can come from car and truck exhaust, factories, dust, pollen, mold spores, volcanoes, and wildfires.
- **Analog** - A person or thing that is comparable to or a representation of another person or thing.
- **Gnomon (No-mon)** - The pole on a sundial that shows the time by the position of its shadow.
- **Remote sensing** - Acquiring information from a distance

Culturally Responsive Education (CRE) Strategies Tip Sheet

Section Title (page #)	CRE Strategy	CRE Tips
Mission Briefing Activating Prior Knowledge pg. 6, 9, 11, 16	 Making Cultural Connections	• Pose questions to activate prior knowledge and/or make connections to real-life applications.
Preparation pg. 6, 9, 12, 16	 Power and Participation	• This activity provides the opportunity for active participation of all students. • Sharing responses in small groups and with the entire class. • Team roles can be assigned to encourage all students to participate.
Mission Briefing Activating Prior Knowledge pg. 6, 9, 11, 16	 Language and Communications	• Activate prior knowledge on terms used in the lesson and have students offer a definition or understanding of the terms. (gnomon) (air pollution, aerosols, remote sensing) (water cycle, freshwater, evaporation, condensation, runoff, transpiration, precipitation, groundwater) (satellites)
Challenge Questions pg. 7, 10, 13, 18	 Power and Participation	• Students will participate in a think/pair share to answer Challenge Questions
Procedure pg. 6	 High Expectations	• Students will use inquiry and critical thinking to collaborate in groups to make quantitative observations of the Sun
Connection to NASA pg. 6, 9, 11, 16	 High Expectations	• Students will learn about connection to NASA and determine how it relates to their lives

For more, join our community of educators, NASA CONNECTS!

https://stemgateway.nasa.gov/connects/s