FUTURE U.

Boeing 360 Experience Companion

Objectives

Students will:

- **Reflect** on the life and work of Gladys West
- **Explain** how the Global Positioning System works
- **Identify** specific places using GPS coordinates
- **Create** SMART goals for tackling a challenge in their own lives

Gladys West

Overview

In this hands-on activity, students will apply the work of Gladys West as they explore some of the many uses of the Global Positioning System (GPS) and ultimately use GPS coordinates to create a community, national, or global tour for their peers.

Standards

ITEA Standards for Technological Literacy

- Standard 1: Scope of Technology
    - F: Technology is closely linked to creativity, which has resulted in innovation.
- Standard 2: The Relationship Among Technologies and the Connection between Technologies and Other Fields
    - E. A product, system, or environment developed for one setting may be applied to another setting.
- Standard 4: The Cultural Social Economic and Political Effects of Technology
    - D. The use of technology affects humans in various ways, including their safety, comfort, choices, and attitudes towards technology development and use.

Common Core Standards for Mathematical Practice

- CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.

Materials

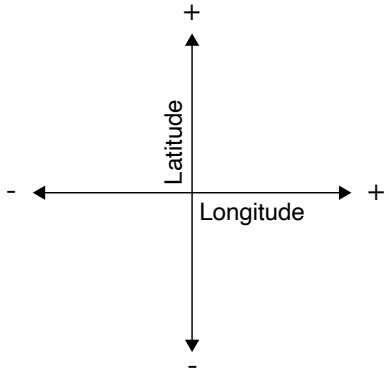
- Device with the ability to project, one for the educator
- GPS Tour handout, enough for half the class
- Devices with internet access, at least enough for half the class

Connect

- Remind students that they recently learned about Gladys West—a mathematician known for her contributions to geodesy, which is the mathematical modeling of the shape of the Earth.
- Guide students into a quick discussion ABOUT this scientist, with questions such as:
    - How did Gladys West defy the odds throughout her life?
    - In what ways did her work in STEM advance society?
    - Gladys West's contributions to geodesy helped create the GPS systems we rely on today. When do *you* use GPS? How do GPS systems make your life easier?

Be Inspired

- Explain that today students are going to use a GPS service that they may know well: Google Maps! But before they do, it's important for them to understand how the Global Positioning System works.
- Project spaceplace.nasa.gov/gps/ or print out copies of the webpage to share with the class. Read the webpage together and ask students to look for details related to how GPS works. When the reading is complete, encourage students to share key details.
- Elaborate on the reading and explain that humans can easily find a specific location if they know its GPS coordinates.



- On the board, replicate the image to the right. Encourage students to imagine that the map of the Earth is covered with an X and Y axis.
- Explain that GPS coordinates consist of two different numbers on this coordinate plane: latitude, which tells the location's north-south position and longitude, which tells the location's the east-west position.
- Demonstrate this by google.com/maps and zooming out as much as possible.
- Bring students' attention to the dotted line in the center of the map, and explain that this imaginary line is the Equator. Then point to the X axis on the image on the board and explain that any location that is north of the Equator will have a positive latitude number. Any location that is south of the Equator will have a negative latitude number.
- Explain that there is a second imaginary line that passes straight through London, England. This line is called the Prime Meridian. Point to the Y axis on the image on the board and explain that any location east of the Prime Meridian will have a positive longitude number and any location west of the Prime Meridian will have a negative longitude number.
- Now search for your school in Google Maps. Right click on it and bring students' attention to the two numbers that appear on the top of the call-out. Explain that the first number is the latitude and the second number is the longitude. These specific coordinates belong only to your school, and anyone who inputs these coordinates into a GPS will be able to locate it.
- Explain that students will now use GPS coordinates to dream up a community, national, or world tour for their classmates! Perform the following to prepare students for the activity:
    - Pass out one GPS Tour handout to pairs of students and review the directions provided.
    - Be sure students understand that they will first create the tour by using Google Maps to fill

out the white columns on the left. They will then exchange papers, “take” a tour that their classmates created, and fill out the grey columns on the right side of their new handout.

- Once you have answered any questions, encourage students to have fun and get started.

- Once pairs have completed their tours, redistribute the handouts so each pair has a tour created by another group. Instruct pairs to use Google Maps to “take” this tour and fill out the grey columns on the right as they do.

Reflect

Bring the students back together near the end of the class session and guide students into reflecting on the following questions in small groups or all together as a full class:

- In addition to determining locations, GPS can also be used for navigation, tracking movement, creating maps, and timing—all of which have many applications. How might you be able to creatively integrate any of these GPS features into your tour?
- Gladys West published a guide that helped the world increase the accuracy of some very important parts of satellite geodesy. Other than tourism and transportation, what industries are positively affected by her work?

Look forward

- Remind students that Gladys West was not only innovative because of the discoveries she made, but also because of *how* she worked.She defied the odds and shattered society's perceptions of what black women could achieve in that era. In the spirit of Gladys West, encourage students to defy the odds and work toward objectives that others tell them they can’t achieve. Lead the class in writing SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) goals and creating trackers to measure their progress.

GPS Tour

Directions for the Tour Creator…	**Directions for the Tour Taker…**
Plan a community, national, or world tour for your classmates. Select 6 different secret destinations, and then provide one hint about each place as well as its GPS coordinates.	Switch tours with your classmates. Then: **1.** Make a guess about each destination based on the hint provided. **2.** Input the GPS coordinates into the "Search Google Maps" box in the top left corner of the screen to find the actual destination. Then use street view to "walk" around the destination and record what you see!

Hint	**GPS Coordinates**	**Guess and real destination**	**2–3 Observations**
	_____, _____,	Guess: Real destination:	
	_____, _____,	Guess: Real destination:	
	_____, _____,	Guess: Real destination:	
	_____, _____,	Guess: Real destination:	
	_____, _____,	Guess: Real destination:	
	_____, _____,	Guess: Real destination:	