CORE LESSON: GPS

Objectives and Summary: Students reflect on various approaches to navigation, and practice using GPS units. After a brief teacher led intro, the class breaks into 3 or 4 small groups, each led by a high school leader. Each small group uses GPS units, and enters coordinates that lead to cached stamps and ink pads. After stamping the corresponding box in the journal on the GPS page, the group moves on to the next waypoint. There are 5 waypoints in total. Reconvene for a brief conclusion.

Background (from Wikipedia): Eratosthenes of Cyrene (BC – c. 195/194 BC) was a Greek mathematician, geographer, poet, astronomer, and music theorist. He was a man of learning, becoming the chief librarian at the Library of Alexandria. He invented the discipline of geography, including the terminology used today. He is best known for being the first person to calculate the circumference of the Earth, which he did by applying a measuring system using stadia, a standard unit of measure during that time period. He was also the first to calculate the tilt of the Earth's axis. Additionally, he may have accurately calculated the distance from the Earth to the Sun and invented the leap day. He created the first map of the world, incorporating parallels and meridians based on the available geographic knowledge of his era. All without the benefit of modern technology!

Materials

Part I *(Materials setup by Waskowitz*):

- Large world map + dry erase
- 1 Lat/Long laminated map per pair of students

Part II: See GPS page in Discovery Guide

Materials setup by Waskowitz: approximately 12 GPS units (or 1 for each pair of students, maximum. Waskowitz has 24 GPS units)

Location and Duration: 60-90 min total. The Barn or Council Hall and the Waskowitz 30 acres.

HS Leader Role: Lead small groups through the GPS scavenger hunt

Procedure

Introduction: Gather the group and have them seated on the floor in front of the world map. Help students get oriented to the map by facilitating some observations. Rely on student answers to establish (use a dry erase as needed):

- The cardinal directions (NSEW)
- The location of Seattle/the student's home town
- The location of a far distant city, e.g., Paris, Toyko, etc.

Lesson/Activity

Part I

1. Ask students to imagine that they are living 200 years in the past, and that they are communicating (via letter or telegraph) with a person in that distant city. They need to describe to that person how to get from there to here (feel free to insert a story as to why).
2. Get suggestions from students on how this would be accomplished. Press students for details, and ask clarifying questions intended to highlight the difficulties of being successful simply by using written descriptions of maps. For example: Point out that simply telling the foreigner to "go to Seattle" wouldn't work, and that following directions like NSEW or geographic features becomes problematic over long distances. Your job as a facilitator here is to help students realize the need for a universal coordinate system (Latitude and Longitude); without one, traveling long distances with accuracy is very challenging.
3. Tell students (if they haven't come up with the idea themselves already) that to solve this problem, people came up with the latitude and longitude system.
4. Have students work in pairs. Pass out laminated 2 sided maps to each pair. Review latitude (*Latitude= Flatitude = lines that run E-W!*) and longitude. Identify the point of 0 degrees latitude's intersection with 0 degrees longitude (the equator and the prime meridian). Review that N is above the equator, E is to the right of the prime meridian, etc.
5. Prepare students to practice using Lat/Long coordinates to identify spots on the on the world map. Quiz them on a few points, and demonstrate how to locate them using the dry erase as needed. Where would you be if you were at:
    - 20S x 140E = Australia
    - 60N x 160W = Alaska
    - 80S x 0 = Antarctica
    - 0 x 80E = Indian Ocean
6. Latitude and Longitude works on a smaller scale too! Turn over the map and let's try a few more in WA State. Look carefully because this map has lots more information than the world map! Where would you be if you were at:
    - 46.9N x 121.75W = Mt. Rainier
    - 47.5N x 117.5W = Spokane
7. ***Transition to the 2nd half of the activity.***

Part II

1. We are going to get to know our environment and Waskowitz better by going on a treasure hunt using these GPS coordinates*. Discuss that GPS units can calculate latitude and longitude very precisely.*
2. Divide students into small groups, with each small group assigned to a HS leader (Expedition Groups). If you have *more* than 4 HS leaders, recombine groups to end up with *no more* than 4 small groups. Any number less than 4 works fine as well. Distribute GPS units. Approximately 1 per pair of students (they can share the units and work in pairs. *12 units per entire class, max*).

The groups can then "compete" to see who can be the first to successfully locate all 5 waypoints (see **Notes** below).

3. Students (with the help of the HS leader and the GPS page in their Discovery Guides) enter latitude and longitude coordinates into GPS units, and then use them to navigate to each point. Be sure to start the groups at different points to avoid pile-ups at waypoints. For example, one group can go 3,4,5,1,2 while the other group goes 1,2,3,4,5, etc.
4. At each Waypoint careful inspection will reveal an ink pad and stamp. Students should stamp the appropriate box in their journals before recording new coordinates (from the HS Leader) and continuing to the next waypoint.

Using the GPS units: *HS leaders will need to instruct and aid students in GPS unit use.*

Before the start of the lesson: Go outside with a clear view of the sky to turn on the GPS units; they need some time and space to locate satellites and orient themselves***. Also, make sure that all prior Waypoints are deleted. Select the DELETE ALL option on the Waypoints screen using the ENTER key on the left side of the unit. Use pg. 21 in the Journals to have students record the coordinates for each point, or let them use the coordinates printed on this paper.***

1. Press the PWR button on the right side of the unit to turn it on.
2. Once the screen says "READY TO NAVIGATE", Press the PAGE button on the right side of the unit until you get to the Menu screen (you will probably have to press it 4 times).
3. Select MARK, by pressing the ENTER button on the left side of the unit.
4. Use the UP/DOWN arrows and the ENTER button on the left side of the unit to scroll up and correctly label this waypoint (1-5). Select OK when finished.
5. Scroll down with arrows and ENTER keys to input the correct coordinates.
6. When finished, select OK. You will be returned to the MENU screen.
7. Scroll down and select the WAYPOINTS option using the ENTER key.
8. Select the waypoint you just created using the arrows and ENTER key.
9. Select GO TO
10. Navigate to the Waypoint using the compass arrow and distance indicator. Using the PAGE button will scroll you through different options, but the compass arrow screen is the one you want to use. ***When you are getting close, move slowly and give the unit time to adjust. Use the Clues below to help locate the ink and stamp pad. The GPS unit will only be accurate to within 30ft or so.***
11. After finding the stamp, go to another waypoint by repeating #s 4-10.

Conclusion: Either let all the groups finish, or set a wrap up time to meet back at the starting point. Invite students to reflect on the experience by sharing their feelings about the activity, asking more questions, or sharing something they learned. Celebrate a job well done!

Extension: With additional time, groups could mark and describe their own waypoints, leaving some token behind. Coordinates and a clue could then be traded with another group, who could then finish the activity by recovering the left behind item. The extension coordinates could be recorded in the extra blank space in the field journals.

Notes: Successfully entering the coordinates in the GPS units may be challenging. Groups may need to rely heavily on the HS leaders, or other tech savvy members within the group. ***Hold the GPS unit flat and parallel to the ground. Avoid sudden changes of pace directions. Go slow and make your turns gradual to avoid "confusing" the unit. Use the GPS page in the Discovery Guides to help you find the next point, and to collect stamps. Replace stamps and stamp pads where you found them. Close the bags to keep out rainwater, please!***

Waypoints

Waypoint 1: Large thatcher ant colony between trail and river near 30 acre shelter.

Lat: N47 28.175'

Long: W121 44.228'

Clue: Many different kinds of animals can only survive if they live and work together in groups. Some examples include Lions, Bees, and Humans. The animals who live *here* though, might be the best at group living and cooperation…

Stamp: Frog

WP2: Worm bin farthest from the Kitchen

Lat: N47 28.177'

Long: W121 44.043'

Clue: Decomposers play the key role of recyclers in every single ecosystem on our planet. Without them, all the consumers and producers would run out of the raw materials needed to sustain their lives. The decomposers you will find living *here*, turn our food and yard waste back into useable soil and nutrients.

Stamp: Dog

WP3: Snag with woodpecker cavity south of Whatzit Board

Lat: N47 28.149'

Long: W121 44.024'

Clue: The trees and forests of the PNW provide all living communities with essential food, clean water and shelter. Many of the animals who call this area home have special adaptations to take advantage of all the trees have to offer. *Here*, you will find evidence of one of these adaptations.

Stamp: Cat

WP4: East Totem

Lat: N47 28.124'

Long: W121 44.062'

Clue: The PNW and the Snoqualmie Valley (where you are right now) was home to humans, long before Europeans and others arrived here in the late 1700s. *Here,* you will find art inspired by the native tribes that have lived in this area for the past 10,000 years.

Stamp: Human

WP5: Underneath the large smooth rock W of the Ed buildings.

Lat: N47 28.150'

Long: W121 44.075'

Clue: Erosion is the process of wind, water, and other forces that move soil and earth from one location to another. Over time, erosion turns mountains into sand, and lets rivers cut deep canyons. *Here* you will find evidence that over time, water will smooth and polish even the hardest surfaces.

Stamp: Raccoon