

A GeoTreasure Hunt!!

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Grade Level	4
Duration	1-2 class periods

Arizona Social Studies Standards

Strand 4: Geography

Concept 1: The World in Spatial Terms

PO 2. Interpret political and physical maps using the following map elements:

- title
- compass rose (cardinal and intermediate directions)
- symbols
- legend
- scale
- road map index
- grid (latitude and longitude)

PO 6. Locate physical and human features using maps, illustrations, images, or globes:

- physical (i.e., river, lake, mountain range, coast, sea, desert, gulf, bay, strait)
- human (i.e., equator-four hemispheres, city, state, country, roads, railroads)

Concept 2: Places and Regions

PO 3. Locate the landform regions of Arizona (plateau, mountain, desert) on a map.

Other Arizona Standards

Technology Education Standards

Standard 3: Technology Productivity Tools

Essentials (Grades 4-8)

1T-E2. Demonstrate increasingly sophisticated operation of technology components

See: Arts {Music} (1AM-E9-10), Mathematics (1M-E6, 2M-E1), Science (1SC-E2) and Workplace Skills (7WP-E1)

PO 3. Demonstrate functional operation of technology devices (e.g., presentation devices, digital cameras, scanners, document cameras, scientific probes) (See Technology 3T-E2, PO1)

WRITING

Strand 2: Writing Elements

Concept 4: Word Choice

PO 2. Use descriptive words and phrases that energize the writing

Concept 5: Sentence Fluency

PO 1. Write simple and compound sentences.

Overview

Global Positioning Systems, also called GPS, is a new geotechnology that receives signals from satellites orbiting the Earth. It calculates our absolute location using latitude and longitude coordinates.

In 2000, GPS was opened to the civilian population. As a result, a hi-tech treasure hunt called "geocaching" was born. It began in the area of Portland, Oregon with one cache. A cache is a hidden container with a logbook and possible items inside. Today there are over 544,000 caches world-wide. Through the use of the official geocaching website, one can be a part of this growing and popular activity.

Purpose

This lesson will introduce students to GPS technology and give them the opportunity to have hands-on experience geocaching with the use of a GPS receiver. In addition, they will complete a mapping activity with hints found in three caches.

Materials

- GPS Units (put into teams of 2-4). The GPS units used are Garmin eTrex Legend (blue with toggle switch)
- Batteries – AA - for GPS units
- Clipboards – 1 per team (optional)
- Pencils or pens
- Whiteboard / dry erase marker
- Sample Cache Container – plastic container with a logbook, pen, and item(s)
- 3 Geocache Containers, containing the following:
 - (1) logbook, pen, and Az. Landform Map with 3 regions shown and words desert, mountain, and plateau highlighted.
 - (2) logbook, pen, and Az. Landform Map with a compass rose drawn at the bottom.
 - (3) logbook, pen, and Az. Landform Map with cities in each region. Circle the word Phoenix and its star.
- Handouts:
 - GPS Unit Parts
 - eTrex Legend Quick Reference Guide
 - Landform Regions of Arizona Map – labeled (3 - one for each geocache container)
- Each team has:
 - 1 - Geocaching handout
 - 1 – Landform Regions of Arizona Map (unlabeled)
 - 1 - Student Roles Name Cards
 - 1 - Group Rotations
- PPP – “Learning about GPS” - teacher information (optional)
- Geocache Container Information Sheet – teacher use

Objectives

Students will:

- Name 3 items that may prevent a satellite from having visibility with a GPS unit
- Identify parts of a GPS Unit
- Locate geocaches using waypoints from a GPS unit
- Sign a logbook in the geocache containers
- Write the 3 regions on an unlabeled Arizona Landform Map
- Draw a compass rose on an unlabeled Arizona Landform map
- Identify 2 cities from each region on an unlabeled Arizona Landform map
- Write a paragraph of their experience locating geocaches

Lesson Components

Prerequisite skills:

- Students should have an understanding of latitude and longitude.
- Teacher should have prior knowledge of setting waypoints.
- Teacher should be able to put together a geocache container.
- For this lesson, students will NOT have to set waypoints. They have been already set by the teacher.
- Students will work in teams to locate hidden caches.

Prior Preparation:

Teacher will need to make sure the GPS units are set up in degrees, decimal minutes. (Main Page, Set Up (hammer), Units, Position Format (below it - hddd°mm.mmm', Click on it.)

Teacher will make a “waypoint” for each geocache in each GPS unit. Place each physical geocache container at one different waypoint location. Make sure the waypoints are placed in a safe location (not near a road, parked cars, etc.) and if possible, have extra adults to monitor the students when they geocache.

Note: There is a Geocache Container Information Sheet that gives the information to put in each geocache container.

On a separate paper, write down the waypoint number or title and the latitude/longitude of each geocache location. (This is important if you need to reset a GPS waypoint.) Include what the student will find at that waypoint.

Show students a “sample” geocache container so they know what they are searching for as they walk around with their GPS.

1. Introduce lesson by explaining that today students will work with Global Positioning System (GPS). Global Positioning System is a new technology that uses satellites to find absolute locations on the earth’s surface. Write on the whiteboard the following word: **Clouds**. Then write these words in a column: **Tall Buildings, Land, Trees**. Hold out your GPS unit and explain that if you are outside, you can usually get a signal from the satellites to your GPS through the clouds; however, you may not get the signals if you are near tall buildings, land that blocks your view, or a lot of trees. For best results, you need to be outdoors in an open area to get the best satellite reception.
2. Hand out GPS Unit Parts handout. Model on the whiteboard the parts as students write them down. (Note: GPS Units may vary as far as to where the buttons are located, but they should contain these parts). Top right – pages (5), Bottom right – on / off button. Top left –up, Middle left –down, Bottom left – enter.
3. Hand out eTrex Legend Quick Reference Guide handout. Review 5 page screens – Sky View or Satellite, Map, Pointer Page, Trip Computer, and Main Menu.
4. Show sample caches that are used for geocaching. These are waterproof containers, such as Tupperware, that have a logbook, pen, and different items inside it.
5. Put students into teams of 3 or 4 students. Hand out the clipboards with the Landform Regions of Arizona Map (unlabeled) AND Geocaching handout. Give the Student Roles Name Cards to group. Each student will have a role as follows:
 - GPS Specialist (person with the GPS unit)
 - Recorder (person with clipboard and Geocache & Map Handout.)
 - Reader (person who gets the logbook for the group to sign and puts it away).
 - Geocache Specialist – The person who notices where the geocache is and puts the cache back EXACTLY where it belongs after group is done.

AFTER EACH CACHE FIND, STUDENTS SHOULD ROTATE THEIR ROLES, SO EVERYONE GETS A CHANCE TO USE THE GPS UNIT.

6. Hand out GPS Units to each team. (Batteries (2-AA) should be already in the unit). Do not turn on the unit until you are outside to save battery power. They may not work inside the building.
7. Go outside. Turn on the unit (bottom right side button).
8. Watch screen for satellites. Wait until you receive at least 3-4 satellites (black circles).
9. Click Page (top right side button) until you reach Main Page.
10. Select **Find**, then **Waypoints**, choose **Nearest**. Scroll to the Waypoint that is the first one on your Geocache Handout. (If you use the rotation sheet, each group will look for a different geocache.)
11. Scroll to the bottom of the page and select **GO TO**. The screen will become a Navigation Page. It will be an arrow page.
12. Follow the arrow to your waypoint. **YOU MUST BE MOVING FOR THE ARROW TO WORK. IF YOU STOP, THE ARROW DOESN'T WORK.** It also tells you how far away you are from your waypoint at the top of the screen.

(In this lesson, there are 8 waypoints: 3 have physical cache containers – these are the 3 geocache containers that the teacher hides. The other 5 waypoints are locations where students must find an answer to a question at that waypoint. This is called a “virtual cache”.)

13. Each student will sign a logbook, if available, and find the answers for their handout at each cache. Remember: Place the cache back in the **EXACT** spot as you found it.
14. Go to the next cache. Press **Enter** or (Main Page, Find, Waypoints, Nearest, Highlight the next waypoint).
15. Once you have found all the caches and finished your handout, return to the classroom. Collect student work for assessment.

Assessment

The Landform Regions of Arizona Map out will have the 3 regions correctly labeled with 2 cities in each region listed, and a compass rose placed on the map. 8 out of 10 would be considered mastery.

Locating 6 of 8 geocaches would be considered mastery for operating technology.

Write a paragraph describing their search for the caches using technology and graded for word choice (descriptive words) and sentence fluency (simple and compound sentences).

Extensions

Use GPS units to have students “waypoint” various objects around the school, such as a flagpole, benches, trees, etc. Then have their classmates navigate to the waypoints.

ATLAS Worksheet: "Seeing" Satellites and Satellite Visibility – handout on satellites
http://cfa-www.harvard.edu/space_geodesy/ATLAS/visibility.html

Information on earthcaching:

<http://www.earthcache.org>

<http://www.discoverychannel.ca/shows/showdetails.aspx?sid=7544>

Sources

www.geocaching.com

<http://www.geocachingvideo.com> - DVD on geocaching

Yahoo group for educators: [nygps @yahoogroups.com](mailto:nygps@yahoo.com)

Has over 900 members who are interested in GPS and share activities, etc.

http://www8.garmin.com/manuals/eTrexLegend_OwnersManual.pdf - page 14 only



GEOCACHING

Team _____

**Every team will have a clipboard with a pen/pencil.
Each team member will be assigned a role.**

Go to Satellite Page:

My latitude is N _____ °
longitude is W _____ °
elevation is _____ ft.

1. Start with waypoint: **Tree 1**
This tree can grow up to _____ feet. It is native along streams and canyons of South and East Arizona.
This is called an Arizona _____.
2. Go to waypoint: **Art**
There is a geocache there. Follow its instructions. Remember to put it back EXACTLY where you found it!
3. Go to waypoint: **Monument**
What is the date that this monument was dedicated?

4. Go to waypoint: **Map**
What is F4 on this map?

5. Go to waypoint: **Tree 2**
What country is this tree from? _____
_____ is made from the fruits of this tree, which are pickled.
6. Go to waypoint: **Tree 3**
There is a geocache nearby. Follow its instructions. Remember to put it back EXACTLY where you found it!
7. Go to waypoint: **White**
There is a geocache there. Follow its instructions. Remember to put it back EXACTLY where you found it!
8. Go to waypoint: **Pole**
What is the yellow item nearby? _____
Congratulations!! You have completed your first geocache!!

Tape a label on top of each plastic Geocache container. This is to make others aware of not removing the containers.

This is a geocache for a class project about GPS.
Please put it back exactly where you found it.
Thank you!

Teacher: _____ Class: _____

Geocache #1 – has log book, pen, Landform Regions of Arizona Map – labeled. Highlight in yellow the 3 regions.

Geocache #2 – has a log sheet, pen, Landform Regions of Arizona Map – labeled. Put a handmade compass rose at the bottom of your map.

Geocache #3 – has a log book, pen, Landform Regions of Arizona Map - labeled, put a circle around Phoenix and its star.

(Note: Students will have a Landform Regions of Arizona Map – unlabeled and a Geocaching Handout)

Put the following directions in each geocache.

Geocache #1

Congratulations! You have found a “geocache”.

1. Each student must sign their name and today’s date in the log book.
2. The 3 regions of Arizona are highlighted in yellow. Write these 3 regions on your blank Arizona Map.
3. Put back this cache and continue to the next one.

REMEMBER TO PUT THIS GEOCACHE EXACTLY WHERE YOU FOUND IT!

Geocache #2

Congratulations! You found a geocache.

1. Each student will sign and put today’s date in the log sheet.
Add a comment if you wish. Be nice!
2. Your Arizona Map does NOT have a compass rose. Look at the map in this geocache. It shows a handmade compass rose at the bottom of the map.
3. Draw a compass rose anywhere on your map OUTSIDE the state of Arizona.
Be neat!
4. Circle your title on your map.
5. Continue to the next geocache.

REMEMBER TO PUT THIS GEOCACHE EXACTLY WHERE YOU FOUND IT!

Geocache #3

Congratulations! You found a geocache.

1. Each student will sign and put today’s date in the log book.
2. On your Arizona Map you have a star and black dots. The star indicates our capital city and the dots represent cities in our state.
3. Look at the Desert area. Find the star and write the name of our capital on your paper.
Choose 2 cities in the desert area and write them on your map.
4. Locate the Mountain area. Write 2 cities in this area on your paper.
5. Locate the Plateau area. Write 2 cities in this area on your paper.

You will have 6 cities and the capital of Arizona listed on your map.

REMEMBER TO PUT THIS GEOCACHE EXACTLY WHERE YOU FOUND IT!

Student Roles Name Cards



GPS Specialist

You are responsible for the GPS Unit loaned by teacher.

You will find a waypoint to the cache.

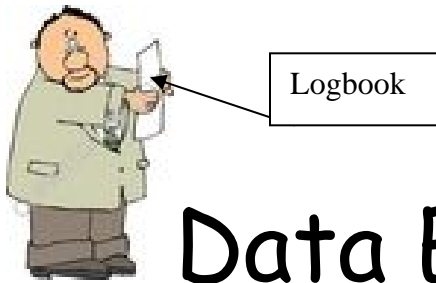
You will help guide your group to the cache location.



Recorder Specialist

You are responsible to carry a clipboard, pen or pencil,
and the class paper to each cache.

You will record the answers.



Data Entry Specialist

You are responsible to make sure everyone in your group signs and dates the logbook found in each cache.
You will place it back neatly into the cache for the next group to find.



Geocache Specialist

Your responsibility is to see where the cache is found. After your group is finished using the cache, you will put the cache back.
The cache should be EXACTLY where you found it so that the co-ordinates are correct for the other team members to find it.

GROUP ROTATIONS

So groups are not going to the same cache at the same time, you can start them at different caches. Here is an example of 8 caches, everyone ends up with the last cache being “home base”—maybe a picnic table.

Here is an example of 5 teams and the order of their rotation:

Team #	CACHE #1 TREE1	CACHE #2 ART	CACHE #3 MONUM	CACHE #4 MAP	CACHE #5 TREE2	CACHE #6 TREE3	CACHE #7 WHITE	CACHE #8 POLE
1	1	2	3	4	5	6	7	8
2	6	7	1	2	3	4	5	8
3	4	5	6	7	1	2	3	8
4	2	3	4	5	6	7	1	8
5	7	1	2	3	4	5	6	8

Team #	CACHE #1 TREE1	CACHE #2 ART	CACHE #3 MONUM	CACHE #4 MAP	CACHE #5 TREE2	CACHE #6 TREE3	CACHE #7 WHITE	CACHE #8 POLE
1	1	2	3	4	5	6	7	8
2	6	7	1	2	3	4	5	8
3	4	5	6	7	1	2	3	8
4	2	3	4	5	6	7	1	8
5	7	1	2	3	4	5	6	8

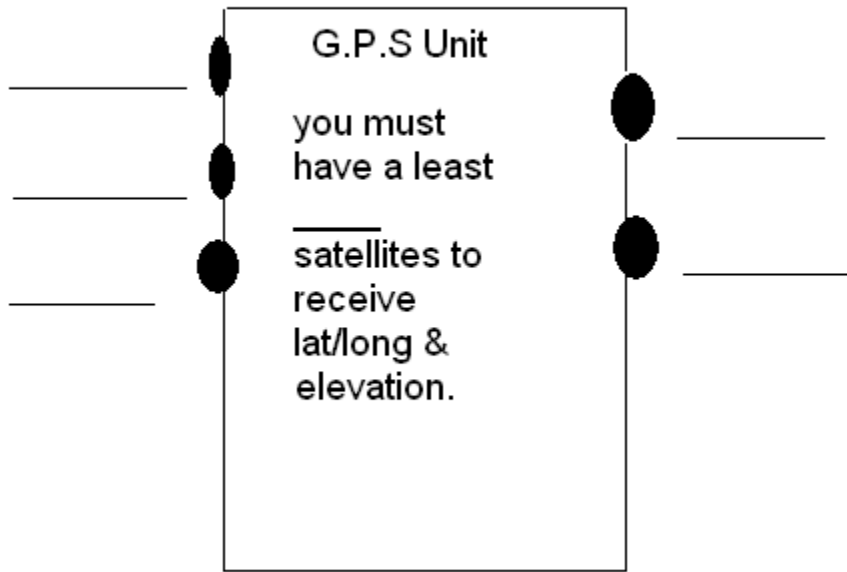
Team #	CACHE #1 TREE1	CACHE #2 ART	CACHE #3 MONUM	CACHE #4 MAP	CACHE #5 TREE2	CACHE #6 TREE3	CACHE #7 WHITE	CACHE #8 POLE
1	1	2	3	4	5	6	7	8
2	6	7	1	2	3	4	5	8
3	4	5	6	7	1	2	3	8
4	2	3	4	5	6	7	1	8
5	7	1	2	3	4	5	6	8

Team #	CACHE #1 TREE1	CACHE #2 ART	CACHE #3 MONUM	CACHE #4 MAP	CACHE #5 TREE2	CACHE #6 TREE3	CACHE #7 WHITE	CACHE #8 POLE
1	1	2	3	4	5	6	7	8
2	6	7	1	2	3	4	5	8
3	4	5	6	7	1	2	3	8
4	2	3	4	5	6	7	1	8
5	7	1	2	3	4	5	6	8

Team #	CACHE #1 TREE1	CACHE #2 ART	CACHE #3 MONUM	CACHE #4 MAP	CACHE #5 TREE2	CACHE #6 TREE3	CACHE #7 WHITE	CACHE #8 POLE
1	1	2	3	4	5	6	7	8
2	6	7	1	2	3	4	5	8
3	4	5	6	7	1	2	3	8
4	2	3	4	5	6	7	1	8
5	7	1	2	3	4	5	6	8

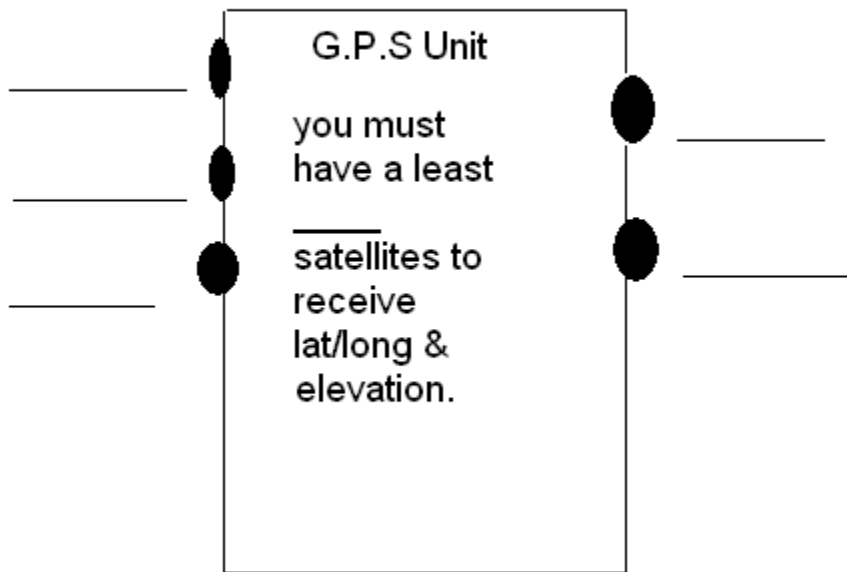
GPS Unit Parts

Name _____ Points(5) _____



Global Positioning System

Name _____ Points(5) _____



Global Positioning System