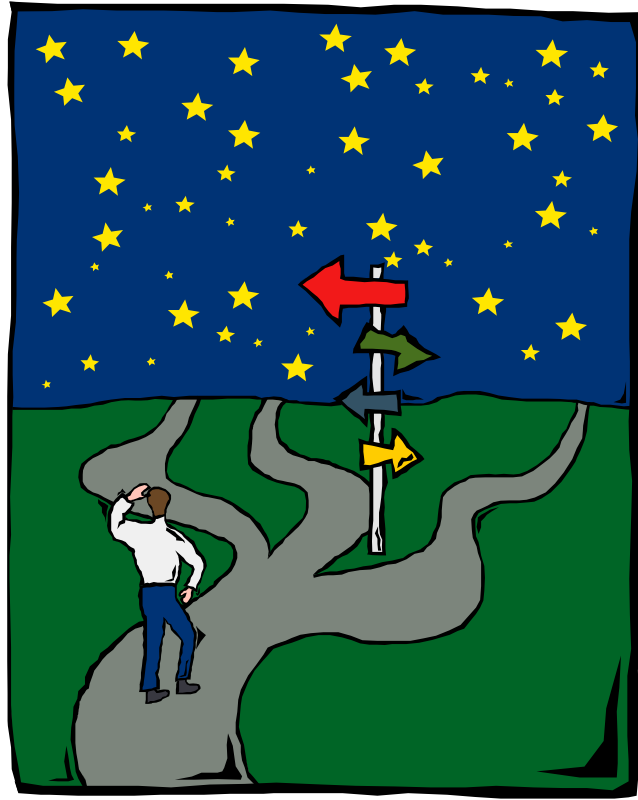


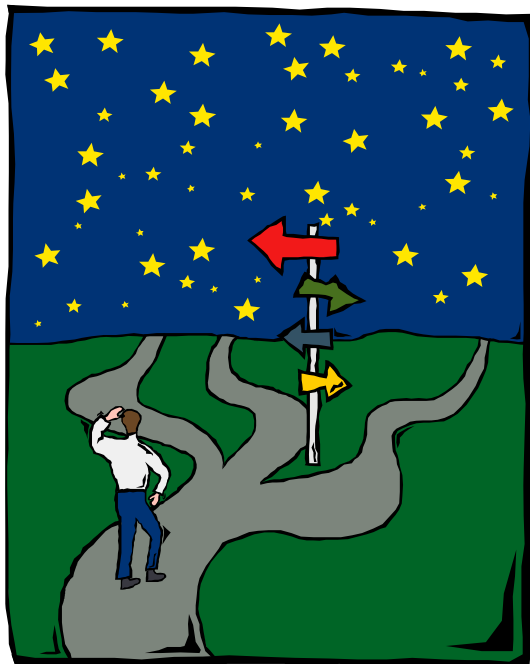
Camp Huntington's Geo-Adventure



Activity Guide

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Introduction

This *Geo-Adventure Activity* was designed for preservice elementary educators. A fundamental goal of this activity is to provide a way for future teachers to explore and gain practice with technology in nature while utilizing and developing social studies, mathematics, science and technological skills. Specifically, this activity provides a way for preservice teachers to use a *Global Positioning System (GPS)* receiver and observational skills to locate hidden containers at *Camp Huntington*. This activity guide provides location coordinates for hiding and retrieving the accompanying containers and their contents.

Understanding Global Positioning System

This activity depends on using Global Positioning System (GPS) technology so users of this activity should have a basic understanding of GPS. GPS receivers track radio signals that are being transmitted from satellites currently orbiting the Earth. The GPS receivers measure the distance from the satellites to the receiver and can often pinpoint the locations within ~50 feet of accuracy anywhere in the world.

A GPS receiver calculates the satellites' distances from itself. The formula: $\text{Distance} = \text{Rate} \times \text{Time}$ is used for this calculation. The radio signal travels at the speed of light (186,000 miles per second) and the receiver tracks how long it takes for each satellite signal to be received.

There are currently 21 satellites orbiting our Earth that offer information for GPS receivers (three extras are orbiting as a back-up, totaling 24).

GPS receivers need to use a minimum of three satellites' signals to determine the users location in two-dimensions: latitude and longitude. Four satellites' signals are needed to determine the users location in three-dimensions: latitude, longitude and altitude (elevation).

Generally, the more satellites' signals that are received, the more accurate the location reading will be.

Clouds, rain, snow and other inclement weather will not affect the satellites' signals from being received. However, the signals are quite weak so they do not penetrate through buildings or heavy tree canopy.

Geo-Adventure Activity

Safety First! It is important that safety is considered first when planning to implement this *Geo-Adventure Activity*. Therefore, this activity was designed for small groups of students to work together to complete it. Having students work in small groups will help to ensure that students will have at least one person to help if an emergency should occur. All of the 'treasures' (containers) locations have been established within 40 feet of marked trails at Camp Huntington, but it is always best to have a buddy with a student just in case a need arises.

Rationale: This activity was created to provide a way for future teachers to explore and practice using technology in nature while developing social studies, mathematics, science and technological skills. When preservice teachers participate in this activity, they can be guided to contemplate ways that an activity similar to this could be implemented into elementary school classrooms while reflecting on their own learning experiences.

Desired student outcomes: After completing this activity, students will (1) identify how *GPS* receivers can specify locations; (2) apply knowledge of *GPS* receivers to locate predetermined locations (treasures); (3) analyze the activity to list the embedded skills/knowledge necessary for elementary students' successful completion and (4) summarize their own knowledge gains from the activity.

Participants: This activity has been designed for 12 students to work in 3 small groups of 4, with students within each group paired.

Time needed: 45 minutes - 1 hour

Materials needed:

- 7 *GPS* receivers (6 for student use, 1 for facilitator modeling)
- 3 maps of Camp Huntington's hiking trails
- "treasures" previously placed near hiking trails
- safety pins for collecting treasures

Preparing for the activity:

It is important that this activity's facilitator(s) know how to use the GPS receivers. GPS manuals are stored with the GPS receivers at Camp Huntington and can be reviewed as needed. Prior to beginning this activity, it is essential that the facilitator(s) hide the treasures along trail paths using the predetermined locations provided in the Student Pages section of this guide. During the activity, students will need to be given directions on how to input the locations, called waypoints, into their GPS receivers (see below).

Eliciting Prior Knowledge:

The following questions may help students elicit prior knowledge on content information needed for this activity. Facilitators may need to correct any misunderstandings.

Longitude and Latitude:

What do you know about longitude and latitude? Students may not answer this question whole group... so a paired-share may be more beneficial at this time. Afterward, some students can share some ideas whole group. It's important that students know:

1. Two numbers - longitude and latitude, can describe any location on Earth.
2. These two numbers are actually angle measurements, identified as degrees, minutes of an arc and seconds of an arc. The symbols used are $^{\circ}$, $'$ and $''$. The $'$ (used for minutes of the arc) and $''$ (used for seconds of the arc) shouldn't be confused with units of linear measure (feet and inches). There are 60 minutes of an arc in a degree and 60 seconds of an arc in a minute. This sounds like units of time but it should not be confused with such.
3. Latitude lines measures the elevation angle above and below the equator. They are imaginary lines that run parallel to the equator. The equator is where the northern and southern hemispheres are distinguished.
4. Longitude lines (sometimes called meridians) run north and south, merging at the poles. Longitude begins its count at Greenwich, England, which is noted as zero degrees longitude. This is called the prime meridian line and is where the eastern and western hemispheres are distinguished.

GPS Receivers

What do students already know about *GPS* receivers? They may have never used or seen a *GPS* receiver before. They need to know the following:

1. *GPS* units receive satellite signals and can determine where the unit is located within approximately 50 feet.
2. *GPS* receivers need to be held still to locate current location.
3. Locations (identified as waypoints - longitude and latitude coordinates) can be input into the receiver and the unit can provide directions for the user to locate the established waypoint(s).
4. *GPS* receivers can only provide directions to established waypoints if the user is moving.

Directions for students:

After eliciting prior knowledge, students should gain some experience holding and exploring the *GPS* receivers. The facilitator should show how to navigate through and explain the features of the *GPS* receiver. There are different *GPS* models that students can use so this activity guide will not elaborate on how to use *GPS* receivers. Instead, see specific manuals for the *GPS* receivers that will be used with your group of students.

For this activity, students will be handed out safety pins to collect beads, trinkets and charms that can be clipped to the pins. They may keep these items. Safety pins will need to be passed out at this time.

Practicing with a *GPS* receiver:

Students will benefit from practice reading coordinates, entering waypoints and using the "mouse" on the receiver to navigate to the menu, sub-menus and other pages on the *GPS* receiver screen.

Practicing treasure hunting:

Two different coordinates have been established to provide students experience locating treasures as a whole group (pairs of students can share one *GPS* receiver). Students begin by entering the provided waypoints and begin to walk to determine which direction to head. Students continue until the receiver identifies that the users are nearing the waypoint. At that time, the students need to rely less on

the GPS receivers and more on observation skills. Students need to understand that the GPS receivers will not specifically identify the exact location of the hidden treasure. Instead, the GPS receivers will get students within 50-feet of the identified location.

Practicing Observation Skills:

Students may benefit from determining a systematic way to observe and search for the treasure. This is an important component of this activity because it is where technology use ends and students' abilities of observation take over. Once students are within 50 feet of the treasure, students can read the treasure descriptions (found on the Student Pages) to try to identify whether the treasure might be hidden in a tree hollow, behind a rock, or under a suspicious pile of sticks. For this activity, the treasures should not be hard to find. Rather, students should gain experience with this activity to determine embedded skills and subsequently consider how elementary school teachers and their students might benefit from such an activity.

After students locate the practice treasures, they'll need to open them to identify what's inside. Students should find a pen/pencil, a logbook and beads/treasures for their safety pins. Students should sign the logbook with their names, date, and any information that they can provide regarding their hunt for the treasure. Students should take a treasure and add it to their safety pins.

Once students have had some practice using GPS receivers and locating items, students can be divided into small groups. This activity has been designed for 3 groups of 4 students; however, modifications to this arrangement can easily be made.

Steps:

1. Sort students into 3 small groups with 4 students in each group.
2. Distribute GPS receivers for each pair of students in each small group.
3. Provide each group of students with a Camp Huntington Trail Map.
4. Assign each group of students to one trail (Red, Blue or Green).

5. Provide each group of students with a *Geo-Adventure Treasure Coordinates Chart* to identify the treasures to locate.
6. Each group of students enters the coordinates (waypoints) for the treasures on the trail they've been assigned only.
7. Students then hike their assigned trail, searching for their treasures.
8. Once they find their treasures, they should (1) sign the logbook, (2) take a treasure, and (3) put the treasure back just as they've found it.
9. After they have found all of their treasures, they should return to where they started.

After all groups have returned, they should reflect on their experience. The following questions may help for this:

What did you notice about the coordinates used? What stayed the same? Students should be guided to note that the coordinates were always in N and W, regardless of where they walked. Why? This is because we are in the northern hemisphere and in the western hemisphere. The United States is in this region. So, if we were completing this activity in Florida, we would still have N and W coordinates.

What did you notice about observation skills? Observation skills are necessary for successful completion of this activity.

What teamwork did your group use? What were the embedded social skills used in this activity?

How might elementary students benefit from this activity? What grade level(s) might be appropriate? Why?

What did you learn from this activity?

Evaluation:

Students are evaluated based on participation, observation and answers provided in group discussions during and following the activity. Specifically, students should be observed to ensure that they know how to use a *GPS* receiver to input locations and locate predetermined locations. Students' verbal answers to questions should provide evidence that they can identify

the embedded skills/knowledge necessary for elementary students' successful completion of this activity. In addition, verbal responses to questions will identify that students can summarize their own knowledge gains from the activity.

An evaluation sheet is provided in the Student Papers section of this guide so students can evaluate and provide feedback on this activity.

Extension activity:

If there is extra time to continue this activity, students can be assigned to different trails to locate additional treasures, sign the logbook and obtain additional trinkets to keep. There are a total of 8 treasures (2 practice treasures, 2 on the blue trail, 2 on the green trail, and 2 on the red trail).

For an extension to better understand the use of GPS receivers, students would benefit by visiting the following website:

<http://www.pbs.org/wgbh/nova/longitude/gps.html>

This site provides a little GPS game that does a great job showing how our global positioning system works.

Teaching Elementary Students

As stated earlier, this activity has been designed for preservice elementary teachers. Therefore, it is important that they think about and come to realize that there are many ways that their future elementary students can benefit from teachers incorporating GPS activities into school settings.

There are many connections that can be made to elementary education curricula:

Technology

Students can benefit by identifying how technology can be effectively used as a tool to help them learn. GPS receivers, once exclusively used by the military, can provide a way for students to begin to learn how satellite signals are used to identify ALL locations on Earth.

Science

GPS receivers can only be used outdoors. Therefore, students will be out in nature to complete GPS activities. Making environmental observations is necessary for successful completion of GPS activities. Students can be asked to locate different plants or animal habitats along the way. In addition, waypoints can be established for particular environmental locations that could pinpoint specific nests, dens or plants.

Social Studies

Longitude and latitude concepts are regularly taught in elementary school social studies curricula yet students have very little understanding of these coordinates and what they mean. This activity provides an experiential approach to learning about this abstract concept. The GPS receivers provide location data to show students where they are on Earth and they are able to see how the coordinates change when they move from place to place. Experimenting in an open space such as a large field would help students to begin to make early observations with coordinate changes on GPS receivers.

Students also gain experience reading a map. Maps are a necessary part of this activity and students can combine their knowledge of latitude and longitude coordinates to maps of their current location. Superimposing the

coordinates on the map provides students with an experiential way to begin to learn about Geographic Information System (GIS) and layering of information.

GPS receivers can be used to locate historical buildings or landmarks and information can be discovered as students gather observations in predetermined locations.

Mathematics

GPS receivers work by using mathematics. Students who may be developmentally ready for more difficult math concepts would benefit from understanding that the satellite signals travel at the speed of light (186,000 miles per second). The GPS receivers have a clock in them that keeps track of how long it takes to receive the signals (often in hundredths of a second). The GPS receivers use a common formula in math to determine distance:
Rate (speed) \times Time = Distance

The rate is 186,000 miles/second \times ____ time = Distance from the satellite.

Three satellites are needed to completely determine where the GPS receiver is located.

To better understand the math concepts, please visit:

<http://www.pbs.org/wgbh/nova/longitude/gps.html>

to play the GPS Navigation Game

English Language Arts

This activity requires that students use social skills: speaking and listening. Students work in small groups to (1) plan a systematic way for observing and locating hidden treasures and (2) talk about their plans, possibly adjusting their original ideas to new ones.

Students also need to be able to read and comprehend and apply simple directions to the tasks involved with this activity.

Physical Education

Perhaps one of the more beneficial outcomes of this Geo-Adventure is the physical activity necessary for task completion. Students will benefit from

walking or hiking to discover hidden treasures. By nature, *GPS* activities are dependent on student movement and this is an important benefit for students' overall health, physical and emotional well-being.

Student Pages (reproducible)

The following pages are needed to complete this *Geo-Adventure* and require that all pages be reproduced for students' use. Since students will be working in pairs, students can share pages.

This section contains the following student pages:

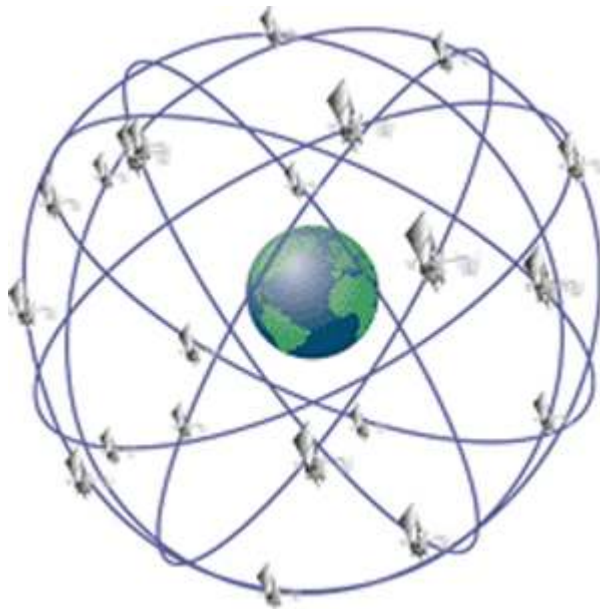
1. Picture of Satellites orbiting Earth
2. *Geo-Adventure Coordinates Chart and Location Clues*
3. *Geo-Adventure Evaluation*
4. *Map of Camp Huntington's Hiking Trails (found at end of guide)*

Camp Huntington's Geo-Adventure

Understanding Earth's Satellites' Orbiting Patterns

There are 24 manmade satellites that are part of the Earth's Global Positioning System (GPS). The satellites are about 12,500 miles above Earth and are moving at about 7,000 miles/hour. It takes about 12 hours for a satellite to orbit Earth; GPS satellites orbit the Earth twice a day in a very precise path.

This picture that shows the satellites and their orbiting patterns around Earth:



Camp Huntington's Geo-Adventure

This page provides information of coordinates and location clues for treasures found near Camp Huntington. These two different locations are provided as a practice for students' GPS receiver use and were intended to be reviewed whole group.

Example #1:

Coordinates Chart

N 43° 49.206'
W 074° 37.662'

Clue

Arne gur punyrgf jngre.

Example #2:

Coordinates Chart

N 43° 49.281'
W 074° 37.645'

Clue

Jnyx gur cynax.

Decryption Key
A|B|C|D|E|F|G|H|I|J|K|L|M

N|O|P|Q|R|S|T|U|V|W|X|Y|Z
(letter above equals below,
and vice versa)

GREEN TRAIL ADVENTURE

Use the coordinates and clues to help you locate the treasures.

Vanderbilt's Vault:

Coordinates Chart

N 43° 49.463'
W 074° 37.742'

Clue

N qel fcbg.

Pineknot Stumper:

Coordinates Chart

N 43° 49.515'
W 074° 37.885'

Clue

Centref ner arneol.

Decryption Key
A|B|C|D|E|F|G|H|I|J|K|L|M

N|O|P|Q|R|S|T|U|V|W|X|Y|Z
(letter above equals below,
and vice versa)

BLUE TRAIL ADVENTURE

Use the coordinates and clues to help you locate the treasures.

Where's Huntington Bear?:

Coordinates Chart

N 43° 49.470'
W 074° 37.560'

Clue

Orerngu n cvyr bs fgvpxf.

Cortland Cache:

Coordinates Chart

N 43° 49.499'
W 074° 37.381'

Clue

Va n gerr'f yrt.

Decryption Key

A|B|C|D|E|F|G|H|I|J|K|L|M

N|O|P|Q|R|S|T|U|V|W|X|Y|Z

(letter above equals below,
and vice versa)

RED TRAIL ADVENTURE

Use the coordinates and clues to help you locate the treasures.

Durant's Nest Egg:

Coordinates Chart

N 43° 49.298'
W 074° 37.464'

Clue

Bss gur tebhaq.

Pinecone Alley:

Coordinates Chart

N 43° 49.313'
W 074° 37.413'

Clue

Va n gerrebbg qra.

Decryption Key

A|B|C|D|E|F|G|H|I|J|K|L|M

N|O|P|Q|R|S|T|U|V|W|X|Y|Z

(letter above equals below,
and vice versa)

Geo-Adventure Evaluation

Directions: Please answer the following questions about your experiences with this activity:

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

References

Cameron, L. (2004). *The Geocaching Handbook*. Falcon.

Dyer, M. (2004). *The Essential Guide to Geocaching: Tracking Treasure with Your GPS*. Fulcrum Press.

Hinch, D. (2004). *Outdoor Navigation with GPS*. Santa Rosa, CA: Annadel Press.

McNamara, J. (2004). *Geocaching for Dummies*. Indianapolis, IN: Wiley Publishing.