Hide and Seek

GPS and Geocaching in the Classroom

By Lynn M. Lary

Subject: Global positioning systems

Audience: Teachers, teacher educators

Grade Level: K–12 (Ages 5–18)

Technology: GPS units, Web

Standards: *NETS•S* 3 (http://www.iste.org/standards/)

Screenshots courtesy of Groundspeak, Inc. Used with permission.

Ever heard of *geocaching*? If not, don't be surprised. But thousands of people are participating in this new sport.

As an instructional technology specialist, and an avid geocacher, I'd like to share with you a little bit about the sport and some ways geocaching can be incorporated in classroom instruction. In short, geocaching is a high-tech, worldwide treasure hunt (geocaches can now be found in more than 180 countries) where a person hides a cache for others to find. Generally, the cache is some type of waterproof container that contains a log book and an assortment of goodies, such as lottery tickets, toys, photo books for cachers to fill with their own photos, or music recordings. Longitude and latitude coordinates are then posted on the geocaching Web site, along with a description of the cache, a hint, and any other pertinent information. Once a cache has been posted, it is ready to be discovered—and so the hunt begins! (***Editor's note:*** Find URLs under Resources on p. 18.)

The first question many people ask me is, "How do I know where to look for a cache?" The geocaching site has a searchable database so that you can search for caches located in your area. Once you determine which cache you want to find, you have to enter the longitude and latitude coordinates into a global positioning system (GPS) unit. The unit can then be used to navigate to the location on earth (what a concept!) where the cache is hidden. Because GPS units are accurate to within several meters, the verbal descriptions are very useful in finding the cache. Often you are within inches of the cache and don't even know it!

Student Uses of GPS

Last spring, I had the pleasure of guest teaching at Thurston Middle School in Springfield, Oregon, preparing the students for orienteering activities they would be participating in at Outdoor School—a two-day camp centering on science. The first lesson I taught focused on how GPS devices work and applications of GPS. Being a former math teacher, I created an opening activity for the lesson that had them thinking about what a degree is in relation to miles so they had some point of reference when thinking about their own movement while using the GPS units. I gave them some basic information: Earth is about 7,926 miles in diameter, and the circumference of Earth (which we considered a sphere) is π times the diameter where $\pi = 3.1416$. They found that the circumference of Earth is approximately 24,900 miles and that 1° is approximately 69.2 miles. Mighty impressive for sixth-grade students! In addition to thinking about it mathematically, they also could relate their real-world experiences, as the school is about 70 miles south of the 45th parallel and many of the kids have driven by a sign announcing the 45th parallel on Interstate 5. This was a great perception check. Students saw that the GPS showed our latitude as 44° and, given that 1° is about 69 miles, their calculations were right on.

The second lesson focused on how to use the GPS. The students worked in groups of three, input longitude and latitude coordinates into the GPS, and then went to the physical locations they had entered into the units. The students were excited about using the GPS and were very adept at learning new skills. This was evident because they successfully used the GPS to locate several "mystery" landmarks on campus. (I provided the coordinates to the students, and they were able to enter them into the GPS, then use the GPS to find the mystery landmarks.) Of course, who would be surprised, given that they are a part of the Game Boy generation? The students finished the lesson by brainstorming uses of GPS.

After the initial lessons, I went to their outdoor camp where I worked with Thurston Middle School teachers to create 12 geocaches for the students to find. Because of time constraints, the GPS units each had 3 of the 12 cache coordinates pre-entered for the students. After a quick review of how the GPS unit operated, each team of three students took their unit and went on the hunt to find their three assigned caches. One of the things to note is that students must understand that much like a calculator, a GPS will only give you information; it can't find the cache on its own just as a calculator can't give you the answer if you don't key in a problem. As in real caching, the students had clues provided for each location; to find the cache, they actually had to set the GPS aside and work with their teammates to figure out what the clues might mean (answers in paren-

Geocaching is a high-tech, worldwide treasure hunt (geocaches can now be found in more than 180 countries) where a person hides a cache for others to find.

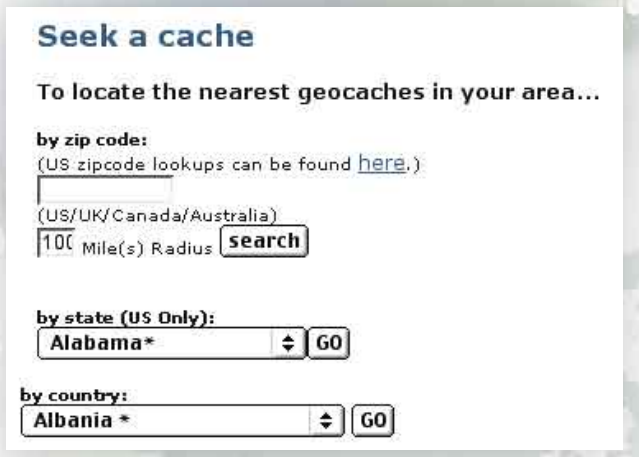
theses). Some of the clues we used are below—note that the math problem required the students to correctly use the order of operations or they wouldn't be able to find the right box (and it was obvious which kids knew the order of operations).

- This cache is "illuminated" and near the state flower of Virginia. *(near a light post)*
- Go past the flat tire or you'll get "stumped" by this one! *(hidden in a stump)*
- Look for Box # ___ = 100 – 80 ÷ 2 – 2 x 25 + 1 (fill in the __ with the answer to this problem, *11*)
- Give a hoot, don't forget to "salute." *(in a space under the flagpole)*
- One of the three pigs used this to build his house. *(in a pile of sticks)*
- You might have to take a walk around the "block" to find this cache. *(near a cinder block)*

As the day progressed, the students who rotated into the GPS session with me began to get a bit more competitive. For example, once a team found their three caches, they would come back to see if they could trade GPS units (with other pre-entered coordinates) so they could find the other caches. One team of girls actually found all 12 caches in about 40 minutes! Their success can be attributed to their love of the hunt, their physical speed, and their ability to use the GPS (although neither of them had used a GPS outside of school). The kids were excited (as were the parent volunteers who, in one case, had to be restrained!), and two of them even mailed me thank you notes after the camp was over. How often do students actually *thank* you for teaching them something?

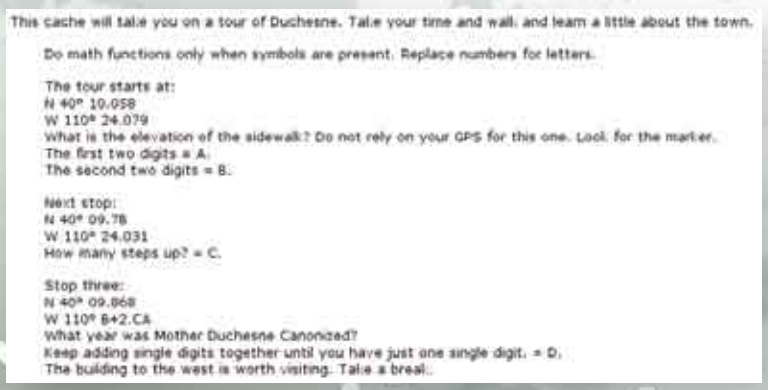
Other Classroom Applications

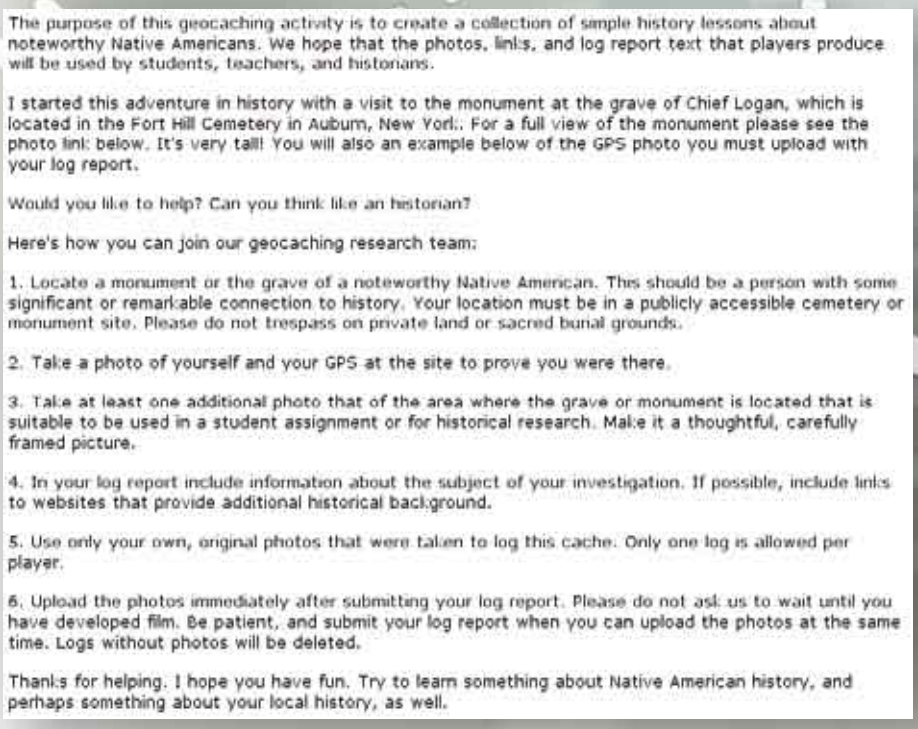
So far, I have only talked about traditional caches. However, there are several cache variations, and each has some excellent classroom applica-



It is easy to find local geocaches on the Geocaching Web site.

Multi-site geocaches can be like GPS-based scavenger hunts.




The purpose of this geocaching activity is to create a collection of simple history lessons about noteworthy Native Americans. We hope that the photos, links, and log report text that players produce will be used by students, teachers, and historians.

I started this adventure in history with a visit to the monument at the grave of Chief Logan, which is located in the Fort Hill Cemetery in Auburn, New York. For a full view of the monument please see the photo link below. It's very tall! You will also an example below of the GPS photo you must upload with your log report.

Would you like to help? Can you think like an historian?

Here's how you can join our geocaching research team:

1. Locate a monument or the grave of a noteworthy Native American. This should be a person with some significant or remarkable connection to history. Your location must be in a publicly accessible cemetery or monument site. Please do not trespass on private land or sacred burial grounds.

2. Take a photo of yourself and your GPS at the site to prove you were there.

3. Take at least one additional photo that of the area where the grave or monument is located that is suitable to be used in a student assignment or for historical research. Make it a thoughtful, carefully framed picture.

4. In your log report include information about the subject of your investigation. If possible, include links to websites that provide additional historical background.

5. Use only your own, original photos that were taken to log this cache. Only one log is allowed per player.

6. Upload the photos immediately after submitting your log report. Please do not ask us to wait until you have developed film. Be patient, and submit your log report when you can upload the photos at the same time. Logs without photos will be deleted.

Thanks for helping. I hope you have fun. Try to learn something about Native American history, and perhaps something about your local history, as well.

A locationless cache allows you to geocache without a GPS unit.

November 8, 2003 by KC5DRI (KC5DRI / N3YRG and kids) (191 found)
N 40° 12.544 W 077° 10.537
Charles Albert (Chief) Bender 1884-1954
He was one of baseballs greatest pitchers, Bender played for the Philadelphia Athletics from 1903-14, helping them to win 5 pennants and 3 world championships. After winning 212 games over 16 seasons and becoming one of the first World Series stars, he was inducted into Baseball Hall of Fame in 1954. His mother was one-half Chippewa and he attended Carlsile Indian Industrial School from 1898-1901. This plaque is located at the prade grounds on Carlisle Barracks, home of the Army War College.
[view this log on a separate page]
$ shot with GPSr
Close Up

November 2, 2003 by 4OnTheGo (4OnTheGo) (137 found)
N 43° 32.918 W 089° 44.336
"Yellow Thunder - Chief of the Winnebago" -
HISTORY::
Yellow Thunder Chief of the Winnebago 1774 - 1874
It was in 1994 that the people who were called Winnebago, by French fur traders more than 300 years earlier, chose to reclaim their heritage and take on a shortened version of their true name to become, the HO-CHUNK.

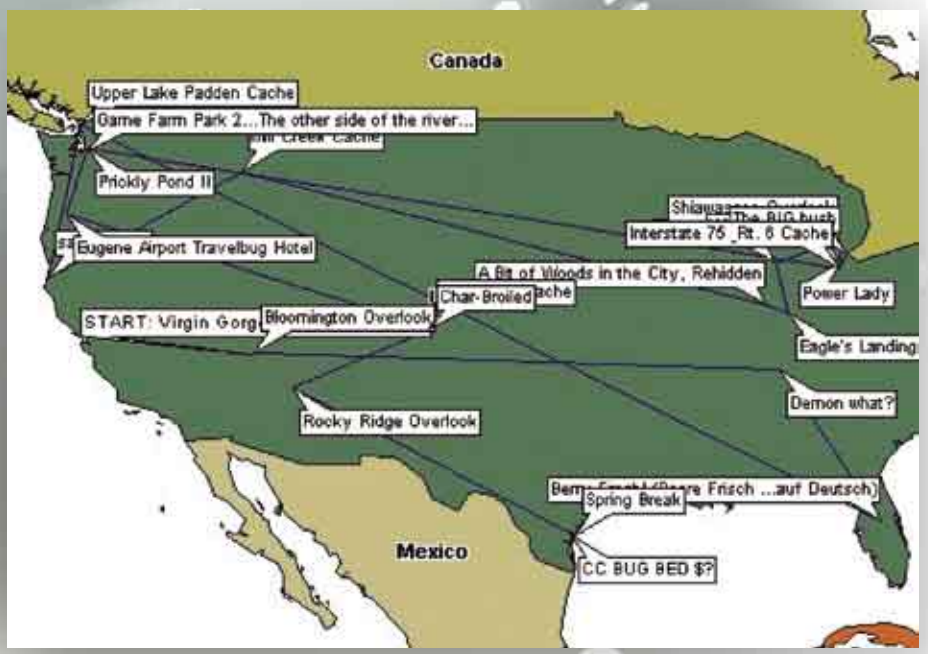
The largest concentration of Ho-Chunk reside in Monroe, Sauk, Jackson, Milwaukee, Wood and Shawano counties. Chief Yellow Thunder is best remembered as "the man who would not leave".

Four times between 1844 & 1873, the federal government hired contractors to round up Indians and evict them. Sending them by rail car or steamboat to Iowa, Minnesota, or Nebraska. Each time, Yellow Thunder would wait just long enough to turn around and go home.

(we were so busy making all the photos that we forgot the one with the gps, will go back to take one with gps)

[This entry was edited by 4OnTheGo on Sunday, November 16, 2003 at 12:00:50 PM.]
[view this log on a separate page]
monument from further away
wayside sign
the monument
yellow thunder plaque
historical society plaque

Online log entries can serve as a multi-person journal for each cache or Travel Bug.



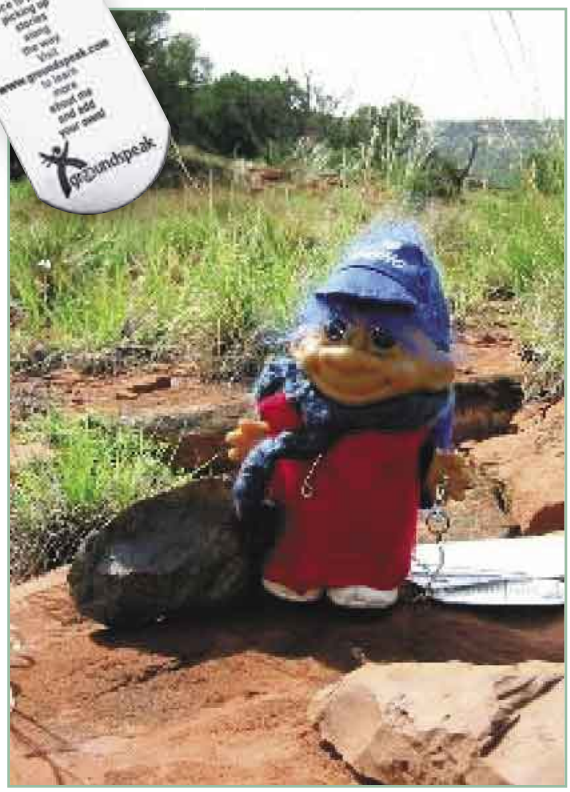
A map tracing the travels of The Hiker Travel Bug.

tions. The very first cache I went on was a multi-site cache called Tour of Duchesne. A *multi-site cache* requires the cacher go to the first set of coordinates, answer a question and perhaps do a calculation to determine the next set of coordinates, and so on. (There are many variations on this—the main idea though is that it has multiple parts.)

The cool thing about this multi-site cache was that I got to learn a little bit about the town of Duchesne, which is located in east central Utah, and to see some of the things I may not have otherwise taken the time to see. I suppose you are now wondering how this applies to the classroom? The Lane Education Service District has a federal Teaching American History grant that serves Lane County teachers. The goal is to engage students in learning history. In the second round of the grant, one of the focus areas will be local history. As an avid geocacher, I thought, "What better way for kids to learn about their community than to create an historically based multi-site geocache that focuses on their community?" The cache could then be completed by other classes or by members of the community.

Locationless caching is another variation of the Geocaching sport, except that in this variety, the person who creates the cache doesn't even have to own a GPS! In locationless caching, the creator of the cache describes some object they are in search of and then cachers from around the globe take photos of the desired objects and post them online along with their longitude and latitude coordinates. For instance, an instructional technology specialist in New York created the Native American History Lesson locationless geocache. The purpose of this cache is for people from all over the United States to "create a history lesson about a noteworthy Native American."

Travel Bugs can serve as a modern update for the traveling stuffed animal activity.



The Hiker with some of the artifacts that we found during the archaeological survey with Passport in Time, a volunteer program sponsored by the U.S. Forest Service.

PHOTO BY LYNN M. LARY

The kids were excited (as were the parent volunteers who, in one case, had to be restrained!), and two of them even mailed me thank you notes after the camp was over. How often do students actually thank you for teaching them something?

To date, this cache has 54 entries. Some entries are lengthy and provide rich detail about contributions of Native Americans; others are brief.

Not only does the class get a virtual museum on a specific topic, but you could post a world map in the classroom so that students could track the physical locations of the objects.

Travel Bugs are an element of geocaching that may be of particular interest to elementary teachers. I remember when teachers used to take a stuffed animal, mail it to a teacher in a another state or country, and then the class would receive letters about the adventures the stuffed animal had. Eventually, the stuffed animal would be returned along with souvenir trinkets. Travel Bugs are a kind of high-tech version of this concept. Essentially, a cacher purchases a Travel Bug ($6.50) and attaches it to some object, indicates where it wants to go, and then "releases" it into a cache. Each time the Travel Bug is moved, the person who moves it logs the movements on the Geocaching Web site. This log becomes a part of the journal of the Travel Bug's journey. An automatic map is generated showing the journey of the Travel Bug. For example, I picked up The Hiker Travel Bug from Eugene, Oregon, and took him along with me on a recent archeology project in southeastern Colorado.

As of September 17, 2003, The Hiker had traveled a total distance of 12,533.63 miles. The Geocaching Web site generates a map of the locations a Travel Bug has visited. In addition to the map, there is a log that serves as a journal of the Travel Bug's adventures, and you can find pictures of the Travel Bug in action. As a part of a classroom activity, students could plot the movement of a Travel Bug on a physical map.

As with all types of caches, the owner of the cache determines the theme and type of cache (e.g., multisite, traditional, locationless, etc). In the same way, Travel Bug owners determine where the Travel Bugs go, and can request photos of the Travel Bug on its travels, making this an ideal way to have a class participate in a virtual field trip.

I've listed just a few applications of Geocaching for the classroom. Hopefully, soon you will become a cacher, too!

Resources

Geocaching: http://www.geocaching.com/

Geocaching: Guide to Purchasing a GPS Unit: http://www.geocaching.com/articles/gps_buying.asp

Lane ESD Virtual Training Center: Global Positioning System: http://www.lane.k12.or.us/insttech/vtc/gps.html

Louisiana INTECH 2 Social Studies Project: http://www.doe.state.la.us/lde/lcet/Intech2SS/frameset.htm

Native American History Lesson: http://www.geocaching.com/seek/cache_details.aspx?guid=b6204975-bdd6-46d9-bfb2-34110b440eaf

Tour of Duchesne: http://www.geocaching.com/seek/cache_details.aspx?ID=21876

Travel Bugs: http://www.geocaching.com/track/

Lynn M. Lary is an instructional technology specialist at Lane Education Service District in Eugene, Oregon, where she provides technology staff development for teachers working in Lane County public schools. Lynn is the president of Oregon Educational Technology Consortium and is actively involved in the Northwest Council for Computer Education, both of which are ISTE Affiliates.