Lesson Plan: EarthCaching the Campus

The following lesson plan can be used as a template for an EarthCache™ adventure around the school campus.
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Regents Earth Science
EarthCaching the Campus

Introduction:
The trail system around our campus and the adjacent nature preserve brings hikers to several interesting points of geologic interest. In this EarthCaching activity, you will self-guide yourself through a tour of several of these features represented at six stops along the way.

Materials:
- This packet
- A GPSr with healthy batteries (and extras)
- A clipboard and something to write on (field notes!) and with
- Food and water for 3 days (only kidding, you'll be back by the end of the lab period!)

Procedure:
1. Make sure you know how to use your GPSr. You must be able to:
   - Set up your unit.
   - Display latitude and longitude in dd m.mmm (degrees and minutes, with the minutes displayed to 3 decimal places).
   - Set the Map Datum* (see end of lesson). We will be using WGS-84 on this tour.
   - Enter and label waypoint (or landmark) coordinates.
   - Navigate to waypoints (or landmarks).

2. Navigate to each of the stops on the tour listed below and on the following pages.

3. At each stop
   - Read the introductory material.
   - Explore the site for a few minutes, recording any observations you make (field notes) and any questions your observations may raise.
   - Answer the questions associated with the stop.

Tour of Local Geologic Features
Starting point: Northeast corner of K-Wing (latitude +XX° 11.517’ longitude -XX° 40.688’)

1. Navigate to the bottom of “Cable Hill” road (latitude +XX° 11.517’ longitude -XX° 40.688’) and head south, up the hill. Proceed to Stop 1 (next page).
Stop 1 (latitude +XX° 11.415’ longitude -XX° 40.682’)

DATE and TIME of arrival at Stop 1

Examine the rock outcrop on the left (east) side of the road here. The rocks are metamorphic gneiss, and they have been smoothed by the flow of glacial ice over them. Notice the ridges and valleys on the surface exposures of the rock. Record any observations and questions as field notes below:

Stop 1 Question(s)

Notice and describe the color of the minerals that form the ridges and the valleys of the grooves on the exposed rock surface.

What do you suppose is the cause of the ridges and valleys on the exposed rock surface?
**Stop 2** (latitude +XX° 11.323’ longitude -XX° 40.716682’)

DATE and TIME of arrival at Stop

Notice the water seeping from the ground on the right (west) side of the road. This small natural spring flows, at least a little, even during times of water budget deficit in August. Record any observations and questions as field notes below:

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**Stop 2 Question(s)**

What do you suppose is the source of the water that seeps from the ground here?

What force(s) do you suppose drives the flow of this water?
Stop 3 (latitude +XX° 11.146’ longitude -XX° 40.680’)

DATE and TIME of arrival at Stop 3

Our school leases this small area of land to the local TV company. Describe what you are observing and record any observations and questions as field notes below:

Stop 3 Question(s)

Why do you suppose this particular location is well-suited for the location of this facility?
Stop 4 (latitude +XX° 11.138’ longitude -XX° 40.663’)

DATE and TIME of arrival at Stop 4

This stop marks the top of a steep trail down into the valley to the east of Cable Hill. Record any observations and questions as field notes below:

Stop 4 Question(s)

Notice and describe the vegetation on the slope below. Note particularly the difference in the appearance of the small trees (< 10cm (4 inches) diameter) and the larger trees (>30 cm (1 foot) in diameter).

What might be the cause of the difference in the appearance of the small and large trees? (Hint: Look up “creep” in your textbook!)
**Stop 5**

(latitude +XX° 11.131’ longitude -XX° 40.597’)

DATE and TIME of arrival at Stop 5

Depending on the time of year, this little depression may be filled with water and breeding frogs (when it is called a ‘vernal pool’), or bone dry and dusty. Record the condition of the depression during your visit today, and any observations and questions as field notes below:

**Stop 5 Question(s)**

What do you suppose is the source of water when this pool is filled?

During the summer, even after a heavy rain, the depression remains dry. Try to explain why that is so.
Stop 6 (latitude +XX° 11.219’ longitude -XX° 40.622’)

DATE and TIME of arrival at Stop 6

This narrow valley follows the trace of a large fracture in the bedrock of this area. In what compass direction does the valley run? Record your answer and any observations and questions as field notes below:

Stop 6 Question(s)

Choose a letter of the alphabet that best describes the cross sectional shape of this valley. Back in the classroom, use your text to research valleys with that shape, and determine and record the agent that produced this valley.

Note the elevation of this stop, and record it here.

Returning to the classroom

Navigate to latitude +XX° 11.264’ longitude -XX° 40.671’. You will be walking at about 700 feet above sea level along the north side of a hill.

From there, continue on at the same elevation to latitude +XX° 11.268’ longitude -XX° 40.738 where you will meet up with Cable Hill road once again.

Turn to the north (downhill) and head back to the building entrance at latitude +XX° 11.517” longitude -XX° 40.688”.

The Geological Society of America
A Word on Map Datums

A map datum is a model of the shape of the Earth's surface used to match surface features with a coordinate system on a map. At various times and in various places, cartographers have used slightly different models of the Earth's shape, and slightly different projections, to draw their maps.

For that reason, identical coordinates in two different map datums might identify slightly different places on Earth's surface – or a single place on Earth's surface may be identified with slightly different coordinates in different map datums.

While there are many map datums used throughout the world, the GPS system uses the World Geodetic System 1984 (WGS 84), which was developed from and is virtually identical to the North American Datum of 1983 (NAD 83). EarthCaches™™ are identified by coordinates in the WGS-84 system, and most GPSrs' default settings report their locations in WGS 84.

Many USGS topographic maps, however, use the North American Datum of 1927 (NAD 27), and location coordinates in NAD 27 can vary by almost 40 meters from the same location coordinates in WGS 84. So using a map in conjunction with your GPSr may require that you adjust the GPSr map datum to match your paper map's datum. It is important, too, to know which datum a set of coordinates refers to.

Fortunately, your GPSr is capable of converting the location of a landmark/waypoint/point of interest in one datum to any other map datum supported by the GPSr. The GPSr user should be able to quickly switch the GPSr's display from one datum to another.

The following section describes how to set your map datum on two popular models of GPSr, one from Garmin and the other from Magellan.

Changing the Map Datum on the Garmin etrex GPSr

1. In the Main menu, Scroll to and Select “Setup”.
2. Scroll down and over and Select “Units”.
3. Scroll to and Select “Map Datum”
4. Scroll to and Select the map datum you wish to use.

EarthCaches™™ are posted in WGS84, but many USGS topographic maps use the NAD27 datum. The map datum used is printed on the lower left hand margin of USGS topo maps. Once a waypoint is set on your GPSr, switching map datums will display landmarks in the new datum.
Changing the Map Datum on the Magellan 210 GPSr

From any Navigation screen, press Menu
Scroll to and Select “Preferences”
Scroll to and Select “Map Units”

Scroll to and Select “Map Datum”

And finally, scroll to and select the map datum you wish to use.

Pressing the “Nav” button will bring you back to the Navigation screen you left.

EarthCaches™ are posted in WGS84, but many USGS topographic maps use the NAD27 datum. The map datum used is printed on the lower left hand margin of USGS topo maps. Once a landmark (“Point of Interest”) is set on your GPSr, switching map datums will display landmarks in the new datum.