

South Carolina Geographic Alliance

CarolinaCaching: Global Positioning Systems

How to Create a GPS Course on Campus – Teachers' Guide

Curriculum Note:

This document corresponds with the slideshow titled "Global Positioning Systems: Setting Up a GPS Course."

Technical Note:

This document is specific for the Garmin Legend GPS unit. The information is applicable for any GPS unit, however the specific steps and menu options may differ.

Pre-lesson:

1. Initialize the GPS units
 - a. Step outside where the unit has a clear view of the sky and turn on the unit by holding down the bottom button on the right side.
 - b. This is an automatic process that need only be done when the unit is first used or if it has been stored unused for several months.
2. Enter setup data to ensure all GPS units operate in the same manner
 - a. Using the thumb stick, toggle to highlight the icon in the upper right corner and press down on the center of the thumb stick (center select).
 - b. Toggle down to "Main Menu" and center select.
 - c. Toggle down to "Setup" and center select.
 - d. Toggle down to "Time" and center select.
 - i. Toggle down to "Time Zone". If it is not for US-Eastern, center select and toggle down until US-Eastern is shown. Center select.
 - ii. Toggle back to the X icon in the upper right corner. Center select.
 - e. Toggle over to "Units" and center select.
 - i. Toggle down, center select, and change where appropriate.
 1. Position format should be hddd° mm.mmm'.
 2. Map Datum should be WGS 84.
 3. Distance/Speed should be metric.
 - ii. Toggle back to the X icon in the upper right corner. Center select.
 - f. Toggle back to the X icon in the upper right corner. Center select.
 - g. Toggle to the pages icon in the upper right corner. Center select.
 - h. Toggle to "Satellites" and center select.

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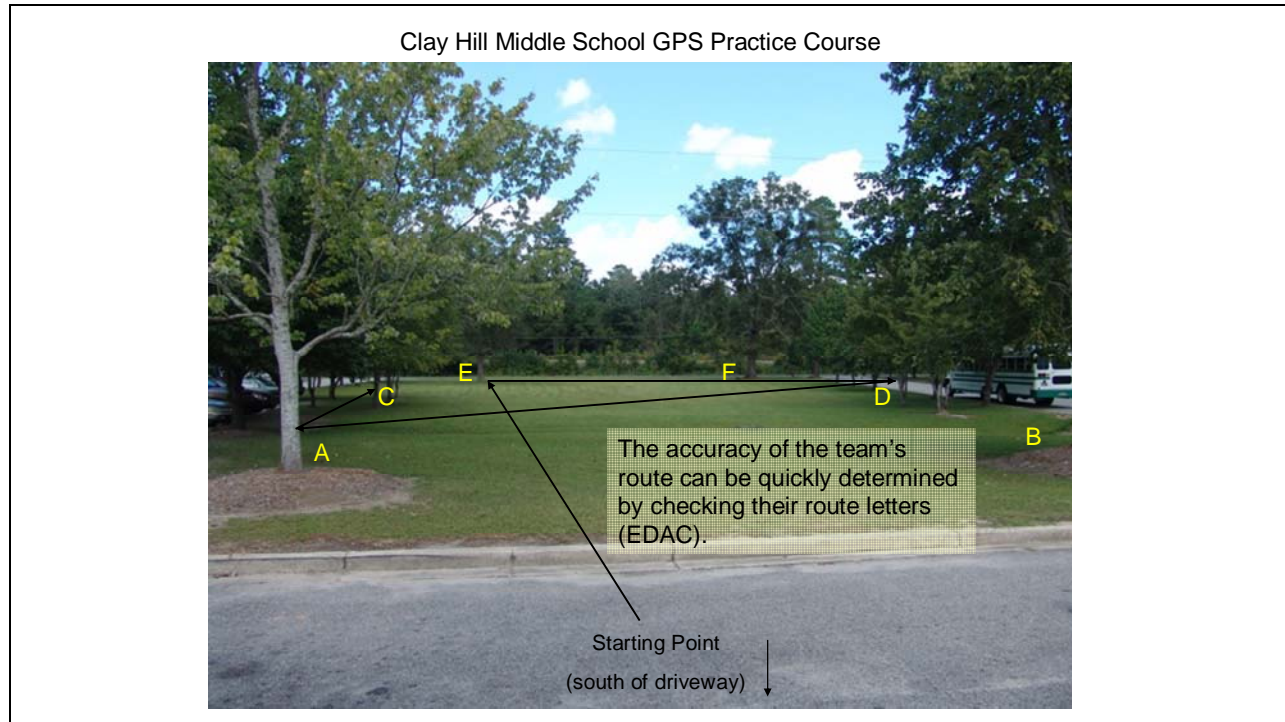
3. Select an area on the school grounds that will offer sufficient space for students to practice navigating with a GPS unit. At a minimum, the area should offer students the opportunity to navigate legs of 40 meters or more.



Clay Hill Middle School, Ridgeville, South Carolina

A large open area with multiple destination points allows for numerous legs to crisscross a relatively confined area (see next page).

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4. Use the GPS unit to capture the coordinates for destination points to which the students will be navigating. In the image above, the destination points would be A through F.
 - a. While standing at the point to be marked, turn on the GPS unit and allow the unit to acquire a sufficient number of satellites. "Ready to Navigate" will appear at the top of the screen when a sufficient number of satellite signals have been acquired.
 - b. Allow the unit to continue acquiring satellites until the "Accuracy" shown at the top of the screen is 7 meters or better.
 - c. Using the thumb stick, hold the center down for two seconds. The waypoint is captured and will be assigned a three-digit waypoint name. This designation may be kept or it can be changed to a descriptive name.
 - i. Change the waypoint name by toggling down until the name field is highlighted. Center select and an alpha-numeric keyboard will be displayed. Toggle across the keyboard and select the desired highlighted letter or number to change the waypoint name.
 - d. Repeat the above steps until coordinates have been collected for all the destination points as well as a starting point.

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5. Using the destination point coordinates collected and stored in the GPS unit, create destination point cards to direct students to their next destination point.
 - a. Access waypoint data by pushing the bottom button on the left side to display the menu. Toggle to “Waypoints” and center select. Toggle to either “Nearest” or “By Name” and center select. Toggle to your choice of waypoint and center select to display the data.
 - b. On a piece of paper, sketch the GPS practice navigation course and annotate the coordinates for each of the destination points. This will help in visualizing how to set up each team’s card and ensure that the coordinates for each point are accurately listed on the destination cards located at each point.
 - c. Using the image below as a reference, note that a card located at Point A would have the coordinates for Points B through F. Students arriving at Point A could be sent to any of the five other points of the course.



- d. For clarity, all coordinates in this document will be listed as “Coordinates for *letter*” while the destination card would actually contain the $Nxx^{\circ} xx.xxx$, $W0xx^{\circ} xx.xxx$ coordinates without revealing the destination point’s letter.
- e. An example of a possible destination card located at Point A would be:

1.	<i>Coordinates for F</i>
2.	<i>Coordinates for B</i>
3.	<i>Coordinates for C</i>
4.	<i>Coordinates for E</i>
5.	<i>Coordinates for D</i>

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f. An example of a possible team card would be:

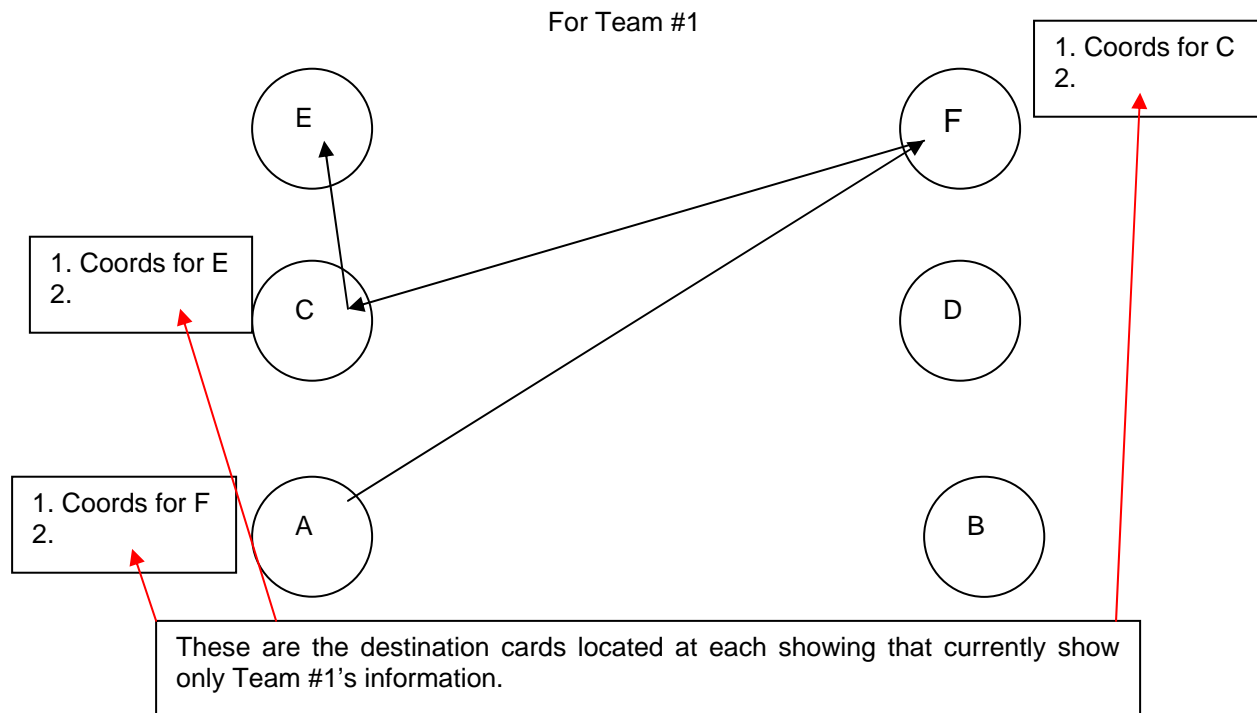
Team	Student Name	Coordinates	Destination Letter
#1	John Smith	<i>Coordinates for A (given to John)</i>	
#1	Mary Jones		
#1	Michael White		
#1	Cheryl Wilson		

g. John Smith enters the given coordinates into the GPS unit (see GPS Program PowerPoint and narrative or Step 4 on the practice sheet) and navigates to the location, which in this case is Point A. Mary Jones reads the card located at Point A. As she is part of Team #1, Mary selects the coordinates listed next to "1" (in the example in paragraph "e" above, it is Point F), fills out her card and enters the new coordinates into the GPS unit.

h. The team's card would now be as shown below:

Team	Student Name	Coordinates	Destination Letter
#1	John Smith	<i>Coordinates for A (given to John)</i>	A
#1	Mary Jones	<i>Coordinates for F</i>	
#1	Michael White		
#1	Cheryl Wilson		

i. An example of a possible routing/answer card for Team #1 would be:



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- j. For this example, Team #1's final card should be as shown below:

Team	Student Name	Coordinates	Destination Letter
#1	John Smith	<i>Coordinates for A (given to John)</i>	A
#1	Mary Jones	<i>Coordinates for F</i>	F
#1	Michael White	<i>Coordinates for C</i>	C
#1	Cheryl Wilson	<i>Coordinates for E</i>	E
		Answer:	AFCE

- k. This process would be repeated for each team. Additional team members can be accommodated by adding another leg to the card. More than six destination points may also be created.
6. Present the Global Positioning Systems PowerPoint to the students.
 7. Use or modify the GPS unit practice sheet at the end of this document.
 8. Provide each team with a starting coordinate, a team card, and let them begin to navigate!
 9. Once students have become proficient at using the GPS unit to navigate through the practice course, a larger, less-confined course may be created around the campus.
 - a. The steps for setting up a larger course are the same as listed above.
 - b. Instead of providing the coordinates outright at each destination point, themes or other areas of the curriculum can be used with the students solving problems or answering questions to determine the next coordinates.
 - c. For example, using the next image as a point to which students have navigated, students would solve for the next destination coordinates;
 - i. N32° 05.ABC, W080° 18.DEF
 - ii. A = the number of sides on the structure's roof (answer is 6)
 - iii. B = cube root for the number of slats on one side of the structure (answer is 2, since there are 8 slats per side)
 - iv. C = the number of urban areas discussed in Ms. Smith's class (answer is 2, since the novel was *A Tale of Two Cities*)
 - v. Additional clues would be provided to solve for D through F.

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- d. This type of course can be applied to any size campus and is limited only by the imagination of the individuals, including students, designing the course.

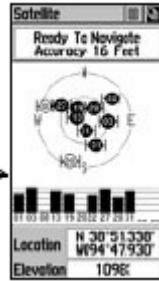
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GPSr Practice Sheet

1. Turn on the GPSr

- Press bottom button on the right side until the Welcome Page appears.
- Press the top button on the right side three times to reach the Satellite Page.
- After sufficient satellite signals have been acquired, the coordinates of your location will be displayed in the **Location** field.



2. Using the Satellite Page:

- What are the latitude and longitude coordinates of your current position? _____
- What is the current accuracy shown on your GPSr? _____
- From how many satellites are you receiving a signal? _____

3. Create a waypoint to allow yourself to navigate back to the school building.

- Press the center of the thumb stick and hold it down for two seconds.
- Your current position will be shown with a default 3-digit name.
- What are the latitude and longitude coordinates of your current position? _____
- What is the 3-digit name assigned to this waypoint? _____
- "OK" should be highlighted. Press the center of the thumb stick to save the waypoint.

4. Create another waypoint as before.

- What is the 3-digit name assigned to the second waypoint? _____
- "OK" should be highlighted. Press the center of the thumb stick to save the waypoint.
- Press the bottom button on the left side to display the waypoints menu.
- Using the thumb stick, select either "Nearest" or "By Name".
- Using the thumb stick, scroll down to the name field (the 3-digit default name). Press the center of the thumb stick to select a waypoint you just created.
- Using the thumb stick, scroll down until the name field is highlighted. Press the center of the thumb stick to display the keyboard.
- Using the thumb stick, move across the keyboard and select the desired highlighted letter or number to rename your waypoint. Select "OK".
- Using the thumb stick, highlight the "Location" field. Press the center of the thumb stick to display the number pad.
- Using the thumb stick, highlight the directional arrows to move across the number pad to highlight the numbers and change the coordinates as you wish. Select "OK".

5. "Go to" the waypoint you have just named.

- Using the thumb stick, move down to the "Goto" button.
- Press the center of the thumb stick to display the compass page.
- What is the bearing and the distance to the waypoint from your position? _____
- Where on the planet do you think your waypoint location might be? _____

6. You are now ready to begin the practice navigation course!

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Narrative for Slideshow: “Global Positioning Systems: Setting Up a GPS Course”

1. This PowerPoint offers instruction on how to set up a basic GPS navigation course at any location, especially a school, so that students and adults can become proficient in the basic operation of a GPS unit.
2. The example shown in the presentation is a sample course set up in the open area in front of Clay Hill Middle School.
3. Students should be divided into teams of no more than 4 per GPS unit. Using the GPS unit, each student will independently complete the practice sheet (see above).
4. Each team will be given coordinates to several destinations. In the example, the coordinates for six (A-F) points have been captured along with the coordinates for a starting point (see above). The first student to navigate will load the first set of coordinates into the GPS unit (see Step 4 of the practice sheet).
5. After loading the coordinates, the first student will navigate to that destination (see #5 of the pre-lesson information).
6. At the destination, the team will record the letter for that point and find new coordinates listed by their team's number (see #5 of the pre-lesson information).
7. A second team member will load the new coordinates to the GPS unit and navigate to the destination (see #5 of the pre-lesson information).
8. At the destination, the team will record the letter for that point and find new coordinates listed by their team's number (see #5 of the pre-lesson information).
9. A third team member will load the new coordinates to the GPS unit and navigate to the destination (see #5 of the pre-lesson information).
10. At the destination, the team will record the letter for that point and find new coordinates listed by their team's number (see #5 of the pre-lesson information).
11. The final team member will load the new coordinates to the GPS unit and navigate to the destination (see #5 of the pre-lesson information).
12. The accuracy of the team's route can be quickly determined by checking their route letters (EDAC).
13. If the team's route is inaccurate, the separate legs of the route can be checked. Here the third student navigated erroneously from point D to point C. Work can be done with that student to determine if the error was simply a data entry error or if the student has yet to understand the skill.
14. However, for this team, the correct destination from point C is point B. Therefore, the fourth student navigated correctly even though the student began from the incorrect point due to the third student's error.
15. If necessary, more than one set of coordinate cards can be created to ensure students do not become familiar with the routes.
16. Additional examples of GPS courses can be found at: GPS, Map and Compass - <http://rockyweb.cr.usgs.gov/outreach/gps.html>; “Cruise the Campus” (GCGA6T) at www.geocaching.com (type “GCGA6T” in the “View a Cache Listing” box)
17. Conclusion slide: GPS technology continues to be incorporated into various aspects of our society. Understanding the concepts behind the technology as well as its use not only helps students address curriculum standards, it is an ever-increasing employment skill. A simple campus-based navigation course is an easy, effective method for teaching students GPS skills and technology!

Author Credit: Mark Musselman, Audubon Center at Francis Beidler Forest, Harleyville, South Carolina