Lesson Plan - **GPS- Global Positioning Systems**

<table>
<thead>
<tr>
<th><strong>Learning elements</strong></th>
<th>Communication, Relationships, New Tech, the Environment, Science, Social Science</th>
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<tr>
<td><strong>Contributes to these Educational Standards</strong></td>
<td>Communication, Digital Citizenship, Reading, Relationships, Science, Social Science</td>
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<tr>
<td><strong>Supports these CRLs</strong></td>
<td>Communication, Employment Foundations, Personal Management</td>
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<td><strong>Learning Environment requirements:</strong></td>
<td>Central focus space to set the stage. Projection device for PowerPoint presentation.</td>
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<tr>
<td><strong>Introduction</strong></td>
<td>The GPS is a global positioning device that was originally used in the military, and has expanded to many uses. GPS is used in the transportation industry. Trucks carry many different products to many different places. Almost everything we buy has been delivered by truck to a store or to our homes. Truck drivers travel 100K miles or more per year. They encounter many varying conditions—Weather, Heavy traffic, Road conditions, Detours. The shipper and the receiver are also very interested where the truck driver is on their route. GPS allows all three to know where the truck is, and how it is progressing on its journey. GPS also has applications in other industries—marine, aviation, environmental, space, banking, etc. and plays a key role in tracking, synchronization, and surveying.</td>
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<table>
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<th>Objective</th>
<th>Time (minutes)</th>
<th>Teaching Points</th>
<th>Supplies</th>
<th>Vocabulary Words</th>
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| #1 Recognize what a Global Positioning System (GPS) is, and how it originated. | 5 min | • The global positioning system is a satellite-based navigation system that sends and receives radio signals  
• Made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense  
• Originally used by the military | Grade 9 GPS PowerPoint | GPS  
Synchronize  
Ionospheric irregularities  
Scintillation  
Triangulation |
| #2 Describe how GPS technology works. | 5 min | • Receiver collects information from the GPS satellites  
• Receiver accounts for errors  
• Determines the current location, velocity, and time  
• Can calculate trip distance to destination, sunrise and sunset time |  |  |
| #3 Discover how GPS helps the transportation industry. | 5 min | • Helps monitor and plan routes for delivery vans and emergency vehicles  
• Helps with automatic vehicle location and in-vehicle navigation system  
• Shows the vehicle’s location on an electronic street map  
• Creates a route and gives turn-by-turn directions |  |  |
| #4 Review GPS usage for military, railroad, marine, and aviation applications. | 5 min | • Military aircraft, Target destination, Weapon technology, Ships, Submarines, Tanks, Jeeps  
• Precise knowledge of location  
• Train control (to prevent collisions), maintain smooth traffic flow  
• Track fish migration, underwater surveying, mapping  
• Accurate aircraft location anywhere on or near the earth  
• Route navigation and airport approaches |  |  |
| #5 Recognize how GPS can help with environmental disasters. | 3 min | • Helps survey disaster areas and map the movement of environmental phenomena  
  o Forest fires  
  o Oil spills  
  o Hurricanes  
  o Earthquakes |  |  |
| #6 Discover GPS contribution to space travel and satellite activity. | 3 min | • Helps track and control satellites in orbit  
• Space shuttles use GPS  
• Future rockets and reusable launch vehicles will launch, orbit the earth, return, and land, all under automatic control. |  |  |
| #7 Reflect on GPS relationship with time, and how that contributes to global synchronization. | 4 min | • Delivers precise time to any user  
• Helps synchronize clocks and events around the world  
• Pager companies depend on GPS satellites to synchronize the transmission or information throughout their systems.  
• Investments banking firms rely on GPS to record international transactions simultaneously |
|---|---|---|
| #8 Explore GPS accuracy | 7 min | • Depends on accuracy of signals that travels from GPS satellites to a GPS receiver  
• Turn on GPS on an open area  
• It takes between 65 and 85 milliseconds for a signal to travel to GPS receiver on the surface of the earth  
• Natural sources of interference:  
  o Direct interference (solar radio burst in the same frequency band  
  o By scattering of the GPS radio signal in ionospheric irregularities referred to as scintillation  
• Artificial sources of interference:  
  o In automotive GPS receivers; metallic features in windshields, such a defrosters, or car window tinting films  
  o Man-made EMI (electromagnetic interference), can also disrupt, or jam, GPS signals  
  o Stronger signal can interfere with GPS receivers when they are within radio range  
  o Obscured locations due to the potential for both natural and man-made noise |
| #9 Explore virtual GPS | 8 min | • Cell phones have a “My Location” feature that acts very similarly to GPS  
• Information is triangulated from nearby cell phone towers, similar to action of making a call  
• Information is approximate, and gets better the more you use it  
• Produces a map which is visible on the phone screen  
YouTube—My Location phone feature: [http://www.youtube.com/watch?v=y-SqN86EzQ](http://www.youtube.com/watch?v=y-SqN86EzQ)  
older, but good information: [http://www.youtube.com/watch?v=mlG-Dw7ld3Q6eurl=htp%3A%2F%2Fwww%2Eslashgear%2Ecom%2Fgoogle%2Dmobile%2Dmaps%2Dupdate%2Dadds%2Dvirtual%2DGps%2D298760%2F&feature=player_embedded](http://www.youtube.com/watch?v=mlG-Dw7ld3Q6eurl=htp%3A%2F%2Fwww%2Eslashgear%2Ecom%2Fgoogle%2Dmobile%2Dmaps%2Dupdate%2Dadds%2Dvirtual%2DGps%2D298760%2F&feature=player_embedded)  
Optional handout: GPS related Web Sites |

Total: 45 min
GPS Web Sites

Learn more:

http://scign.jpl.nasa.gov/learn/gps1.htm  NASA explains more about GPS systems

http://www.trimble.com/gps/index.shtml  Good advice on triangulating, mapping, tracking techniques

http://www.aero.org/education/primers/gps/whatisgps.html  Good information from the Aerospace Corporation

Have fun!

http://www.geocaching.com  Geocaching is a treasure hunting game played throughout the world by adventure seekers equipped with GPS devices. The basic idea is to locate hidden containers, called geocaches, outdoors and then share your experiences online. Geocaching is enjoyed by people from all age groups, with a strong sense of community and support for the environment.

http://www.gpsgames.org  Geodashing is a game in which players use GPS receivers on a playing field that covers the entire planet. The waypoints, or dashpoints, to be reached are randomly selected. The win goes to who can get to the most dashpoints; that is, if you can get to them at all! Each game has a new set of dashpoints making each game completely different and unpredictable.

Shutterspot is a game in which some players take photographs and other players are challenged to find the exact spot where the photographer stood when the camera shutter clicked.

Geodashing Golf is a game in which players use GPS receivers to navigate to 18 randomly placed waypoints (or 9 in a short course). Your score depends on how close you can get to each of the waypoints. The closer you get, the lower your score. Low score wins, just like real golf.

GeoVexilla is a GPS game that uses the globe for a playing field. At random times, in random places, random virtual flags appear on a map of the world. The challenge is to visit a flag's waypoint before the flag disappears.

http://gpsmission.com  GPS Mission, the first GPS online game for the iPhone, allows players to choose missions to explore throughout the world, using a phone as their GPS source. The site also hosts other GPS games such as scavenger hunts, travels through local history, guided tours as well as crime and mystery stories.

What sites do you recommend? _______________________________________________________
__________________________________________________________________________________