GPS Object Lesson

Equipment needed

- Inflatable globe
- 3 balls
  - 1 should be 1/4th the size of the inflatable globe
  - 2 should be smaller than the above ball, and different sizes
- String
- Toy space shuttle
- BB or similar size object
  - Keep in an empty film canister to avoid loosing in your kit
  - Carry more than one in your kit – these are easy to lose!
- Carrying case for everything – a large shaving kit type bag works well
- Air Pump (Optional, but nice to have when sharing the kit with others)
- Utah 4-H GPS Training PowerPoint

Helpful websites for getting equipment

- http://utah4h.org – Utah 4-H GPS Training PowerPoint
- http://spacetoys.com – Inflatable globe and toy space shuttle

Preparation

- Measure and cut a string that is the circumference of the inflatable globe.
- Measure one string that is 10 times the circumference of the inflatable globe and tie a knot at that length. Leave this on the spool of string for ease of use.

Description

This lesson is written to be used with the Utah 4-H GPS Training PowerPoint, and will be organized by slide title.

Earth

Hold up the inflated globe and ask participants to guess the circumference of the earth. It is always good to explain what circumference is, so using the globe show that circumference is the distance around the globe at the equator.

After several guesses explain that the circumference of the earth is 24,000 miles, and mention that the rotation of the earth is what causes day and night. Ask for a volunteer to be the earth and have them come to the front and hold the inflated globe.

Moon

Hold up the three balls, and ask the participants which one would represent the Moon if the Earth was the size of the inflated globe.

After voting or guessing, tell them that it's the biggest of the three and that the Moon is 1/4th the size of the Earth. Ask for a volunteer to be the Moon, have them come to the front and hold the Moon.

Ask the class where the moon would be in relation to the Earth. Would the Moon be closer to or farther away from the Earth? After letting the class guess the location of the Moon, give the Earth the end of the string on the spool, and the spool to the Moon, and have the Moon walk until they come to the knot in the string. Explain that the moon is 240,000 miles away from the earth, which is 10 times the circumference of the earth.

Notes:

- You may have to walk with the moon and have them stop when appropriate, some kids will just keep going and ignore the knot.
- Depending on your teaching area, you may not always be able to have the moon walk the appropriate distance. When this happens, explain to the kids where the moon should be but that there are obstacles in the way. (walls, trees, rivers, etc).

GPS Satellites

Ask for another volunteer and give them the BB and explain that this represents a GPS Satellite. To be accurate in this presentation, the GPS Satellite should be represented by a pin head, but using a BB works better with kids as they can't poke themselves.

Then ask the class where on the string the BB should be. It usually helps to position the volunteer somewhere on the string and ask if they should be closer or farther away from the earth.

After letting the class decide where the satellite should be, pull out the cut string and explain that it represents 24,000 miles, the circumference of the earth. Fold the string in half and use that to measure 12,000 miles out from the earth and position the satellite there. Explain that the GPS satellites are 12,000 miles away from the earth.

This is also a good time to explain that GPS satellites have a wingspan of 18 feet. This is easy to represent by asking 3 volunteers who are 6 feet tall to stand fingertip to fingertip with arms extended to their sides. If you don't have volunteers that tall, simply use more people until you have what looks to be about 18 feet.

NASA Space Shuttle

Ask for one more volunteer who will represent the NASA Space Shuttle and give them the toy space shuttle. Ask the class to position the volunteer where the shuttle would be if it were orbiting the earth. Explain that this means that the shuttle is simply flying around the earth – it is not going to the moon or anywhere else.

After letting the class guess, show them that the Space Shuttle is 100 miles above the earth when it is in orbit. This can be represented by putting your pinky or a pen on the earth and setting the space shuttle on top of it.