GLOBAL POSITIONING SYSTEMS

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How can we enhance and expand the use of Global Positioning System (GPS) devices in our own school and/or community?

ELEMENTARY SIXTH GRADE

TIMEFRAME 2 - 3 (OPTIONAL) 60 MINUTE PERIODS

6.SP.5: Summarize numerical data sets in relation to their context, such as by:
   a. Reporting the number of observations.
   b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
SC.6.1.2: Use appropriate tools, equipment, and techniques safely to collect, display, and analyze data.

SC.6.2.1: Explain how technology has an impact on society and science.
SC.6.2.2: Explain how the needs of society have influenced the development and use of technologies.
6.W.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

GENERAL LEARNING OUTCOMES

• Self-directed Learner (The ability to be responsible for one’s own learning)
• Community Contributor (The understanding that it is essential for human beings to work together)
• Complex Thinker (The ability to demonstrate critical thinking and problem solving)
• Quality Producer (The ability to recognize and produce quality performance and quality products)
• Effective Communicator (The ability to communicate effectively)

• Effective and Ethical User of Technology (The ability to use a variety of technologies effectively and ethically)

NĀ HONUA MAULI OLA PATHWAYS:

• ‘Ike Pilina: Relationship Pathway (We envision generations that have respectful, responsible and strong relationships in service to akua, ‘āina and each other)
• ‘Ike Na’auao: Intellectual Pathway (We envision generations fostering the cycle of joyous learning through curiosity, inquiry, experience and mentorship)
ENDURING UNDERSTANDINGS:
• Enhance and expand students’ understandings of global geography
• Develop technological skills through the use of handheld Global Positioning System (GPS receivers).

CRITICAL SKILLS AND CONCEPTS:
• Understand Global Positioning System (GPS) receivers
• Understand latitude and longitude
• Use geocaching, a geography-based approach, to problem solving
• Use field sampling tools and techniques

AUTHENTIC PERFORMANCE TASK:
Students will use geocaching techniques to learn about global geography within their own school community. They will then write a detailed 1-2 page essay describing their experiences using the handheld GPS receivers. Their descriptions should include geographical terminology, plotting techniques, and pictures.

AUTHENTIC AUDIENCE:
• Classmates
• Teachers
• School administration

OTHER EVIDENCE:
• Science Journals
• Handheld Global Positioning System receivers (i.e. Garmin eTrex Venture)
LEARNING PLAN

- **PREPARATION:** In preparation for this lesson, the teacher must become familiarized with the handheld GPS device. *Note: This YouTube video helped me to learn about the GPS device (Garmin eTrex Venture) that my students were to use in this lesson: https://www.youtube.com/watch?v=6cy7DP0IA-M
- Prior preparation for this lesson may also consist of determining students’ prior knowledge on latitude and longitude, as well as students’ word processing skills.

DAY 1: INTRODUCTION TO GLOBAL GEOGRAPHY AND THE GLOBAL POSITIONING SYSTEMS

Propose questions to students about Global Geography and Global Positioning Systems. You can have students brainstorm their ideas in a Circle Map. (*Note: If you have not used a Circle Map before, it is a Thinking Map used to define information. See attached example.)*

The following are some sample questions:
- “What is Global Geography?” (Global Geography is the study of the world around us.)
- “What is a Global Positioning System?” (A Global Positioning System or GPS is a satellite-based navigation system.)
- “How does GPS work?” (There are GPS satellites that circle Earth and transmit information to Earth. GPS receivers take the information that is transmitted and use triangulation to calculate the user’s exact location.)
- “Why is GPS important?” (GPS can help with navigation.)
- “How can we benefit from using GPS?” (Fuel economy, travel directions, recreation, maritime GPS, GPS tracking)
- “What is geocaching?” (Geocaching is a real-world, recreational activity of “treasure hunting” through the use of GPS coordinates.)

- Introduce students to geocaching via website: www.geocaching.com
- Introduce students to the Global Positioning System (GPS) receiver. Review with them the main buttons and functions of the device. *Note: This introductory manual helped me to learn more about the functions of the GPS device (Garmin eTrex Venture): http://gep.frec.vt.edu/pdfFiles/eTrex_Venture_HC_manual-20091006.pdf
DAY 2: GEOCACHE TREASURE HUNT

Prior preparation for Day 2 is hiding treasures/clues around your school community. Mark waypoints or write down the coordinates in the spot where you are hiding the treasures/clues.

- Assign students into heterogeneous pairs or groups with one GPS receiver. Involve all students by designating roles, for example: Leader, GPS Handler, Recorder, and Photographer (if using cameras, iPads work great too). Instruct students to change roles throughout activity so that every student has the chance to be a Leader, GPS Handler, Recorder, and Photographer.

- **Option 1**: If you marked where the treasures/clues are using waypoints on the GPS receiver, students can navigate to where the treasures/clues are hidden by using the “Find” function and clicking on “Waypoints” to navigate towards those treasures/clues. Once students find the hidden spots, they can record their necessary data.

- **Option 2**: If you wrote down the coordinates of where the treasures/clues are hidden, then students can manually create a waypoint and input the coordinates of where the treasures/clues are hidden. Once they have inputted and saved their waypoints, students can use the “Find” function to navigate to their waypoint.

*Note: See introductory manual for details on both options.

Once students are finished with the activity, ask them to write a type-written 1-2 page reflective essay about their experiences using the handheld GPS receiver. Their descriptions should include the necessary vocabulary used throughout this lesson, as well as plotting techniques (marking waypoints), how they found their hidden treasures/clues, and any pictures they may have taken along the way.
Note: The “Frame of Reference” is the frame around the circle map. This should be drawn in black. The “ways you know” are the sources as to where the students got their ideas. Any sources written down in the frame of reference should be written in green. The circle map itself can be drawn in black as well. Students can use other colors to write down their ideas and central theme.

Resources:
http://www.scimathmn.org/stemtc/sites/default/files/images/frameworks/science/9P.1.3.3/image001.png