

Science Lesson 1: Globes, Maps and Cartesian Coordinates

Hawaii DOE Content Standards:

Science Standard 2: Nature of Science: Understand that science, technology and society are interrelated. *Map making has improved over the years as the observational tools to design the map have become more accurate and precise. Discuss the role of technology in map making and the need of society for accurate maps.*

Key concept:

“Sense of place” can be understood through mapping, cultural stories, place names, and geographic location.

Performance indicators: After completing this lesson, students will . . .

- locate the Hawaiian Islands on a globe
- explain the change in scale and distortion associated with different maps
- explain the coordinates of a Cartesian mapping system

Note to the Student:

“When you have completed this lesson you will be able to find your place on the earth using a globe or flat map, noting your location with Cartesian longitude and latitude points.”

Activity at a glance:

Introduce students to globes and charts through hands on exploration.

Time:

One hour

Prerequisite skills:

None

Skills to be introduced:

Reading the Cartesian coordinates, using charts and a globe.

Assessment:

Create a journal entry of the class activities describing the use and creation of maps. Include the copies of the small group maps in each student’s portfolio.

Vocabulary:

globe, map, navigational charts, Cartesian plane, longitude, latitude, coordinates, distortion, scale, key

Materials:

Globe, charts and maps, rulers, measuring tape, grid paper and clip board



Activity Overview

1. Introduce students to the globe as the most accurate representation or map of the Earth's geography. Pay special attention to the Cartesian grid system circling the globe and note the position and degrees of the equator and the Greenwich mean longitude line. Describe the process of creating a latitude and longitude co-ordinate point of location using this grid system.
2. Zoom in with a local area map of the Hawaiian Islands. Begin to discuss scale of maps and reference back to the Cartesian grid, noting the replication of the grid on the flat map. Also talk about the distortion created when the map changes from a globe to a flat map. Zoom in further with a navigational chart of the bay and project site. What is the scale of the map? What other information does the map show? Make a note of the longitude and latitude of the class's present location and of other significant places for the students using any of the maps available (e.g., places they used to live, landmarks).
3. Once you have located your position on the chart with the greatest detail have the students split into groups to create a map of the immediate area, create a scale for the map using the measuring tape and rulers and place land marks on the map in correct orientation. Talk again about scale and distortion as well as the other accuracy issues of the map. Talk about the map making process, surveying and changes that make older maps inaccurate.

Cultural Values

Pono

Maps create a record of the past as well as defining ownerships and responsibilities of the land. Navigational charts are used to keep boats safe and note depths and other navigational features.

Malama

Maps help us to care for the environment and people by creating a record of change over time. Use an atlas to find different kinds of maps that detail information as it relates to geography.

Laulima

Work together as a team to make a map of your site.

Kokua

Take initiative, clean up any trash while making your map.

Lokahi

Work as a team, designate a leader to decide how best to get the work of map making done.





Adaptations/ Extensions

Discuss distortion and map making, the Fuller projection map and one ocean map. Use the compass and GPS from lessons two and three to make more detailed maps and orient student maps to the cardinal directions. Detail way points and orienteering points on map during orienteering exercise.

Background, teaching suggestions, resources:

- See Science lecture #1: "The Cartesian Coordinates" in Appendix B.
- Cartesian coordinate system, Hawaii Atlas, Navigational Charts of Kaneohe Bay, Topographical map the State of Hawaii, Buckminster Fullers projection map and one ocean map

Connections to other curricula or lessons:

Use charts to map and identify reef survey sight. Use line drawing and grid paper to map detail of reef survey site.

Safety

Be aware of the environment you are working in and potential safety hazards of the terrain.