Lesson 4: Maps As Scientific Tools– Teacher's Key

Lesson Objectives: At the end of the lesson, students will be able to

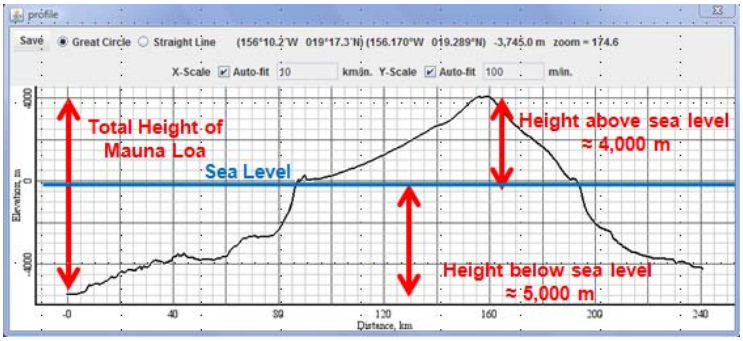
Exploration 1: Compare Mount Everest and Mauna Loa with maps.

Question 1. Fill in the table below.

	Mount Everest	Mauna Loa (above sea level)	Mauna Loa (from base on sea floor)
Height in meters	8,848 m	4,169 m	Approx. 9,000 m
Height in feet	29,000 feet	13, 679 feet	Approx. 29,528
Relative Geographic Location*	In the Himalayan range, on the border between Nepal and China.	On the southern portion of the Big Island of Hawaii, in the Pacific Ocean.	On the southern portion of the Big Island of Hawaii, in the Pacific Ocean.
Absolute Geographic Location**	28°N, 87°W	19.38°N, 155.62°W	19.38°N, 155.62°W

***Relative Geographic Location: describe the location of the feature relative to other features, continents, countries, oceans,** etc.

****Absolute Geographic Location: describe the location of the feature using latitude and longitude coordinates.**



Exploration 2: Research ice changes around Antarctica using maps.

Question 2: When do you think there will be more sea ice, in January or June? Students from the Northern Hemisphere will probably make a prediction based on their experience of seasons, thus stating that there will be more ice in January. This is the time of the year students from North America will have experienced winter.

Question 3. What % change in Antarctic Sea Ice Extent do you observe in the composite images between January and June? Give a 2 sentence justification of your estimate.

The sea ice is 20-30% larger in June, compared to the extent in January.

Answers will vary. The importance in this question is the observations, and the support for them. Encourage students to give a brief description of how they made their estimates, and justification for them.

Question 4. Fill in the table below on Sea Ice Extent Measurements.

Sea Ice Extent in million sq km	**1982**	**1986**	**1990**	**1994**	**1998**	**2002**
Jan	**3**	**3**	**3**	**3**	**3**	**3**
June	**19**	**18**	**18.5**	**19**	**19**	**18.5**

Question 5. Why is it important to collect data in the same month every year to assess changes in sea ice extent? Seasonal variation occurs in the amount of sea ice. It is important to compare the data from the same time of the year so you are measuring changes by year, and not monthly that occur due to environmental changes in the Earth. In this way, you are not comparing the proverbial apples versus oranges, and by considering the natural temporal variation, you can discuss the changes that may be occurring on a long term basis.

Exploration 3: Follow the Blue Whale along the Pacific Coast.

Question 6: Complete the following table.

Whale Species	Longitude	Latitude	Depth	Average Depth
Blue Whale	*Answers will vary. The Blue whale should be in the deepest water, as this whale tends to travel further away from in shore shallower waters.*			2,294.96m
Atlantic Right Whale				1,117.81m
Bowhead Whale				231.04m

Question 7. How does this relate to the behaviors and characteristics of the different whale species? The whales' movements and travel correlates with seasonal migrations related to reproduction and feeding. The whales were tagged close to shore, as ship time is expensive and it is more practical to tag animals that are closer to shore, and ships' ports. The whales stay relatively close to shore, and do not travel deep into the center of ocean basins or over very deep waters. This relates to the whales behavior as they are primarily searching for prey and feeding immediately after the tagging events.