Principle 1: Grades 6-8

Principle 1: Earth has one big ocean with many features.

The ocean, which covers 70% of Earth's surface, is the defining feature of the planet.

Geologic Features

A. The size and shape of the ocean has changed over geologic time and continues to move and change.

A.1. Motion along the margins of lithospheric plates creates physical features on the ocean floor and land.

A.2. Many of the physical features on the ocean floor are the result of the constant motion of the lithospheric plates that make up Earth's crust.

A.3. New lithospheric crust is generated at spreading centers while older, denser crust is recycled into the Earth's interior at subduction zones, creating various physical features.

A.4. Plate movement is primarily caused by the convection of hot fluids below Earth's crust.

A.5. Features on the ocean floor are highly varied, and include trenches, rift valleys, mid-ocean ridges, seamounts, islands and continental shelves.

See Principle 2: A19

A.7. During various times in Earth's geologic history, all of the continents have been joined into one "super continent." A giant ocean circulated around the supercontinent.

A.8. The supercontinent broke apart along rift valleys to create new, smaller continents and ocean basins now known as the Pacific Ocean, Atlantic Ocean, etc.

A.9. The continents are still in motion today.

See Principle 7: A2

Properties of Ocean Water

B. 97% of all water on Earth is ocean water, which has unique chemical and physical properties.

B.1. Salts enter the ocean via erosion from land, volcanic emissions, reactions at the seafloor and atmospheric deposition.

B.2. The freezing point of ocean water decreases as salinity increases; the pH of ocean water is more basic than freshwater.

B.3. Density differences between masses of water can cause currents.

B.4. The density of ocean water increases as salinity (amount of dissolved salts) increases and as temperature decreases.

B.5. The salinity of ocean water can change due to adding or removing water (e.g., evaporation, melting glaciers, or inflow from rivers, streams and rainfall).

B.6. The temperature of ocean water can change due to warming and cooling (e.g., heat from the sun or contact with ice).

Ocean Circulation

C. The ocean is one interconnected body of water that is integral to the water cycle; and is in constant motion in a global circulation system.

C.1. A global ocean circulation system is generated from tides and different types of currents moving the water.

C.2. Deep ocean currents are driven by density differences between masses of ocean water.

C.3. The wind, combined with Earth's rotation (Coriolis effect), drives surface currents in circular gyres in each ocean basin; clockwise in the Northern Hemisphere and counter-clockwise in the Southern Hemisphere.

C.4. Tides are mainly caused by the gravitational interaction between Earth, the moon and the sun.

C.5. Ocean circulation is influenced by the position of basins, continents and other geologic features.

C.6. Currents transport heat, nutrients and organisms throughout the ocean.

C.7. Upwelling, which occurs mostly on west coasts, brings nutrients from deep water to the sunlit surface zone where photosynthetic primary producers grow.

C.8. Currents are especially important in moving young organisms (larvae and juveniles) to populate new areas.

C.9. All major watersheds, from the Amazon River to melting glaciers, mix fresh and salt water when they meet the ocean, which contributes to the density differences that set ocean currents in motion.

C.10. As water travels through the watersheds, it collects nutrients, salts, sediments and pollutants and carries them into the ocean.

C.11. Sea level rises as glaciers melt.

See Principle 3: A1

See Principle 5: A8

See Principle 5: B11

See Principle 6: D17

See Principle 2: A15