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Insolation and Ecosystem

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Insolation and Ecosystem Model:

Purpose:

The purpose of this model is to demonstrate the impact of angle of insolation and precipitation on the health of a specific climate zone's ecosystem. Our model has four different climate zones based on the angle of insolation. Angle of insolation is directly connected to latitude. Angle of insolation and latitude are complimentary angles (they add up to 90°). The angle of insolation is adjustable in the model by using a slider. Different ecosystems at different latitudes were shown by varying they type and quantity of plants and animals found at each location.

Precipitation was added as an additional variable to show students that when an ecosystem is out of balance, it has lasting impacts on all living thinks in that ecosystem. Students can adjust the amount of precipitation based on 3 settings (0 = below normal rainfall, 50 = average rainfall, 100 = above average rainfall).

Students will complete a worksheet to go along with the model. The worksheet will require students to run the model under various settings and complete questions, answer questions about the data collected, calculate the latitude based on angle of insolation and use outside sources to determine what locations and climate zones are found at these different latitudes.

Educational Standards:

Biology:

Standard 4

5.1a: The energy for life comes primarily from the Sun. Photosynthesis provides a vital connection between the Sun and the energy needs of living systems.

6.1a: Energy flows through ecosystems in one direction, typically from the Sun, through photosynthetic organisms including green plants and algae, to herbivores to carnivores and decomposers.

6.1d: In any particular environment, the growth and survival of organisms depend on the physical conditions including light intensity, temperature range, mineral availability, soil/rock type, and relative acidity (pH)

Earth Science:

Standard 4

1.1f: Earth's changing position with regard to the Sun and the moon has noticeable effects.

• During Earth's one-year period of revolution, the tilt of its axis results in changes in the angle of incidence of the Sun's rays at a given latitude; these changes cause variation in the heating of the surface. This produces seasonal variation in weather.

2.1a: Earth systems have internal and external sources of energy, both of which create heat.

2.2a: Insolation (solar radiation) heats Earth's surface and atmosphere unequally due to variations in:

- Duration, which varies with seasons and latitude

2.2c: A location's climate is influenced by latitude, proximity to large bodies of water, ocean currents, prevailing winds, vegetative cover, elevation, and mountain ranges.

Standard 6

Key Idea 2: Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design.

Key Idea 6: Identifying patterns of change is necessary for making predictions about future behavior and conditions.

Math:

7.G.B.5 : Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.