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Particle Transport

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Particle Transport Simulation

Introduction: The particle transport simulation is designed to help students gain a deeper level of understanding of the relationship between velocity and particle size. Students will be able to manipulate the velocity and particle size to see if the particle will move. The mathematical component will require the students to analyze a particle portion of the graph using the simulator and Earth Science Reference Table (ESRT).

Objectives:

Students will be able to explain the relationship between steam velocity and particle size.

Students will be able to explain the math that derives the Relationship of Transported Particle Size to Water Velocity Graph.

Learning Targets:

I will be manipulate the velocity and particle size in the simulator.

I will be able to explain how particle size and stream velocity are dependent on one another for particle transport.

I will be able to find and label the x coordinate and y coordinate for specific points on the graph.

I will be able to justify that a function is linear using the Relationship of Transported Particle Size to Water Velocity Graph.

I will be able to categorize the particles based on their particle size.

I will be able to find the slope and y-intercept of the Relationship of Transported Particle Size to Water Velocity Graph.

I will be able to describe and categorize the type of function in the Relationship of Transported Particle Size to Water Velocity Graph.

I will be able to determine the equation of the function in the Relationship of Transported Particle Size to Water Velocity Graph

I will be able to interpret the Relationship of Transported Particle Size to Water Velocity graph found in the ESRT.

Earth Science Standards:

2.1v Patterns of deposition result from a loss of energy within the transporting system and are influenced by the size, shape, and density of the transported particles. Sediment deposits may be sorted or unsorted.

Standard 1 Analysis, Inquiry, and Design:

MATHEMATICAL ANALYSIS:

Key Idea 1:

Abstraction and symbolic representation are used to communicate mathematically. For example: Use eccentricity, rate, gradient, standard error of measurement, and density in context

Key Idea 2:

Deductive and inductive reasoning are used to reach mathematical conclusions. For example: Determine the relationships among: velocity, slope, sediment size, channel shape, and volume of a stream. Understand the relationships among: the planets distance from the Sun, gravitational force, period of revolution, and speed of revolution.

Key Idea 3:

Critical thinking skills are used in the solution of mathematical problems. For example: In a field, use isolines to determine a source of pollution. Construct and compare linear, quadratic, and exponential models and solve problems.

Mathematical Standards:

CCSS.MATH.CONTENT.HSF.LE.A.1

Distinguish between situations that can be modeled with linear functions and with exponential functions.

CCSS.MATH.CONTENT.HSF.LE.A.1.A

Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

Cross-cutting concepts:

3. Scale, proportion, and quantity. In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system’s structure or performance.

4. Systems and system models. Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

5. Energy and matter: Flows, cycles, and conservation. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.

7. Stability and change. For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.