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Principles of Diffusion

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CMST INTEGRATED LESSON PLAN

GRADE LEVEL/SUBJECT TAUGHT: Grades 9 – 12, Math and Living Environment

OBJECTIVES: Students will be able to describe 2 principles of diffusion that will be demonstrated and explained in models of diffusion. These are applied math and science principles used in inquiry methods of learning.

MATHEMATICAL – SCIENCE CONCEPTS to be integrated:

Math: The symbolic change in color is representative of molecules moving to a state of equilibrium. This relates to equations because what you do to one side of an equation must be done to the other side too in order to maintain equilibrium, or balance. Using color to symbolize "balancing" both sides of the "membrane" is a novel approach using a "wave" motion to show diffusion.

Science: Diffusion is the random movement of molecules, from an area of high concentration to an area of lower concentration. It needs no external source of energy to happen.

Assessing prior knowledge: The students are broken up into groups of two students each and each is given a piece of copy paper. In a 5 minute time period, each group is to draw or describe what diffusion is. The teacher will move about the classroom and help keep students focused. Also, teacher can ask them to recollect the concepts learned in grade 8 math re: equations, balancing both sides, etc., pointing out the similarity between those ideas and the process of diffusion.

Beginning the lesson: We will begin the lesson making models of diffusion and after which we will test the models using different smelling substances introduced into the air of the room. The math model will be prepared ahead of time and demonstrated by the teacher. It uses the Geometry Sketch Pad and color to demonstrate two substances introduced into the air of the room at different locations. Being gaseous substances, the substances can be in the same general area at the same time. The GSP model lets us see this happening. It also relates to an equation where what is done on one side of the equation, must also be done on the other side of the equation. It expresses the idea of equivalence. Both sides of the membrane have to be in balance when the diffusion has taken place. Students will be writing descriptions in their notebooks of what they see and what this represents.(10-15 minutes)

The next model will be using Agent Sheets. This model will be set up by a student under the direction of the teacher and projected up onto the front screen. Two substances will be released from opposite sides of a room with a semi-porous membrane across the room. The molecules are set in random motion and move around the room through the membrane ending up with nearly the same number of each type of molecule on each side of the membrane. As the model is being constructed, the teacher will lead a discussion of

the key elements of diffusion. Students will take notes based on this discussion in their notebooks.(20 minutes)

The assessment of the lesson will be to have the student groups turn the paper they were given at the beginning of the class period and again draw and or describe what diffusion is, and must include the result of the diffusion process. The resulting state will show equilibrium or a balance on each side of the membrane. The description must include the following: The molecules move in a random motion, they move from an area of high concentration to an area of low concentration, and diffusion requires no outside input of energy. (5-10 minutes)

Rubric

	Type of movement	Direction of movement	Source of energy
Diffusion			

Point value: 10 pts for the correct term
10 pts for description

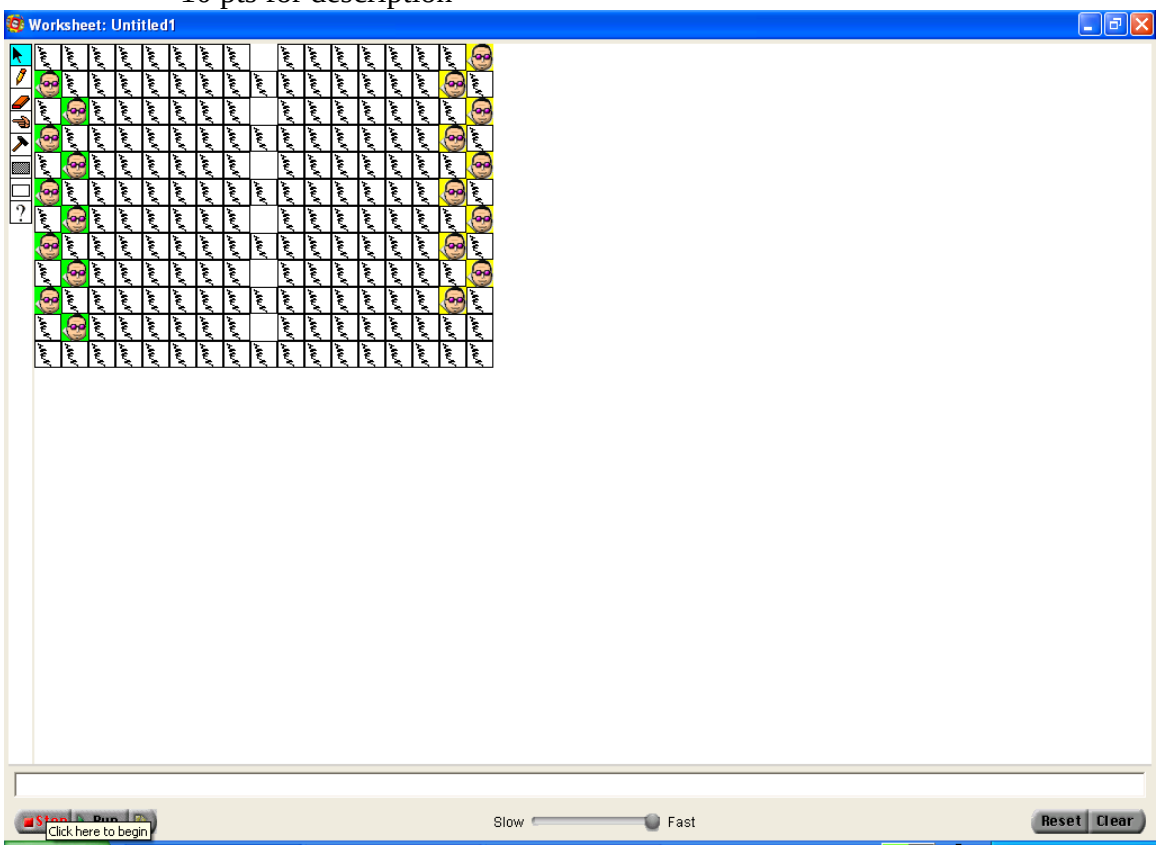

FIGURE 1