Open and Closed Circulatory System

Curriculum/State Standards
5.3.12.A.3, 5.3.12.A.6

Overview
Students can visually determine the effect of an open vs. closed circulatory system in an isolated field by pouring steel ball bearings among cells with non-specific receptors (rare earth magnets) projecting from cell surface receptors. Knowing the number of signal molecules being poured over the cells and comparing how many signal molecules attach to the receptor cells can give students an understanding of the efficacy of an open vs. closed circulatory system in animal systems.

Objectives
The student will pour a known number of steel bearings in a “closed” circulatory system and an open circulatory system. The student will record the results 3 times in data tables and graph the results; comparing the open circulatory system to the closed and determining how many “cells” received “NO” signal molecules and determine the over-all effect of a specific cell signal during any one metabolic incident.

Materials
isolated cell chamber equipped with blood vessels and open circulatory system plywood:
3 boxes rare earth magnets
ball bearings
PVC flex tubing
glass marbles to demo:
Plexi-glass
paint
construction materials

Readiness Activity
Students will learn about the evolution of cells and organisms with respect to constant contact with water and strategies used to move away from constant contact with water.

Strategies/Activities
Students will be given a handout which will explain the development of and need for a circulatory system to move away from constant contact with water. Moreover, students will get explanations, pictures, and diagrams of our red/white blood circulatory system and out lymph system. Then students will pour steel ball bearings over a known number of cells with a known number of receptors. Students will count the number of signal molecules not attached to cells, set up data tables to record these results and eventually graph the results of receptors in a closed circulatory system vs. an open circulatory system.

Culminating Activity
Students will graph the results to prove that a closed circulatory system can activate more cells in a target organ compared to an open circulatory system and will speculate why the lymph circulatory system is effective as an open circulatory system rather than evolving into a closed circulatory system.

Evaluation Method
Students will hand in handouts, data tables, and graphs and answers to questions on the lab that determine understanding of the process.

THIS WINNING PROJECT IDEA SUBMITTED BY:
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GRADE LEVEL
9-12

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