Michelle Dale
Zebra Mussels - Math Lesson

Mathematical Concept:

- Students will use the *STELLA* model (zebra) created by the teacher to investigate how many zebra mussels it will take to clog a pipe, taking into consideration the size of the zebra mussels, number of zebra mussels and diameter of the pipe.

Standard 3 - Mathematics:

- Key Idea 1: Mathematical Reasoning
- Key Idea 2: Number and Numeration
- Key Idea 4: Modeling/Multiple Representation

Materials:

- Computer with *STELLA* Model (zebra)
- Zebra Mussels Worksheet

Objectives:

Using the *STELLA* model (zebra) the students will:

- Identify the variables that affect the pipe getting clogged
- Learn about and discuss the calculations behind the *STELLA* model
- Apply mathematical formulas (area of a circle) to the *STELLA* model
- Understand that manipulating the variables will change the outcome
- Manipulate the variables on the model to arrive at a desired outcome

Vision:

- Teacher's Role

This lesson would be best used in coordination with a unit on invasive species during Science class. After students have had a background on zebra mussels, how their populations grow and where they are located, impacts of their populations will be discussed. One major impact of zebra mussels is that despite their small size, they attach themselves to each other and hard surfaces to form large colonies that cause reduced water flow and clogs in water and drain pipes. When assuming that it only takes one layer of zebra muscles to clog a pipe, we can calculate the area of the pipe as well as the area of the zebra mussels to determine how many zebra mussels it takes to clog a pipe. Assuming that students have previously been introduced to the *STELLA* program, they will be asked to think about and discuss the variables that will affect a pipe getting clogged with zebra muscles. After the variables have been identified (size of pipe, area of pipe, size of zebra muscles, number of zebra muscles and area of zebra muscles) and the mathematical formulas are identified, the teacher will lead the class through a discussion and explanation of how the different variables are calculated. The teacher will then model how to move the sliders on the zebra program and allow the students to use try using the sliders and complete the worksheet. The teacher will bring the students back together to discuss their results and situations they identified.

- Student's Role

After learning about zebra mussels and the impacts they can have in Science class, the students will relate this knowledge to Math. After being posed the question, "How many zebra mussels does it take to clog a pipe?" the students will discuss the variables that are involved in this question. They will then identify the variables and mathematical formulas that they can apply to this question. After seeing a demonstration of how to use the zebra model, the student will experiment with it and complete the worksheet.

Name _____ Date _____

How Many Zebra Mussels Does it take to Clog a Pipe?

Directions: Complete the following problems. Be sure to show all of your calculations (even if they are done on the zebra program)!

1. Set the size of zebra mussels to 1 inch. If the number of zebra mussels is 8 million, what is the total zebra mussel area?

2. Now set the diameter of your pipe to 2 inches. What is the area of the pipe?

3. What difference do you find?

4. You should have a negative difference, what does it mean when you have a negative difference? Hint: Look at the total zebra mussel area and the area of the pipe.

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5. Now set the diameter of your pipe to 2.828 inches. What difference do you find now?

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6. What does it mean when you have a difference of zero?

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7. Now it is your turn to create a situation. List the numbers you use, the difference you find and what that means in relation to the clogging of the pipe.

Size of Zebra Mussels _____
Number of Zebra Mussels _____
Total Zebra Mussel Area _____
Diameter of Pipe _____
Area of Pipe _____
Difference _____

Explanation: _____

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SCORE	4	3	2	1
Participation in Discussion and Activity	-Student cooperatively and willingly participates in activity	-Student participates in activity	-Student has to be reminded to stay on task	-Student refuses to participate in activity
Completion of Own Situation	-Student creates and explains his/her own situation accurately	-Student creates and explains his/her own situation with one errors	-Student creates his/her own situation with multiple errors or without an explanation	-Student does not create his/her own situation
Completion of Worksheet	-Worksheet is entirely complete	-Worksheet is entirely complete	-Worksheet is only partially complete	-Worksheet is incomplete