MNLA Curriculum Unit B, Lesson 3

UNIT TITLE: Using Math to Create Functional Landscapes:

LESSON 3:   Designing Retaining Walls; 30-40 minutes

MINNESOTA   ACADEMIC STANDARDS IN SCIENCE:

3.1.1.2.2 -- Recognize that when a science investigation is done the way it was done before,
                even in a different place, a similar result is expected.

3.1.3.2.2 --   Recognize that the practice of science and/or engineering involves many
                 different kinds of work and engages men and women of all ages & backgrounds.

4.1.2.2.1 --   Identify and investigate a design solution and describe how it was used to solve
                an everyday problem.

MINNESOTA   ACADEMIC STANDARDS IN MATH:

4.1.1.5 -- Solve multi-step real-world and mathematical problems requiring the use of addition,
             subtraction and multiplication of multi-digit whole numbers. Use various strategies,
             including the relationship between operations, the use of technology, and the context
             of the problem to assess the reasonableness of results.

4.3.2.3 -- Understand that the area of a two-dimensional figure can be found by counting the
             total number of same size square units that cover a shape without gaps or overlaps.
             Justify why length and width are multiplied to find the area of a rectangle by
             breaking the rectangle into one unit by one unit squares and viewing these as grouped
             into rows and columns. *For example*: How many copies of a square sheet of paper
             are needed to cover the classroom door? Measure the length and width of the door to
             the nearest inch and compute the area of the door.

4.3.2.4 -- Find the areas of geometric figures and real-world objects that can be divided into
             rectangular shapes. Use square units to label area measurements.

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GRADE LEVEL/SUBJECT: 3 -4 Science ; 4 Math

OVERVIEW: Third and fourth grade students are expected to measure and calculate the
height and area of objects. The students also are expected to be able to complete multiplication of
whole numbers up to 12 X 12. Students do not do division at these grade levels. This lesson
reinforces these skills and is best done after the teacher has already introduced and taught the
students the basic concepts of height and area. This lesson may be more appropriate for spring
due to the math concepts used.

OBJECTIVE:
As a result of this activity, students will be able to:

1. apply math skills to calculate the height and length of retaining walls.

MATERIALS:

- Picture examples of retaining walls in the landscape.
- Minimum of 3 different samples of retaining wall block and/or stone.
- Retaining Wall Worksheets, one per student. Worksheet is attached to this lesson plan.

ACTIVITIES AND PROCEDURES:

1. Describe what you do as a professional landscaper / horticulturist. Use position titles to help students recognize career path opportunities.
2. Show picture examples of retaining walls in the landscape.
3. Ask students why a landscape designer might need to build a wall in a landscape. Stay positive towards the student's ideas even if they are more "creative" than what you were expecting.
4. Show samples of retaining wall block and/or stone. Ask students to describe the differences between the types of block and/or stone. Enhancing and developing observational skills is one of the science standards.
5. Demonstrate to students how the block/stone can be stacked to create a wall. Explain that the landscapers need to know how many blocks it will take to make a wall so they will know how many blocks to order. Draw on the board a retaining wall 4 blocks long and 3 blocks high using rectangles to represent blocks/stone. Explain how the geight and length of the wall are determined by the number of blocks used. Ask students how they could quickly determine the number of blocks needed without counting each block. Using the example drawn on the board, show the students how they can find the number of blocks in a wall by multiplying the number of blocks in the length by the number of blocks in the height. Write the equation on the board followed by the numbers in the example:

   # blocks needed to build the wall = # blocks in length X # blocks in height
   # blocks needed = 4 blocks X 3 blocks
   # blocks needed = 12 blocks
6. Handout worksheets, one per student, and assist individual students as needed. Ask the classroom teacher to assist.

ASSESSMENT: Students will complete the worksheet provided.

HANDOUTS AND WORKSHEETS:

- "Retaining Walls Worksheet"

Retaining Wall Worksheet

1. If a landscaper needed to build a retaining wall 3 feet tall all along a 10 foot sidewalk how many 1 foot tall and 1 foot long blocks would be needed?

2. A landscaper gives you 24 retaining wall blocks. Each block is 1 foot tall and 1 foot long.

    a. Design a wall with the 24 blocks.

    b. How many blocks tall is the wall and how many blocks in length?

3. The landscaper has designed two retaining walls to prevent the soil from washing down onto the school playground. One wall is 5 feet long and 3 feet tall. The second wall is 8 feet long and 4 feet tall. How many blocks did the landscaper need to order altogether?

4. A. A landscaper designed a 9 foot long and 5 foot tall retaining wall to keep the soil from washing into the dog kennel. How many 1 foot long and 1 foot tall retaining wall blocks would be needed for the project?

    B. If each retaining wall block cost $3, how much would the landscaper have to pay to get all of the blocks for the wall?