Paving Stones
Lesson Plan

Mathematical Goals:
- Connect functions to a real-world task
- Use discourse as a strategy to help students make meaning of functions and equations
- Generalize patterns using variables
- Use an equation to determine a solution for a specific value
- Have students synthesize their own functions and equations

PSSM Algebraic Benchmarks:
- Variable as an unknown quantity
- Letter representing a variable
- Mathematical relationships using equations

Lesson Background:
My class has been working on finding patterns and describing pattern rules. In our last lesson, we explored the perimeter of figures arranged in a row. The students used equilateral triangles, parallelograms, trapezoids, and hexagons as a context to work with functions. The students worked in groups to find a rule that would allow the class to generalize for each shape. Each group wrote an equation with variables to express their generalizations.

Background Knowledge:
My students are working at a variety of levels of understanding using functions. Most students understand that a t-table can be used to represent a pattern, and can determine one- and two-step rules. Most students recognize that a letter can represent a number. However, some of my students still struggle with solving functions with two-step rules. Also, I need more evidence to determine if my students understand the relationship of the equation to the t-table. The task I have chosen will provide another opportunity for students who are struggling with two-step rules as well as allow all of my students to get a deeper understanding of the use of the equation.

Skills and Knowledge to Develop in this Lesson:
Although students have worked with shapes to generalize patterns, they have not used a real-world problem as a starting point. I want my students to begin to understand how an algebraic function can be used to solve a real-world problem. I also want my students to become proficient in explaining how an equation relates to the function. I expect my students to use written and oral language to make meaning of this connection. This task can also provide the opportunity to discuss multiple strategies and solutions.

Task:
The objective of the paving stones problem is for my students to generalize the number of paving stones needed to surround a square pond of any size. After describing the nature of the problem to the students, I will challenge the students to create a function to represent the pattern. The students will continue to explore this pattern with their partner and, when completed, will meet with another partner group to discuss their findings. Each group of four students will develop a poster that describes their understanding of the function and also a possible equation to generalize a rule. These groups will also develop their own function with a mystery rule to challenge the class. We will meet together as a whole class to discuss each group's findings and to determine the validity of possible solutions.

Organization of Students:
Part 1: Whole group discussion
(Review of last discussion/launch new task)

Part 2: Partners work to generalize pattern through function and equation

Part 3: Partners join together to make small groups to discuss results and create posters.

Part 4: Whole group joins together to report results and determine validity of mathematical conclusions from each group

Assessment/Evidence of Student Understanding:

- Student responses during initial whole group discussion
- Observation of partner and small group discourse and written journal work
- Poster presentations and resulting interactive discourse
- Are errors challenged during interactive discourse?

What I Expect Will Be Easy:

- Using tiles to create paving stones to surround pond.
- Working together as partners and teams, participating in whole group discussion.

What I Expect Will Be Hard:

- Creating a function to help solve a real-world problem.
- Using oral and written language to explain the relationship between the function and equation.
- Some students may not be able to find a possible rule for the function.
- Maintaining interactive discourse with partners/small groups/whole group.