**Area Thematic Unit**

**By Deborah Owens**

* **Learning Goal(s)**
* Math: Students will use geometric measurement of area in a real-world application by creating a floor plan for a pet rock house.
* Math: Students will calculate the cost of different flooring materials to use on their floor plan by calculating the area for each room.
* Art: Students will create their own pet rocks using art supplies. Students will illustrate their mini-book.
* Reading: Students will read The Diary of Spider by Doreen Cronin and map out important events.
* Writing: Student will write a diary for their pet rocks and publish the diary as a mini-book.
* **Needs Analysis** –
* **Mathematical Need:** Understand concepts of area and perimeter and relate area to multiplication and to addition per the Common Core.
* **Pre-assessment**—Need to give a pretest covering different concepts of perimeter and area.
* **Learner Analysis**- (Population analysis)
	+ **Entry Level Knowledge**
		- Must be able to multiply up to 10 x 10 facts.
		- Must be able to add 3 digit numbers.
		- Must be able to calculate perimeter of shapes.
	+ **Demographics –**
		- 27 students—15 boys, 12 girls
		- Ages—8 and 9 year olds
		- 1-ESL student
		- 1—resource student (language arts and math)
	+ **Opinions about math based on survey:**
		- I like Math—4 No, 10 sometimes, 11 yes
		- Math is a lot of hard work—8 no, 12 sometimes, 5 yes
		- Afraid of getting wrong answer—9 no, 4 sometimes, 12 yes
		- Math is boring—5 no, 12 sometimes, 8 yes
		- Gets hard, get frustrated—16 no, 3 sometimes, 6 yes
		- Problems requiring effort—6 not at all, 6 a little bit, 5 sometimes, 6 most of the time, 2 very much
		- Playing games/competing—1 not at all, 2 a little bit, 2 sometimes, 4 most of the time, 16 very much
		- Working in small groups—2 not at all, 2 a little bit, 2 sometimes, 10 most of the time, 9 very much
		- Presenting ideas to class—6 not at all, 2 a little bit, 2 sometimes, 6 most of the time, 9 very much
		- Attitude towards computation of 4 operations—1 need improvement, 2 fair, 6 good, 14 very good, 2 not sure
		- Attitude towards story problems—2 need improvement, 7 good, 12 very good, 4 not sure
		- Attitude towards geometry—1 need improvement, 1 fair, 4 good, 13 very good, 6 not sure
		- Attitude towards measurement—1 fair, 5 good, 11 very good, 8 not sure
		- Attitude towards fractions—1 need improvement, 1 good, 21 very good, 2 not sure
		- Tracking and completing homework—21 yes, 4 no
		- Computer access at home—22 yes, 3 no
		- Someone at home to help—24 yes, 1 no
		- Handle “losing” a game—5 not well, 7 okay, 13 pretty well
		- How much like math overall—6 very little, 5 okay, 15 quite a bit
	+ **Pre-Assessing Student Knowledge:**
		- Understanding of commutative property of multiplication—24/24
		- Understanding of which figure has greatest area—with picture—20/25
		- Understanding that 7 x8 describes area—5/25
		- Understanding that can’t find area on a line—9/25
		- Able to count shaded figure to find area—23/25
		- Able to count square tiles of a figure—9/25
		- Able to count area when figure is partially covered—15/25
		- Able to calculate area with 2 side lengths given—5/25
		- Able to calculate greatest perimeter with given area—9/25
		- Able to used distributive property—given figure—6/24
		- Able to calculate rectilinear area given side lengths—1/24
		- Able to calculate rectilinear area given side lengths---5/24
		- Find perimeter—5/24
* **Task Analysis** - From the CORE decide what needs to be taught, specifically look at **tasks, skills and sub-skills**. This can be created as a web, a table or an outline.

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| What must be taught | Tasks, skills, sub-skills |
| I. Covering Regions (Recognize area as an attribute of plane figures and understand concepts of area measurement. 3.MD.5)* 1. A square with side length 1 unit is called a “unit square.” A unit square is said to have “one square unit” of area.
	2. A unit square can be used to measure area.
	3. Area is the # of square units needed to cover a region.
	4. The amount of space inside a shape is its area.
	5. Square units cover the plane figure without overlapping or gaps.
 | Students will:* Use premade square units to measure the tops of their desks.
* Discuss the number of squares used to measure desk, what was actually measured (inside space of desk)
* Discuss discrepancies between classmates’ measurements—guide discussion that squares must cover entire plane figure with NO overlapping or gaps.
* Introduce the word AREA and do a vocabulary web.
* Discuss what unit is used to measure area—square units.
* Provide small groups with different sized square units to measure different surfaces. Record results in a table or chart.
* Discuss the area of surfaces measured to bring about a discussion on what a unit square is.
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| 1. Estimating and Measuring Area (3.MD.6)
	1. Understand the size of different unit squares.
	2. Use concrete and pictorial models of square units to determine the area of two-dimensional surfaces by counting them
	3. Area is the # of square units needed to cover a region.
	4. The amount of space inside a shape is its area.
	5. Square units cover the plane figure without overlapping or gaps.
		1. Be able to accurately count.
 | * Show examples of different sized unit squares, such as square cm, square inches, square feet, square yard, square meter. Students brainstorm and record where they would use each unit square for measuring. For example, square yard for measuring the playground, square feet for measuring classroom.
* Use tile blocks (square inches), laminated square feet to measure different surfaces in classroom and school. Review how to cover accurately and how to calculate total squares used.
* Practice skills by completing a worksheet.
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| 1. Area of Squares and Rectangles—be able to relate area to the operations of multiplication and addition. (3.MD.7)
	1. Find the area of a rectangle with whole-number side lengths by tiling it.
		1. Understand what an array is and relate it to area.
		2. Know how to calculate multiplication facts.
		3. Understand what area is.
		4. Tiling involves no overlapping or leaving of gaps.
 | Students will:* Use graphing paper to solve a story problem involving area.
* Class discussion regarding how to calculate the total number of squares—we could count the number of squares like we did prior lessons. Is there another way? What does square remind us? Review what an array is and how to calculate. What shapes allow us to use this method?
* Use Clickers for class practice and student understanding.
* Use graph paper to create different rectangular shapes and calculate area for each room. Partner check.
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| * 1. Show that the area is the same as would be found by multiplying the side lengths.
		1. Know multiplication facts.
		2. Understand the commutative property of multiplication
 | Students will:* Think-pair share. Solve problem: Joe has found a piece of carpet that has measurements of 4 yards by 5 yards. He needs to figure out the area of the carpet. Use your knowledge of area and multiplication to determine the area. Share your solutions. Discuss as class. Was there an easy or “short cut” to finding area without having to cover the shape with squares? Will the short-cut work on any rectangular shape?
* Practice using this “short-cut” method using computers. <http://www.thatquiz.org/tq-4/?-j201v-lc-m2kc0-na-p0>
* Journal entry: Why can you multiply the lengths of each side to determine area?
* Create floor plan for pet rock house.
* Calculate the area for each room. Given budget decide on how to floor each room.
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| 1. Area and the Distributive Property (3MD7C)
	1. Use tiling to show in a concrete case the area of a large rectangle.
	2. Be able to take this large rectangle and divide it into smaller rectangles. Find the area of the two smaller rectangles.
	3. Be able to explain that a rectangle with the whole-number side lengths a and b+c is the sum of a x b and a x c.
	4. Use area models to represent the distributive property in mathematical reasoning.
 | * Pose problem—The new reading room for the pet rock’s library is shaped like a rectangle that is 8 inches by 9 inches. Mrs. Owens has a rectangular piece of pattern paper that is 8 inches by 5 inches for the reading area. What part of the reading area will be left without carpet? What will the area of the carpeted parted section?
* Link to prior knowledge about finding area by having students share.
* Draw and discuss the rectangle on grid paper. What multiplication facts are represented?
* Small group—draw another rectangle with different dimensions and draw a line to separate into two rectangles. Write the equation for the large rectangle and the equations to the two small equations.
* Matching activity—students will work in pairs to match large rectangle with 2 small rectangle. Then write down the equation for both cards.
* Self—Students complete short quiz for assessment.
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| 1. Area of Irregular Shapes
	1. Recognize area as additive
	2. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts.
 | Partner problem: Provide students with a rectilinear figure and have them work in pairs to find the area. Problem: Mrs. Owens has decided the pet rock library will be in the shape of this picture. The length of each side is shown in feet. Find the area of the library WITHOUT counting each square.Whole class discussion: How can you find the area of the desk *without* counting squares? There are many ways to divide this shape into rectangles and squaresInteractive Lesson using Smartboard Tools to practice and discuss. <http://www.studyladder.com/myschool/173116/myclass/298813>Independent Practice: Complete worksheet. |
| 1. Recognize perimeter as an attribute of plan figures and distinguish between linear and area measures.
	1. Find perimeter given the side lengths
	2. Find an unknown side length
 | Review: perimeterPractice finding perimeter |
| * 1. Exhibit with the same perimeter and different areas
 | Pose questions to whole class: Can you have different shapes with different areas but the same perimeter? Do thumbs up/thumbs down to record guesses.Direct teach: Using 8 units of 1 inch straws, demonstrate using the document camera how you can make a 2 x 2 square with perimeter of 8 units and area of 4 units. Then make a 1 x 3 rectangle. P= 8, but A = 3. Model your recordings on worksheet.Discuss: Can you have same perimeter and different area?Partner work: You have been given 12 units of fencing for your pet rock’s yard. The yard has to be in the shape of a rectangle. You and your partner must use all 12 units of fencing. Figure out the different rectangles you can make with your fencing. Draw these shapes on your inch graph paper/worksheet and determine the area for each. Whole class discussion: Record the different rectangles with area and perimeter on class chart.Individual/journal prompt: Look over your different rectangles, which shape would you chose for your pet rock’s yard. Explain your thinking.  |
| * 1. Exhibit with the same area and different perimeters
 | Pose questions to whole class: Can you have different shapes with SAME areas but the DIFFERENT perimeter? Do thumbs up/thumbs down to record guesses.Direct teach: Watch <http://misterteacher.com/everything_geometry/area_perimeter.html> and work through the examples using Smartboard Tools.Discuss: Can you have same area but different perimeterPartner work: You have been given 16 square units of grass for your pet rock’s yard. The yard has to be in the shape of a rectangle. You and your partner must use all 16 square units of grass. Figure out the different rectangles you can make with your square grass. Draw these shapes on your inch graph paper/worksheet and determine the perimeter for each. Whole class discussion: Record the different rectangles with area and perimeter on class chart.Individual/journal prompt: Look over your different rectangles, which shape would you chose for your pet rock’s yard. Explain your thinking.  |

* **Context for Instruction**
* **Resources to be used**:
	+ Scott Foresman-enVision Math—Unit 16 with Successnet online tools,
	+ Centimeter and inch grid paper, 1 inch paper and foam tiles, tracing shapes
	+ Calculators
	+ Teaching Student-Centered Mathematics by John A. Van de Walle & LouAnn H. Lovin
	+ Online Resources—see above.
	+ 1 inch paper squares, 1 inch foam squares, pattern paper, crayons
* **Delivery methods** to use:
	+ Cooperative groups (based on survey—21/25 like to work in small groups at least some of the times)
	+ Use of manipulatives—engaging and helps those who are kinesthetic
	+ Task/problem solving with presentations of solutions to class
	+ Direct Instruction—to introduce and teach core concepts
	+ Partner Work—To allow students to discuss concepts (21/25 students enjoy talking about their learning)
	+ Technology—Practice calculation skills—my students really enjoy working on the computer, and I know they need practice with instant feedback.
	+ Worksheets for practice of skills/drill.