

Tyler Runkle

Mathematics: The Language of STEM
Discovering Area At the Farm

SECTION 1: CONTENT AND TASK DECISIONS

Grade Level 3

Task:

The students have already created a fence to go around barnyard animals to make a pasture (using prior knowledge from perimeter lessons) ***See perimeter lesson taught earlier (copied below this lesson). If you did not do the perimeter lesson, please have students sketch 4 rectangular shapes within a 12 inch by 12 inch square.*

The students will need to find the area of each figure/pasture (from previous perimeter lesson) created using 2 inch by 2 inch square pieces of paper. After students find the area of all the figures, students will be given 36 squares to make another area. The students need to make connections about the area created, find the perimeter of the new area, and discuss similarities and differences between other students' work.

Indiana Mathematics Content Standards: 3.M.5 Find the area of a rectangle with whole-number side lengths by modeling with unit squares, and show that the area is the same as would be found by multiplying the side lengths. Identify and draw rectangles with the same perimeter and different areas or with the same area and different perimeters.

Indiana Mathematics Process Standards: PS.1 Make sense of problems and persevere in solving them.

Content Goals:

- The students will find the area of a figure created by using square unit manipulatives.
- The students will create an area with a selected amount of square units.
- The students will make connections to perimeter

Language Objectives: The students will explain verbally how to find area using square units. The students will explain in writing how area and perimeter compare.

Materials:

Chart paper from perimeter lesson with fencing drawn on

Popsicle sticks

2 inch by 2 inch paper squares (suggested amount is 72 pieces/group)

Picture of sod

SECTION 2: THE LESSON

BEFORE:

Student Actions—

1. Review perimeter
2. Discover ways to find the area of created figures.
3. Connect squares to find area

Teacher Actions—Before (Launch)

1. Say, **“Today you will be using your barnyard perimeter creations from the perimeter lesson.”** (Teachers who did not do the perimeter lesson need to have students make figures with Popsicle sticks to represent fencing. The fencing needs to be closed to hold in different barnyard animals. Each group of students needs 4 different pastures. Have the students trace their pastures onto chart paper). All four pastures need to be contained to a 12inch by 12 inch square.
2. Tell the class, **“Now that you have fencing up for your animals, you now need to put sod (grass) inside (show a picture of what sod is) each set of fencing for your animals to eat.”**
3. Tell the students, **“Sod only comes in square pieces and you may have to fix some of your fencing so they are all perfect squares or rectangles.”**
4. Each group of students will receive squares of paper to represent the sod. Model using squares to find the area of a smaller area.
5. Explain to the students that each group will need to work together to find the inside of each fencing so they know how many pieces of sod is needed. Student need to write the areas in their journals.
6. Tell the students to compare the different amounts for each of the pastures (which is the biggest, least? any the same?).
7. Allow students to compare with other groups if two or more groups finish earlier.
8. See the ** in the *During (Explore)* for a separate task.

DURING:

Student Actions—

1. Use two inch squares to fill the inside of each figure (pasture) created for the barnyard.
2. Write the area for each pasture on the assessment page.
3. Compare the different sizes of each pasture within their own group.
4. Compare sizes of pastures with other groups.
5. Create a new area using only 36 square inch squares.
6. Find the perimeter of that figure.
7. Make connections between different areas and how that relates to perimeter.
8. Connect different perimeters and what that does to the area?
9. Students who finish early need to write the area of each pen in a journal and compare the area to the perimeter.

Teacher Actions—

1. Observing student work and supporting student questions and ideas.
2. Ask effective questions to help student thinking.
3. **Stop students after 10 minutes of finding areas (or when students have finished finding all the areas).
4. Tell the class, **“When the landscaping company delivered your sod, they gave you an extra 36 squares of sod. Now, you get to create a separate area for a bigger pasture. The pasture has to be in one spot and can’t be separated. Be sure to use all 36 squares and find the perimeter of this new area.”**
5. Allow students to create new area. Groups who finish quickly can find the perimeter using popsicle sticks (each popsicle stick is a certain length)

6. Circulate between groups using scaffolding questions (How does the area change when the perimeter changes? How does the perimeter change by moving the shape of your area?)
7. Have students who finish early write the area of their pens in their journal/assessment page. Be sure they compare the area to the perimeter.

AFTER:

Student Actions—

1. Share findings from the activity.
2. Share connections and all creations made.
3. Answer questions from the class.
4. Ask questions to presenters.

Teacher Actions—

1. Have the groups sit together and have one group at a time share to the class. The groups will show the different areas they found and the new creation for their new area created.
2. The students drive the discussion, the teacher just keeps it flowing (use questions when necessary allowing students to answer questions of other students)
3. Ask the students the connections between perimeter and area. Does perimeter change if the shape of the area changes? Does area change if the perimeter changes?
4. Show how to write the answer being squared. See if any students made that connection to using square pieces.
5. As groups share, students will hopefully notice that the second area that was created all have the same area. However, the perimeters may be different. Be sure to bring this up in the discussions.

Assessment:

Students write the area for each pasture on an assessment page/journal. Compare the area to the perimeter.

Students present their areas to the whole group and discuss the relationship to their perimeters.

Students reflect to the questions from the teacher in their journal.

Observe students' finished product and when they present their findings.

Ask/reflect - Ask the students the connections between perimeter and area. Does perimeter change if the shape of the area changes? Does area change if the perimeter changes?

Author: Jane Zellers

Mathematics: The Language of STEM
Perimeter of the Farm

CONTENT AND TASK DECISIONS

Grade Level(s): Third Grade

Description of the Task:

The students will be using manipulatives to design a farm and discover the perimeter of the farm.

Task

“Your family just bought a farm that is missing all of its fences. You will need to be able to fence in all your animals, so they don’t wander off. You have 5 chickens, 3 pigs, 2 horses and 1 cow. Using cubes as your animals and craft sticks as your fences build your farm. Determine how many pieces of fence you will need to buy. * Note all pens must be rectangular.*

Indiana Mathematics Content Standards:

3.M.7: Find the Perimeters of polygons given the side lengths or by finding the unknown side length.

3.C.1: Add and subtract whole numbers fluently within 100.

3.AT.1: Solve real-world problems involving addition and subtraction of whole numbers within 1000

Indiana Mathematics Process Standards:

PS.1: Make sense of problems and persevere in solving them.

PS.3: Construct viable arguments and critique the reasoning of others.

PS.4: Model with mathematics

Mathematics Content Goals:

The students will be able to create a farm and will be to find the perimeter of each pen for their animals using addition.

The students will be able to share with their classmates what they discovered when designing their farm and the number of fences they used.

The students will be able to design a diagram of their farms.

The students will use counting to find the perimeter of a pen.

Students will have to evaluate and assess their farm design and make adaptations after the challenge.

Students will be able to determine the cost of their fencing.

Language Objectives:

SWBAT record how they found the perimeter and price of the fences using numbers, drawings, symbols and words in their journal.

Listening-Working with a group and listening to peers

Reading - Compare content related material in visuals and graphics

Writing-Writing in math journal, creating poster with team members

Review Vocabulary words- farms, animals, and fences pictures

Materials:

Picture of a farm and animals

Craft sticks for fencing

Unifix cubes for barnyard animals

Chart paper

Tape 12 in by 12 in squares around the room to help students visualize the space of the barn.

THE LESSON

Before:

Student Actions

- Students will have reviewed addition.
- Students will be participating in class discussion and brainstorming what they know about farms.
- Students will listen and observe as teacher models the sheep pen.

Teacher Actions

- Display a picture of a farm to build prior knowledge.
- Display pictures of the farm animals on different farms and the amount of space they each need.
- Ask students what they know about farms.

Questions:

- Types of animals would you find?
 - Where do they live? (inside the barn or outside)
 - Do they roam freely or are they in cages or pens?
 - Why would you need a fence?
 - What do we know about these animals?
 - How would we keep our animals safe?
- Introduce the task **“Your family just bought a farm that does not have any fences. You have 5 chickens, 3 pigs, 2 horses and 1 cow. You will need to design your farm so you can keep all your animals safe. Using cubes as your animals and craft sticks for fences design your farm. How much fence will you need to purchase? * Note all pens must be rectangular.***
 - Go over as a class the different sizes each animal is and the amount of space each animal might need. (Cow=4 cubes, Chicken=1 cubes, Pig=2 cubes, Horse=5 cubes)
 - Model one together (pigs) If I have three pigs how much room might they need in their pen? Manipulate this under the document camera.
 - Pass out handout and materials to each group. (2-3 students per group) have students spread out around the room.

During:

Student Actions

- Students will have to design how they will divide up their animals.
- Students will manipulate materials to design their farms.
- Students will draw their farm in their journals and record how many pieces of fence they will need.
- CHALLENGE ALERT!!!
(20-30 minutes)

- Students will work on redesigning their farms if they used over 60 pieces of fence.
- Students will need to draw their farm on chart paper and determine the number of fences they need.
- Students will need to calculate the cost of their fence.

Teacher Actions

- Teacher will monitor and observe students as they begin to design their farms.
- Teacher will ask leading questions to help those groups that may be struggling to get started.
 - How will you sort your different animals?
 - Do they have enough space to live and wander comfortably?
- Have students who have finished early draw their farm in their journals and record how many pieces of fences they need.
- Ask them if each fence cost \$15 a piece how much will it cost.
- CHALLENGE ALERT-
(20-30 minutes)
 - Lowes just called and they have a shortage of fence to sell. You will only be allowed to purchase 60 pieces of fence each.
- You may need to redesign your farm. You will need to draw your farm on the large chart paper and determine the number of fence you need and how much it will cost. EACH piece of fence costs \$15.
- Monitor and Observe students as they redesign their farm.
- Ask students leading questions to help them find the amount of fence they need and the cost.

After:

Student Actions

- Students will share their designs and why they picked that design.
- Students will make comments, questions, and connects during sharing.
- After all groups have shared students will walk around and record any differences and similarities they find in the different designs in their journals.
- Share notices and reflections.
- Students will discuss their noticing as a class.

Teacher Actions

- Teacher will call groups up to share their posters.
- Teacher will guide questioning if needed.
- After all groups have shared students will walk around and look at the different farm designs and record any similarities and differences they find.
- Ask students to share their noticing.
- Point out that even though they have the same amount of fences they could have designed them differently.
- Talk about the different designs and which one they think might have been the most effective, least effective, and cost the least amount.
- Introduce the vocabulary word: Perimeter

ASSESSMENT

Students will reflect in their journals.

Observe:

Looking for evidence that students have made the connection of addition and perimeter.
Finished projects

Ask:

If you were to do the challenge again what would you do the same? What would you change based on what you learned from the other groups?

Continue Lesson with Area Farm Lesson

Farm Task

Task

Your family just bought a farm that is missing all of its fences. You will need to be able to fence in all your animals so they don't wonder off. You have 5 chickens, 3 pigs, 2 horses and 1 cow. Using cubes as your animals and craft sticks as your fences build your farm. Determine how many pieces of fence you will need to buy.

Important Information

Cow=4 blocks

Chicken=1 blocks

Pig=2 blocks

Horse=5 blocks

1= craft stick= 1 piece of fences

Each piece of fence cost \$15.00

Journal Reflection:

1. Draw a diagram of your farm. Record the number of fences you used and how much they cost.
2. What types of redesigns did you make and why?
3. As you are looking at the different farms write down the similarities and differences you notice.
4. If you were to do this activity again what would you change and why?