Activity: Counting Feet!

Name of Lesson: One is a Snail Ten is a Crab

Mathematics: counting, addition and subtraction, number sense, and problem solving

Grades: K-2

Standards for Mathematical Practices

- Making sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Time Needed
80 minutes

Materials Needed
Copy of One is a Snail Ten is a Crab by April and Jeff Sayre
2 colors of dice
Animal pictures of feet from the book
Drawing paper or journal
Pencils and crayons, or markers
Scissors and glue

Vocabulary/ Visual Models
Vocabulary: count, add, subtract, compose, decompose, tens, ones, add to, take from, put together, compare, unknown
Visual Models: animal feet pictures and/or different kinds of counters, number paths, open number lines

Adapted from April Pulley Sayre and Jeff Sayre. Illustrated by Randy Cecil. One is a Snail, Ten is a Crab: A Counting by Feet Book. Candlewick Press, Cambridge, MA; 2003 Original lesson plan created by Margaret Goldsmith, Math Curriculum Specialist, South Bend Community School Corporation, 2007 www.aprilsayre.com.

Procedures
Launching the Lesson

1. Write the following statement on the board: **Mathematicians do not always agree! Disagreeing respectfully is part of being a mathematician.** Ask a few students to share a time when they had a disagreement with someone. Discuss how they shared their ideas respectfully. Tell the students that in this lesson, they will be composing and decomposing numbers. Then they will be sharing their representations of those numbers with their classmates who will be critiquing their work using the "Talk Move" Agree/Disagree…because.

2. Read the book One is a Snail Ten is a Crab by April Pulley Sayre and Jeff Sayre. You can also find this book online at http://www.slideshare.net/ismes/one-is-a-snail-ten-is-a-crab

3. In your journal, explain what the book is about.
- What is happening in the book?
- What do you notice about the animals in the book?
- How does the author explain the animals?
- What comparisons does the author make?
- What are some questions that you may have about the book?

4. Turn to the page in the book, where it shows two different ways to represent 30.
- What are the two ways the author chose to represent 30?
- Why does that make sense?

5. With a partner, write a story problem in your journal for "The answer is 30." What is the story problem? Ask the participants to use the animals' legs from the story to solve the problem.

6. Ask the students to share their number stories and their number sentences. Record their ideas on the board. Here are two number sentences for "30 is ten people and a crab." 30 = 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 10

Note: You may want to post the illustrations for the students to see all of the animals and their feet when recording.

Adapted from April Pulley Sayre and Jeff Sayre. Illustrated by Randy Cecil. One is a Snail, Ten is a Crab: A Counting by Feet Book. Candlewick Press, Cambridge, MA; 2003 Original lesson plan created by Margaret Goldsmith, Math Curriculum Specialist, South Bend Community School Corporation, 2007 www.aprilsayre.com.

Guiding Questions:

- What information do you have?
- What do you need to find out?
- What strategies are you going to try?

Exploring the Problem:
Part 1:

1. Ask pairs of students to roll a set of dice made of two colors. Designate one color as the groups of tens and the other color as the ones. You might also use double dice. The number on the outside die will be the groups of ten or the number in the tens place and the number on the inside die will be the ones or the number in the ones place to make a two-digit number. For kindergarteners, roll one regular die and one die labeled 1, 2, 3, 10, 10, 10. Ask students to record the number in their journals.

2. Then ask the students to make a list of 3-4 different combinations of creatures with that number of total feet.

3. Repeat that process by rolling the dice 2-4 times total creating lists of 3-4 different combinations of creatures with each two-digit number rolled.

4. Next have the students choose **one** of their combinations to create a story on an 11 by 17 piece of paper or a half sheet of chart paper using the style shown in the book. Ask the students to include a picture that shows all the feet involved and a number sentence that goes with the picture. Then ask them to construct an oral and/or written argument for how they solved their problem.

5. Circulate as your students are creating their math stories. Look for and select several students for the "Author's Chair" that highlight different problem solving methods, reasoning, perseverance, how they have constructed arguments using concrete referents such as objects, drawings, diagrams, and actions, and how they have modeled with mathematics by writing an equation that describes the situation.

Adapted from April Pulley Sayre and Jeff Sayre. Illustrated by Randy Cecil. One is a Snail, Ten is a Crab: A Counting by Feet Book. Candlewick Press, Cambridge, MA; 2003 Original lesson plan created by Margaret Goldsmith, Math Curriculum Specialist, South Bend Community School Corporation, 2007 www.aprilsayre.com.

Guiding Questions:

- What visual models did you use to represent your reasoning and solution path?
- What ideas have we learned or used before that were useful in solving your problem?
- How did you represent your total feet with numbers?
- What relationships can you make with the feet and numbers? *(Understand that 1 crab is the same as 10. When you use 2 crabs in the tens place, it is 20 feet but represented as 2.)*

Summarizing the Learning

1. Gather the students together to share their stories and to share what they did to solve the problem. Make a list of student solutions; for example, 58 is the same as 5 crabs and 2 dogs. Students at all grades can listen to or read the arguments of others, decide whether they make sense, and ask useful questions. Guiding questions are provided to facilitate discussion. As the students share their stories, encourage the audience to make connections to their number combinations.

- What did you notice about the number combinations?
- How are they similar to yours?
- How are they different from yours?
- How else can we say that?

Guiding Questions:

- How did you solve your problem?
- Can you describe your method to us? Why did you choose to do it that way? Why does that work?
- Does your answer seem reasonable? Why or why not?
- Where did you get stuck? How did you get unstuck?
- Were you confused at any point? How did you simplify the task or clarify the problem?
- If you rolled an odd number, how did you choose to work with that number to solve your problem?
- How are the different strategies alike? How are they different?
- There are many different ways to solve problems. Which way might be more efficient? Explain.

Adapted from April Pulley Sayre and Jeff Sayre. Illustrated by Randy Cecil. One is a Snail, Ten is a Crab: A Counting by Feet Book. Candlewick Press, Cambridge, MA; 2003 Original lesson plan created by Margaret Goldsmith, Math Curriculum Specialist, South Bend Community School Corporation, 2007 www.aprilsayre.com.

2. After students share their combinations, ask them to choose a peer's number combination from the class list and determine whether they agree or disagree with the solution. Using their journals, have the students prove their thinking in numbers and words. If time allows, the teacher can ask the students to select a second solution from the list to defend. Teachers are often surprised at how students organize their defense of other students' arguments.

Questions to Prompt Agree/Disagree…because:

- Do you agree or disagree with what _____ said? Explain why.
- Do you have a different way of looking at that?
- Does that make sense to you? Why?
- Can you contribute more evidence for that claim?

Extending the Learning

The following challenges give students opportunities to apply what they have learned and encourage higher-level thinking.

1. Choose any two-digit number. List ALL of the ways you could use snails, people, dogs, insects, spiders, and crabs to total that number. Explain how you know you found ALL of the combinations. You can do this for as many different numbers as you wish.

2. Create your own picture book like One is a Snail Ten is a Crab using drawing paper stapled together. Include at least 5 different pages in your book with numbers not included in One is a Snail Ten is a Crab.

3. Write a quiz for a friend that includes 5 story problems related to this book. Trade quizzes with your friend. Solve each problem and write a number sentence that shows your work. Write both the quiz you made up and your solution to your friend's quiz in your journal.

4. Once your students have experiences writing stories with the unknown number in all positions of an equation, you might want to ask the students to sort their stories into categories, i.e., adding to, taking from, putting together, taking apart, and comparing, with the unknown in all positions.

Adapted from April Pulley Sayre and Jeff Sayre. Illustrated by Randy Cecil. One is a Snail, Ten is a Crab: A Counting by Feet Book. Candlewick Press, Cambridge, MA; 2003 Original lesson plan created by Margaret Goldsmith, Math Curriculum Specialist, South Bend Community School Corporation, 2007 www.aprilsayre.com.

5. For students ready to explore larger numbers: After exploring the above lesson for several days, you can ask students "What will happen if we roll 3 dice?" After accepting students' responses and ideas, roll and create a 3-digit number together. Then have the students explore the number using the book creatures, numbers, and words to represent the total number of feet. Once students have explored building other 3-digit numbers, have them share their combinations, and complete a "peer review". A peer review is when students determine whether they agree or disagree with a peer's combination of numbers, explanation in words, and justification of thinking. During a "summarizing the learning" class meeting, have students share their arguments (or the teacher might choose several arguments to share to highlight strategies or a teaching point). On the next day discuss with students some open-ended observations you noticed about their number constructions.

For example:
"Boys and Girls, yesterday I noticed that when representing the number 458 many of you used crabs for the 4 and the 5.

Guiding Questions

- Why did you decide to use crabs? Was this efficient, why or why not?
- Is there another way we could have used these?
- Is there a different tool or picture you wish you would have had to create your number picture?
- How would that tool have helped you?"

As students express their reasoning as to why they were using crabs to make groups of 10, and that 10 groups of 10 makes a 100, share with them the picture of a bag of 10 crabs as a representation of 100. Ask, "What would this picture represent? How do you know?" Have the students investigate building and representing 3-digit numbers using their new picture of a bag of crabs, creatures from the book, equations, and words. During a "summarizing the learning" class meeting ask;

- What changes did you make when investigating larger numbers today?
- What tools did you use that helped you to be efficient?
- How did those tools help you?
- How did you count differently? Why?
- How did your representations change?

Adapted from April Pulley Sayre and Jeff Sayre. Illustrated by Randy Cecil. One is a Snail, Ten is a Crab: A Counting by Feet Book. Candlewick Press, Cambridge, MA; 2003 Original lesson plan created by Margaret Goldsmith, Math Curriculum Specialist, South Bend Community School Corporation, 2007 www.aprilsayre.com.

Scaffolding Suggestions for Differentiation of Content, Product, and/or Process

This literature book can be used over and over, focusing on different mathematical concepts, expressions, and number values.

Content:

This is an investigation that can be adapted to multiple grade levels and can be used to develop different concepts throughout the school year. When teaching place value, it can be used to show the base-ten system. When developing addition and subtraction, students can investigate the different composition of numbers. In grade 2 students can develop multiplication concepts by investigating different arrays that can be built for the same number as well as illustrating repeating addition.

Teachers can adjust the value of the numbers being used based on the level of the student. Older students working with numbers larger than100 might choose to research the "Top 10 Animals with The Most Legs" to use in their stories. Additionally, you can change the tool students use to choose a number. For example, they can roll a different amount of dice or dodecahedron dice. Students can record all of their numbers from the dice roll and build the highest number and the lowest number and determine how these are different. Students can also roll 2 dice twice to make two 2-digit numbers and combine them to see how many feet in all. Note: This task would help develop Battista's Level 4, as long as students use place value reasoning using an expanded algorithm.

Product: The students may use drawings, equations, and/or other visual models to show their thinking as well as write stories related to the focused operations being developed.

Process: Students can work in small groups or individually.

Assessment of the Focused Standards
Using the work recorded in the student's journal, assess where the student is related to the stages of counting, correct solution, student reasoning, and visual models that clarify the student's solution and reasoning.

Adapted from April Pulley Sayre and Jeff Sayre. Illustrated by Randy Cecil. One is a Snail, Ten is a Crab: A Counting by Feet Book. Candlewick Press, Cambridge, MA; 2003 Original lesson plan created by Margaret Goldsmith, Math Curriculum Specialist, South Bend Community School Corporation, 2007 www.aprilsayre.com.

Teacher Reflection:

- What went well? What didn't go well?
- What changes or adaptations would you make to this lesson?
- What surprises or an "aha" did you have? Explain.
- What misconceptions did your students have?
- What connections did you and your students make?
- What Mathematical Practices were best represented?
- How will you assess understanding of the concepts in this lesson?

Adapted from April Pulley Sayre and Jeff Sayre. Illustrated by Randy Cecil. One is a Snail, Ten is a Crab: A Counting by Feet Book. Candlewick Press, Cambridge, MA; 2003 Original lesson plan created by Margaret Goldsmith, Math Curriculum Specialist, South Bend Community School Corporation, 2007 www.aprilsayre.com.

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet

snail = 1 foot
person = 2 feet
dog = 4 feet
insect = 6 feet
spider = 8 feet
crab = 10 feet