INVESTIGATING ADDITION AND SUBTRACTION

Grade Level: Kindergarten
Target Group: Sheltered content course

By: Christina Roth
TSL 518 (Summer, 2013)
Introduction
Title: Investigating Addition and Subtraction
Grade Level: Kindergarten
Target Group: Sheltered content course
Source of Written Reading Material:
  • *If You Give a Mouse a Cookie* by Laura Numeroff
Source of Lessons:
  • Georgia Department of Education – Common Core Georgia Performance Standards Framework – Kindergarten Mathematics Unit 4
  • North Carolina Department of Public Instruction
    www.ncdpi.wikispaces.net
Learning Goals:
  I want my students to know the difference between addition and subtraction.
  I want my students to know how to solve problems using manipulatives.
  I want my students to know how to decompose numbers.
  I want my students to know how to explain what they are thinking.
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**Performance Indicators**

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<td>Identify</td>
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Lesson 1
Title: Investigating Addition and Subtraction

Grade Level: Kindergarten

Target Group: Sheltered content course

Source of Written Reading Material:
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Lesson 1
If You Give a Mouse a Cookie
(North Carolina Department of Public Instruction
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SIOP Modified Version (purple type indicates modification)

Common Core State Standards:
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
MCCK.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
MCCK.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
MCCK.OA.5 Fluently add and subtract within 5.

Standards for Mathematical Practice:
• Make sense of problems and persevere in solving them.
• Reason abstractly and quantitatively.
• Use appropriate tools strategically.
• Look for and express regularity in repeated reasoning.

Duration: 45 minutes
Vocabulary: addition, plus, equal,

Materials:
• If You Give a Mouse a Cookie by Laura Numeroff
• Cookie shaped cereal for each student
• Work mats
• Number cubes marked 1, 2 and 3.

Grouping:
Whole class, small groups

Instructional Procedures:

Motivation (5-7 minutes)

Small Groups:
Ask students: What kind of foods do you think a mouse likes to eat? Give them 1-2 minutes to discuss their ideas with the group. Have students report their opinions. Record their answers on chart paper.
Tell students “Let’s find out what this mouse likes to eat (show the front cover of the book). Look at the cover of the book. What do you think?”
Read the story If You Give a Mouse a Cookie. Tell students “If you take a mouse to school, he might do a little math… Give an M&M cookie to each child. Mmmm cookies are so yummy! But don’t start eating them yet. You need to count how many M&M’s of each different color are in your cookie and write down the your number. (Use worksheet M&M Cookie Counting pg 9).

Presentation (10-12 minutes)

Explain to the students that you will work together to solve Mouse’s addition problems. Review the content and language objectives written on the blackboard (objectives are on pg 2 of this unit) and tell students they will be making addition stories. They will also be writing, reading or saying the equation that goes with the story problem.

If you add the number of red M&M’s to the number of blue M&M’s you have, how many red and blue M&M’s do you have?
Teacher might say

Here is my cookie. Let’s count how many red M&M’s there are. One, two, three, four. I have 4 red M&M’s. I will write the number 4 on the chart paper.
Now I need to know how many blue M&M’s my cookie have. Let’s count – One, two. My cookie has 2 blue M&M’s. I will write the number 2 on my chart.
Now I need to know how many red and blue M&M’s I have. Hmmm… I have 4 red M&M’s and 2 blue M&M’s and I want to know how many M&M’s are all together (put arms in a circle form in front of you to indicate “together” “total” – have students make the gesture also).
I will draw 4 red M&M’s and 2 blue M&M’s (on the chart under the equation) and now I will count them all together. Let’s see… 4, 5, 6. I have 6 M&M’s in all.

Wow…we just solve an addition problem! Addition is putting things together. You are bringing things from one area (red M&M’s) and combining with another (blue M&M’s).
To indicate addition we use the sign + (plus). When we see this sign (point to the + sign) we know we are putting things together. We are adding. We are joining things together.
The sign = equal tell us what the total is, how many M&M’s in all (use hand sign).

So if I read this number sentence I will say
4 red M&M’s plus 2 blue M&M’s equals 6 red and blue M&M’s. Have the class repeat the sentence. Write the equation 4+2=6

Practice & Application (10-12 minutes)

Read the following story off Picture Card A (see pg 10) and show it to students:
Mouse has 2 chocolate chip cookies. (teacher attaches the card with 2 cookies on the magnetic board)
The teacher will roll a number cube marked 1, 2, and 3
His friend gave him ___ sugar cookies. How many cookies does Mouse have now? (teacher attaches the card with ___ cookies on the magnetic board) making a graphic organizer (see following example)

Mouse has 2 chocolate chip cookies. 1 friend gave him 1 sugar cookie. How many cookies total?

2 + 1 = 3
The teacher can then ask the class, “How many cookies does Mouse have now?” As students give their solutions, it is acceptable to allow many students to share their solution, even if they all say the same solution.

The teacher might say:
*How many cookies does Mouse have now? Does anyone have a different solution?*

Read the following story of Picture Card A again and say:

*Let’s think about this problem. We have a Mouse, Here is the Mouse (points to the blackboard). We need two chocolate chip cookies (calls 2 students to come and stand in front of the class. The teacher continues by asking ___ more students to stand up but in a separate group from the first two students.)*

The teacher can then ask the class, “How many cookies does Mouse have now?” As students give their solutions, it is acceptable to allow many students to share their solution, even if they all say the same solution.

The teacher might say:
*How many cookies does Mouse have? Does anyone have a different solution?*

Regardless of the solution, the teacher should not lead students to think whether their solution is correct or incorrect.

The teacher then asks students: *How can we find out how many cookies does Mouse have?*

Possible responses:
*We can count the number of students (cookies). I know that I start at 2 and then count on ___ more.
I know that 2 and ___ is __.
The teacher will write the equation 2 + ___ = ___*

**Practice and Application (15-17 minutes)**

Small Group activity (groups of 4):

Pass out cereal and work mats (pg 14) to students.
*I’m going to tell you a story. Use your counters and work mat to solve the story problem.*

Read the following story of Picture Card B (pg 11):
*Mousse has 3 chocolate chip cookies.*

The teacher rolls the number cube.
*His friend gave him ___ sugar cookies. How many cookies does Mouse have now?*

Allow students to use their cereal (cookies) and work mat however they want in order to represent the problem.

After students have had a few minutes to work on the problem, ask students:
*How many cookies does Mouse have?*

As students share their solution, ask students to share their strategies. Possible responses:
*I put 3 cookies on the mat and then I put ___ cookie(s) on the mat. Then I counted them.
There were 3 cookies on the mat.
I knew that ___ more is __.
I knew that 3 and ___ is ___.

Tell students to clear their work mat and get ready for another story problem.

Working in small groups students will read and orally explain the story card to each other. Follow the process above to have students solve the problem using any strategy. Do this with Picture Cards D, E, F, G, H, I, and J. (pages 12 & 13) – See performance indicators (pg 2)

Ask students to discuss with their partners

<table>
<thead>
<tr>
<th>Intermediate Fluency</th>
<th>What happens when I join quantities together? Give examples to justify your meaning.</th>
</tr>
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<td>Speech Emergence</td>
<td>What happens when I join quantities together?</td>
</tr>
<tr>
<td>Early Production</td>
<td>Tell what I do when I join quantities together. (pg.17)</td>
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</tr>
<tr>
<td>Pre Production</td>
<td>Point to the picture card that shows joined quantities together. (pg.18)</td>
</tr>
</tbody>
</table>

**Assessment**

As students are working, observe:

- Do students place the correct number of cookies on the mat?
- Can students tell you the total number of cookies?
- Could any students immediately put cereal out without modeling the problem?

As a whole class review objectives and vocabulary.
Reflection:

The original math lesson of this unit was modified for my bilingual class.

I want my students to know addition and understand the names and usage of the mathematical language for addition. The modifications in this lesson include visuals, think aloud, and it models how to solve the problem. All these modifications are critical to ELLs. It allows them to participate in discussions and demonstrate an understanding of the concept taught in the lesson.

Reading the book *If You Give a Mouse a Cookie* by Laura Numeroff and eating the M&M’s cookies creates a shared experience for the students. There are plenty of opportunities for all students to interact and help one another as they learn simple addition problems. Hopefully they will understand how addition is used in everyday life.

Students are prepared to successfully acquire the academic demands of the lesson if there are provided with the main idea, the content specific vocabulary, and the sentence structures related to the lesson.
M&M Cookie Counting

(From www.firststage.org/media/pdf/Mouse_EG_FINAL.pdf)

Fill in the correct number for each statement

I have ___________ red M&M’s in my cookie.

I have ___________ blue M&M’s in my cookie.

I have ___________ green M&M’s in my cookie.

I have ___________ orange M&M’s in my cookie.

I have ___________ yellow M&M’s in my cookie.

I have ___________ brown M&M’s in my cookie.

Now you can eat your cookie!
If You Give a Mouse a Cookie - Picture Card B
Blank Work Mat for Students
1 + 1 = 2

2 + 1 = 3

2 + 2 = 4

3 + 1 = 4

4 + 2 = 6

1 + 4 = 5
Tell what you do when you join quantities together.

When I join quantities together I ______________.

Word bank:

* add
* combine things
* put things together
Point to the picture card that shows joined quantities together.

\[ \begin{array}{c}
\text{+} & = & \text{+} \\
\text{+} & = & \text{+} \\
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\end{array} \]
Lesson 2
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| Students will demonstrate knowledge of key content vocabulary by defining what the words *add, plus, in all, altogether, total* and *sum* mean in their own words. | In small groups, students will define the key math vocabulary in writing and orally: *add, plus, in all, altogether, total* and *sum.*  
In small groups, students will orally create their own story problems.  
In small groups, students will write/draw the process followed to solve the problem. |

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<td>In small groups, students will write (in their own words) the definition of the targeted math vocabulary and explain in writing how they solved the problem.</td>
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<td>In small groups, students will use a word bank and sentence starters to write targeted math vocabulary and to show how they solved the problem.</td>
<td>In small groups, students will write targeted math vocabulary using a word bank and completing one-two word sentences. Students will write/draw to show how they solved the problem.</td>
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<td>In small groups students will orally justify the process they have followed to solve the problem by using the appropriate math vocabulary.</td>
<td>In small groups students will orally explain the process they have followed to solve the problem by using the correct math vocabulary.</td>
<td>In small groups students will orally tell the addition story equation by using key math vocabulary.</td>
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<td>Define &amp; Paraphrasing</td>
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<td><em><strong>1</strong></em> means _<em><strong>2</strong></em></td>
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<td>Plus,</td>
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Lesson 2
Grade K, Day 2 _ Addition Words
SIOP Created Version

Common Core State Standards:
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

**MCCK.OA.1** Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

**MCCK.OA.2** Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

**MCCK.OA.5** Fluently add and subtract within 5.

Standards for Mathematical Practice:
• Make sense of problems and persevere in solving them.
• Reason abstractly and quantitatively.
• Use appropriate tools strategically.
• Look for and express regularity in repeated reasoning.

Duration: 35 minutes

Vocabulary: *add, plus, in all, altogether, total and sum*

Materials:
• Addition puzzles
• Word Problem Chant to Teach Key Words for Addition
  (The Teacher’s Workshop [http://www.teachersworkshop.com/twshop/songschants.html](http://www.teachersworkshop.com/twshop/songschants.html))
• Plastic plate divided into 3 sections
• Counters
• Numeral Cards 0-5.

Grouping:
Whole class, small groups

Instructional Procedures:
Motivation (5-7 minutes)

Whole group:
Students are in a circle. Teacher gives each student a piece of an addition puzzle (pg 6), students have to find the matching piece. Students will ask the person next to them *I have _ +_ or I have ___* (the sum). *What do you have?* The student will answer *I have _ +_ or I have ___*. *Is it a match?* Yes or No. If it is a match they sit down together. If it is not a match, the student asks the next person until they find the matching piece.

Presentation (10-12 minutes)

Teacher will ask students to discuss with their partners (1-2 minutes) what they did when they were looking for the matching piece. Ask students to share their answers. Some answers might be *addition, putting things together, joining things…*

Teacher reads content and language objectives (pg 1). Today you are going to learn key addition words. Teacher will have a graphic organizer on the blackboard (shape of a + sign, pg 7) with the title *Addition Words.* Teacher will explain there are certain words to indicate addition and will explicitly introduce the words *add* (put together two or more amounts), *plus* (the sign to indicate addition), *in all, altogether, total* and *sum* (all these terms indicates the total amount resulting from putting two or more things together).
Teacher will introduce *Word Problem Chant* (To the tune of Rockin’Robin) to facilitate the learning of the math vocabulary.

*These are the key words that tell you what to do-*

Listen to us and you’ll **add** too!

*How many in all?*

*What is the **total**?*

*Put them **altogether**?*

*It’ll give you the **sum** too.*

*Tweetle diddly dee, tweedlely diddly dee* (sing 3 times)

**Practice & Application** (15-17 minutes)

Students will record the new words in their math journal. They will do so by:

1) Completing the graphic organizer *Addition Words* (pg 7-8). Students must select only the vocabulary indicating addition.

2) Completing the Vocabulary Activity Sheet (pg 9) in writing using their own words to define the vocabulary words, draw a picture/symbol illustrating the concept, and completing the frame _____ means ______.

Teacher will monitor students to determine if there is confusion and to clarify meaning. (See performance indicators pg 1)

In small groups, students will create their own math problem using the *Addition Plate*. Students will turn over a numeral card (pg 10). Put as many counters as the picture shows in one small section on the plate. Then turn over another numeral card. Put as many counters as the picture shows in the other small section on the plate. Join the counters together in the larger section on the plate. Explain the addition problem using the math vocabulary. Students will record the work with the addition plate using pictures and numbers (pg 11). Teacher will listen, ask for justification, and clarify misconceptions as students are playing the game. (See performance indicators pg 1)

Students will discuss the new vocabulary words using the Pair-Share Strategy. Students will review their own descriptions and illustrations of the new vocabulary. In pairs they will discuss their descriptions. Students will share aloud their conclusions. (See performance indicators pg 1)

**Wrap-up** (5 minutes)

Review objectives. Rate your learning by completing a Student Progress Chart (pg 12)
Reflection

By having students play "Find Your Match" they are encouraged to interact among their peers as they read and practice the concept of addition as well as expressing themselves orally following the sentence pattern provided ("I have _ +_ " or "I have __ :” “Is it a match? ”).

The goal of this lesson is for students to be able to use properly key vocabulary words to understand the math concept of addition and use the math language to articulate their understanding.

I feel it is essential for students that I explicitly teach the vocabulary of addition before starting subtraction. The specific teaching of vocabulary is crucial for ELLs if we want them to apply this knowledge in everyday situations. These words are not being taught in isolation but in the context of the lesson. To practice the key vocabulary students learn the Word Problem Chant. The catchy tune helps students remember the words and their meaning.

To help students visualize and remember the key math words, the teacher and students prepare a graphic organizer, which is posted on the word wall. Students use their math journal to record the new words. This activity is very important to ELLs because the learner has to think what each word means in order to communicate it in writing.
1 + 1 = 2
2 + 1 = 3
2 + 2 = 4
4 + 1 = 5
3 + 3 = 6
5 + 2 = 7
4 + 4 = 8
6 + 3 = 9
8 + 2 = 10
1 + 0 = 1
Addition Words
total join add in all and
altogether combine subtraction
plus sum minus
Word: ____________________________

Description:
_____________________________________________________
_____________________________________________________
_____________________________________________________

Illustration:

Word Bank:
add         altogether         combine         plus
and         addition          join             in all
sum         total             

_________________________ means __________________________.
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Addition Plate

Use pictures and numbers to show your work with the addition plate.
# Student Progress Chart

<table>
<thead>
<tr>
<th>Word</th>
<th>I understand the term and am not confused about its meaning or usage.</th>
<th>I'm not sure I understand the term, but I have some idea as to its meaning.</th>
<th>I really don't understand the term at all.</th>
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Lesson 3
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<thead>
<tr>
<th><strong>Content Objective:</strong></th>
<th><strong>Language Objectives:</strong></th>
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<tbody>
<tr>
<td>Students will be able to solve subtraction problems.</td>
<td>Students will listen to teacher tell a subtraction problem. In small groups, students will read a story problem, identify key information, and solve the problem. In small groups, students will orally tell subtraction problems. In small groups, students will write subtraction equations.</td>
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</table>

**Performance Indicators**

<table>
<thead>
<tr>
<th><strong>Domain/Topic</strong></th>
<th><strong>Level 5</strong></th>
<th><strong>Level 4</strong></th>
<th><strong>Level 3</strong></th>
<th><strong>Level 2</strong></th>
<th><strong>Level 1</strong></th>
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<tbody>
<tr>
<td><strong>Reading &amp; Writing</strong></td>
<td>In small groups, students will read subtraction problems and identify key information. In writing students will justify how they solved the problem.</td>
<td>In small groups, students will read subtraction problems, and explain in writing/drawing how they solved the problem.</td>
<td>In small groups, students will read subtraction problems by arranging sentences in a sequential order. Students will write the subtraction equations.</td>
<td>In small groups, students will read subtraction problems by arranging sentences (with picture representation) in a sequential order. Students will write the equation by completing the sentence frame __ - (minus)__ =(equals) ___.</td>
<td>In small groups, students will read subtraction problems by matching the answers to picture cards (either orally or pointing to the correct card). Students will write the equations by drawing it.</td>
</tr>
<tr>
<td><strong>Speaking &amp; Listening</strong></td>
<td>In small groups, students will orally create and explain subtraction problems using the appropriate math vocabulary.</td>
<td>In small groups, students will orally explain subtraction problems using the appropriate math vocabulary.</td>
<td>In small groups, students will orally tell the subtraction story equation by using key math vocabulary.</td>
<td>In small groups, students will orally tell the subtraction problem by using the sentence frame.</td>
<td>In small groups students will orally name or point to the correct subtraction equation.</td>
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<tr>
<td>Function</td>
<td>Situation</td>
<td>Expressions</td>
<td>Vocabulary</td>
<td>Grammar</td>
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<tr>
<td>Summarize</td>
<td>• Subtraction</td>
<td>Subtraction is _______.</td>
<td>• taking something away.</td>
<td>Use of capital letters at the beginning of the sentence.</td>
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<td>- means _______.</td>
<td>• removing things.</td>
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<td>• subtraction</td>
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<td>• less</td>
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<td>• take away</td>
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<td>What do I need to _____?</td>
<td>know, find out</td>
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<tr>
<td>Analyze</td>
<td>Word Problems</td>
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<td>Use of punctuation at the end of sentences.</td>
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</tbody>
</table>
Lesson 3
Grade K, Day 3 – Subtraction Problems
www.mathathome.org/.../MonkeyMania/LessonPlanMonkeyManiaWeb.php

SIOP Modified Version (purple type indicates modification)

Common Core State Standards:
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

MCCK.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

MCCK.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

MCCK.OA.5 Fluently add and subtract within 5.

Standards for Mathematical Practice:
• Make sense of problems and persevere in solving them.
• Reason abstractly and quantitatively.
• Use appropriate tools strategically.
• Look for and express regularity in repeated reasoning.

Duration: 45 minutes

Vocabulary: take away, remove, subtraction, minus

Materials:
• Five Little Monkeys Jumping on the Bed, by Eileen Christelow; Scholastic Inc. NY. 1991. ISBN 0395557011
• Cookies (1 per student)
• Recording Sheet
• Work mats / Monkey manipulatives
• Ten-Frame / counters
• Number Cube 1-6

Grouping:
Whole class, small groups

Instructional Procedures:
Motivation (5-7 minutes)

Small Groups (3-4 students):
Each group of students gets 4 cookies and a recording sheet (pg 8). Students are assigned a number in a clockwise rotation. As a group they count how many cookies they have on their plate. Student 2 records the amount of cookies. Student 1 eats one cookie. Student 2 records how many cookies are left. Student 2 passes the recording sheet to student 3 and eats one cookie. Student 3 records how many cookies are left. Student 3 passes the recording sheet to student 4 and eats one cookie. Student 4 records how many cookies are left. Student 4 passes the recording sheet to Student 1 and eats one cookie. Student 1 records how many cookies are left. As a group students discuss what they observed. Do they have fewer or more cookies? What action did they perform? As students were eating the cookies, were they removing cookies from the plate or adding? Teacher writes their answers on a chart paper.

Presentation (15-17 minutes)
Let’s count how many triangles are in this set… 1, 2, 3, 4, 5. There are 5!

Now, let’s take two triangles away…

Count how many triangles are left in the set… 1, 2, 3. There are 3 left!

So, 5-2=3

(teacher reads the equation)

What do you think we just did? – Some answers might be: we took away 2 triangles, we had 5 triangles and we move away 2, so we have 3 triangles left.

Teacher says, this operation is called subtraction. Teacher writes the word on the chart and asks students to repeat the word. Today we are going to learn about subtraction. Subtracting is the action of “taking” an object “away” from a larger group, resulting in a smaller group of objects.

Teacher models what subtraction might look like. For example, teacher holds up 5 of her fingers. “I am holding up 5 fingers. What if I subtract or take away 3 fingers?” Teacher tucks 3 of the fingers behind the palm. “How many fingers are left?” Teacher shows the children the remaining outstretched fingers. “Let’s count how many fingers are left?” “One, two. Yes, two fingers are left.” “So we can say that if we have 5 fingers take away 3 fingers, equals 2 fingers. Is this correct?” Teacher solicits answers and writes the following number sentence, 5-3=2 on the chart.

Teacher explains the sign used to represent “take away” is called minus. Teacher writes the word on the board. Ask students to repeat the word.

Ask the children to solve one or two subtraction problems as a group, using their fingers.
number sentence on the chart / students read ____ minus ____ equals ____.

Teacher introduces the book, *Five Little Monkeys Jumping on the Bed*. Look at the cover. *Do you see all those monkeys on the bed? Let’s count all the monkeys on the bed. One, two, three, four, five.*

What do you think is going to happen?” It is likely that many of the children know this song and will know the next lyric or line in the book. That is okay. When reading the book, teacher rephrases what happens by asking how many monkeys are remaining on the bed after one falls off. Teacher reads the book. Teacher pauses and asks questions after a monkey falls out of the bed. For example: *Three little monkeys jumping on the bed, one falls off and bumps his head. Momma calls the doctor and the doctor says, “No more monkeys jumping on the bed!”* Then, teacher asks before turning the page, *NOW, how many monkeys are jumping on the bed?* The next page in the book will validate their answers. Teacher keeps track of the numerical equations that is asking on the big, chart paper or dry erase board. Show the children how they are thinking in a numerical context and have them begin to connect number sentences with the subtraction that they are doing throughout the book. For example, after teacher reads the first sequence in the book, “5 monkeys………”, and you ask the children how many monkeys are remaining after 1 monkey fell off the bed, the number sentence that should accompany that operation is 5-1=4.

Teacher writes out the subtraction problems that accompany each verse of the book.

5 - 1= ________ 4 - 1 = ________ 3 - 1= ________ 2 - 1 = ________ 1 - 1 = ________

Students act out the song. 5 children stand up and as each “monkey” bumps their head, the child sits down. The children can also pretend to be on the phone when “Mama calls the doctor.”

Teacher extends the children’s vocabulary and the underlying mathematical operation that is being utilized by reinforcing the subtraction involved. When reading the book or singing the song, after the children complete a verse, teacher restates the verse in numerical terms. “4 monkeys were jumping on the bed, one fell off. 4 take away 1 equals 3.” Teacher points to the numerical sentences on the board while reinforcing the number sentences.

**Practice/Application (15 minutes):**

Pass the work mats (pg 9), monkey manipulatives.

Tell the following story to the class:

*There are 7 monkeys jumping on the bed. 1 monkey fell off. How many monkeys are on the bed now?*

Use questions to begin the problem solving process.

*What will happen to the number of monkeys if 1 falls off?*  
*How many monkeys are there now?*

Allow many students to respond even if they have the same solution.

*What did we have to do to solve this problem?*

Use this question to reinforce to students the idea that after the action of the problem (removing monkeys), the remaining monkeys need to be counted in order to solve the problem.

Use the same problem and support students through the process of using counters in a Ten-Frame to solve the problem. (Teacher models on board with magnetic Ten-Frame)

*How many monkeys were jumping on the bed?* Ask a student to put counters on the ten-frame to match the number of monkeys.  
*What happened next? (1 monkey fell off).*  
Ask a student to change the Ten Frame to match the action of 1 monkey falling off the bed.

*How do we figure out how many monkeys are left on the bed? (We need to count the counters that are left).*  
Ask students to share their solution.
Give each pair of students a ten frame (pg 10), counters, a number cube and a subtraction problem frame.

There are ___ monkeys jumping on the bed. 1 monkey fell off. How many monkeys are on the bed now? (Roll the number cube to determine the start number). (pg 11, pg 12, pg 13)

Allow students to solve the problem.
Ask students to share their solutions and their strategies. (See performance indicators pg 1)

Possible responses, for the story: “There are 4 monkeys jumping on the bed. 1 monkey fell off. How many monkeys are on the bed now?”
I put out 4 counters, I took away 1. Then I counted what was left. There were 3 left, so there were 3 monkeys on the bed now.
I used 4 counters, I counted back and said 3 next. I landed on 3 so there are 3 monkeys on the bed now,
I counted from 1 and said 2, 3 and 4. I said 3 numbers, so there are still 3 monkeys on the bed now.
I knew that 3 comes right before 4 when I count. So there are 3 monkeys on the bed now.
I knew that 1 less than 4 is 3. So there are 3 monkeys on the bed now.

Wrap-up (5 minutes)
Review objectives.

Students discuss with their partners.

Speech Emergence : What is something you learned about subtraction today?
Early Production : What is something you learned about subtraction today? (Pg 14)
Pre Production : Is subtraction taking an object away from a larger group? – Yes  No
Reflection

To begin the lesson I allow students to experiment with subtraction and draw their own conclusions. In doing so, students have an opportunity to negotiate meaning, get information about the topic and demonstrate their understanding of the concept before we start the lesson.

Students have ample opportunities to use and develop the four language domains. In general, the language proficiency of the students in my classroom is at level 2 and 3. To accommodate the different language levels of the students I differentiate the writing segment of the lesson where students can demonstrate what they are learning by drawing pictures, using their L1 and completing cloze exercises.

I also want to encourage my students to extend their oral language skills by elaborating on their responses. I do this by asking open-ended questions, modeling the sentence structure to convey the meaning of subtraction, providing students with sentence starters and requesting students to respond in complete sentences following the sentence pattern. This practice is valuable for ELLs because these sentence patterns can be applied and used in other content areas.

I use the book Five Little Monkeys Jumping on the Bed, by Eileen Christelow to facilitate the understanding of the subtraction math concept, by engaging students in problem-solving experiences and developing language.
We started with ______ cookies.

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<th>Cookies we ate</th>
<th>Cookies left</th>
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Ten Frame
Intermediate Fluency & Speech Emergence Level

Subtraction Problems

There are ________ monkeys jumping on the bed. 1 monkey fell off.

How many monkeys are on the bed now?

(Roll the number cube to determine the start number).
Early Production Level:

Subtraction Problems

There are ________ monkeys jumping on the bed.

1 monkey fell off.

How many monkeys are on the bed now?

(Roll the number cube to determine the start number).

Directions:

• Roll the number cube

• Start with the number on top

• Solve the problem ________ - 1 = ________
Pre Production Level:

Subtraction Problems

There are ________ on the ________.

1 fell off.

How many are in the ________ now?

__________ - 1 = ____________
When I subtract I ______________

• take away

• remove

• know how many are left
Original Lessons
Original Materials

• Unit Introduction
• Lesson 1 – If You Give a Mouse a Cookie (pages 1-2)
• If You Give a Mouse a Cookie – Picture Cards (pages 3-7)
• Lesson 2 – One Less Dog (pages 8-10)
• Picture Cards (pages 11-15)
• Lesson 3 – How Many More (pages 16-18)
• Picture Cards (pages 19-22)

Lesson Plans from North Carolina Department of Public Instruction

www.ncdpi.wikispaces.net

Georgia Department of Education
Common Core Georgia Performance Standards Framework
Kindergarten Mathematics • Unit 4

www.georgiastandards.org/Common-Core/Pages/Math-K-5.aspx
Title: Investigating Addition and Subtraction
Grade Level: Kindergarten
Target Group: Sheltered content course
Source of Written Reading Material:
  • If You Give a Mouse a Cookie by Laura Numeroff
Source of Lessons:
  • Georgia Department of Education – Common Core Georgia Performance Standards Framework – Kindergarten Mathematics Unit 4
  • North Carolina Department of Public Instruction
    www.ncdpi.wikispaces.net
Learning Goals:
  I want my students to know the difference between addition and subtraction.
  I want my students to know how to solve problems using manipulatives.
  I want my students to know how to decompose numbers.
  I want my students to know how to explain what they are thinking.
Lesson 1
If You Give a Mouse a Cookie
(North Carolina Department of Public Instruction
www.ncdpi.wikispaces.net)

Grade: Kindergarten

Mathematical Goal:
Students will be able to perform addition and subtraction problems.

Common Core State Standards:
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
MCCK.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
MCCK.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
MCCK.OA.5 Fluently add and subtract within 5.

Standards for Mathematical Practice:
• Make sense of problems and persevere in solving them.
• Reason abstractly and quantitatively.
• Use appropriate tools strategically.
• Look for and express regularity in repeated reasoning.

Duration: 35-40 minutes

Materials:
• If You Give a Mouse a Cookie by Laura Numeroff
• Cookie shaped cereal for each student
• Work mats
• Number cubes marked 1, 2 and 3.

Grouping:
Whole group, pairs

Instructional Procedures:

Engage
During whole group, read the story If You Give a Mouse a Cookie. Explain to the students that you will work together to solve Mouse's problem. Read the following story off Picture Card A (see pg 3) and show it to students:
Mouse has 2 chocolate chip cookies.
The teacher will roll a number cube marked 1, 2, and 3
His friend gave him ___ sugar cookies. How many cookies does Mouse have now?

Ask students to come act out the story. The teacher might say:
Let's think about this problem. We have a Mouse, Here is the Mouse (points to the blackboard). We need two chocolate chip cookies (calls 2 students to come and stand in front of the class. The teacher continues by asking ___ more students to stand up but in a separate group from the first two students.)

The teacher can then ask the class, "How many cookies does Mouse have now?" As students give their solutions, it is acceptable to allow many students to share their solution, even if they all say the same solution.
The teacher might say:
How many cookies does Mouse have? Does anyone have a different solution?
Regardless of the solution, the teacher should not lead students to think whether their solution is correct or incorrect.

The teacher then asks students: *How can we find out how many cookies does Mouse have?*

Possible responses:
*We can count the number of students (cookies). I know that I start at 2 and then count on ___ more. I know that 2 and ___ is ___.*

**Explore and Explain**

Pass out cereal and work mats to students.
*I'm going to tell you a story. Use your counters and work mat to solve the story problem.***

Read the following story off Picture Card B (pg 4):
*Mouse has 3 chocolate chip cookies.***

The teacher rolls the number cube.
*His friend gave him ___ sugar cookies. How many cookies does Mouse have now?***

Allow students to use their cereal (cookies) and work mat however they want in order to represent the problem.

As students are working, observe:
*Do students place the correct number of cookies on the mat?*
  *Can students tell you the total number of cookies?*
  *Could any students immediately put cereal out without modeling the problem?*

After students have had a few minutes to model the problem, ask students:
*How many cookies does Mouse have?***

As students share their solution, ask students to share their strategies. Possible responses:
*I put 3 cookies on the mat and then I put ___ cookie(s) on the mat. Then I counted them.***
*There were 3 cookies on the mat.*
*I knew that ___ more is ___.*
*I knew that 3 and ___ is ___.*

Ask students to clear their work mat to get ready for a new story problem.

Read the following story off Picture Card C and show the card to students:
*Mouse has 1 chocolate chip cookie. The teacher rolls the number cube.*
*His friend gave him ___ sugar cookies. How many cookies does Mouse have now?***

Allow students to use their cookies and work mat however they want in order to represent the problem.

As students are working, observe:
*Do students place the correct number of cookies on the mat?*
  *Can students tell you the total number of cookies?*
  *Could any students immediately put cereal out without modeling the problem?*

After students have had a few minutes to model the problem, ask students:
*How many cookies does Mouse have?***

As students share their solution, follow up with students to share their strategies.
Possible responses:
*I put 1 cookie on the mat and I counted.*
*I put 1 cookie on the mat and then counted on.*
*I knew that 1 and ___ is ___.***

Tell students to clear their work mat and get ready for another story problem.

Working in pairs, students will read and explain the story card to each other. Follow the process above to have students act out and solve the problem. Do this with Picture Cards D, E, F, G, H, I, and J.
Lesson 4: One Less Dog
Overview and Background Information

Mathematical Goals
By the end of the lesson students will:
• Model and solve a subtraction, result unknown problem
• Explain their strategies for solving the problem

Common Core State Standards
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
K.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
K.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
K.OA.5 Fluently add and subtract within 5.

Count to tell the number of objects.
K.CC.5 Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

Emphasized Standards for Mathematical Practice
1. Make Sense and Persevere while Solving Problems
2. Reason Abstractly and Quantitatively
5. Use Appropriate Tools Strategically
8. Look for and Express Regularity in Repeated Reasoning

Prior Knowledge Needed
Making sets of objects (within 5), counting sets of objects consistently with accuracy (within 5)

Vocabulary
fewer, more, remove

Materials
Whole class: number cubes (0-2), counters, work mat
Stations:
Station 1: number cubes (0-2), work mat, counters
Station 2: picture cards, counters, work mat
Station 3: number cards, ten frame, counters
Station 4: cubes
Station 5: paper plate with line down the middle, beans

Tasks in the Lesson
Engage 7-10 minutes
During whole group time, roll a number cube (1-6) and use that as your start number.
Tell the following story to the class:
There are ___ dogs in the park. 1 dog went home. How many dogs are there now?

Use questions to begin the problem solving process.
Who can retell the story to the class?
What is our story about? (dogs in the park).
How many dogs were in the park? (students respond)

Represent the dogs by having students stand up.
What happened in our story? (1 dog went home)
How can we show that? (have 1 student sit down or move)
Some students may want to have 1 more student stand up. If this happens you may have to ask students, *What will happen to the number of dogs if 1 runs away?*

*How many dogs are there now?*
Allow many students to respond even if they have the same solution.

*What did we have to do to solve this problem?*
Use this question to reinforce to students the idea that after the action of the problem (removing people), the remaining people need to be counted in order to solve the problem.

Use the same problem and support students through the process of using counters or cubes in a Ten Frame to solve the problem.
*How many dogs were there in the park?* Put counters on the ten frame to match the number of dogs.
*What happened next?* (1 dog ran away).
Ask a student to change the Ten Frame to match the action of 1 dog running away.

*How do we figure out how many dogs are in the park?* (We need to count the counters that are left). Ask students to share their solution.

**Explore and Explain**

Give each student a ten frame and counters. Roll the number cube to determine the start number. The teacher will tell the story:
*There are ___ dogs in the park. 1 dog ran away.*

Allow students to solve the problem.
Ask students to share their solutions and their strategies.
As students give their solutions, it is acceptable to allow many students to share their solution, even if they all have the same solution. Regardless of the solution, the teacher should not lead students to think whether their solution is correct or incorrect.

Possible responses, for the story: *There are 4 dogs in the park. 1 dog ran away. How many dogs are in the park?*
*I put out 4 counters, I took away 1. Then I counted what was left. There were 3 left, so there were 3 dogs in the park now.*
*I used 4 counters. I counted back and said 3 next. I landed on 3 so there are 3 dogs in the park now.*
*I counted from 1 and said 2, 3 and 4. I said 3 numbers, so there are still 3 students on the playground.*
*I knew that 3 comes right before 4 when I count. So there are 3 dogs in the park now.*
*I knew that 1 less than 4 is 3. So there are 3 dogs in the park now.*

**Elaborate**

Students will spend the remainder of the lesson in independent work stations practicing concepts related to joining and number sense. The teacher's role is to scaffold and extend students' learning by interacting with students at each of the stations. The teacher should not be fixed at one station the entire time.

These stations are intended to focus on combinations of 3, 4, and 5 only. Each day a student should only be working on combinations of either 3, 4, or 5. This is determined by the teacher or the student.

Here is an overview of the five stations:
*Station 1: One Less Dog*
Students will roll a number cube, build the number with counters and find one less than their number.
No recording is needed at this station. Students continue this process.
Station 2: How Many in the Picture?
Students will select a Picture Card and recreate the picture with counters.
Students will create a story to match the Picture Card. Students will determine how many total counters they have. No recording is needed at this station. Students continue to select different story cards.

Station 3: One More Animal
Students will select a number card (0-5) and use that number as the start number in their story problem. Students make that number using counters. From the start number, students will add one more counter and count the total. No recording is needed at this station. Students continue to select different number cards.

Station 4: Snap It
Students will make a train of 3, 4, or 5 cubes and hold it behind their back. Students will snap of a few cubes and count them while holding the rest behind their back. Students will figure out how many cubes are behind their back.

Station 5: Tile Pictures
Students will make a picture using 4, 5 or 6 tiles. Students will trace their picture onto paper and circle two groups of the tiles. For example, if a student uses 4 tiles they could circle a group of 3 and a group of 1, or they could circle 2 groups of 2 tiles. Students continue to make pictures and find combinations of the number.

Evaluation of Students

Formative:
At Stations 1 and 2:
Do students accurately place the correct number of counters out?
Are students able to join two sets and correctly identify the total?

At Station 3-4:
What strategies are students using to determine what one more or one less counter is?

At Stations 5:
What groups of

Plans for Individual Differences

Extension: The number of objects at each station can be increased.

Intervention: If students are struggling, have students only work with the numbers 3 or 4.
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</table>
Lesson 2 - Ten Frame
I started with ___ cubes.

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<tr>
<th>Cubes I see</th>
<th>Cubes hidden</th>
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</table>

Lesson 2 - Snap It!
Lesson 3: How Many More?

Overview and Background Information

<table>
<thead>
<tr>
<th>Mathematical Goals</th>
<th>By the end of the lesson students will:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Determine the missing part</td>
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<td></td>
<td>• Explain how they found the missing part</td>
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</table>

<table>
<thead>
<tr>
<th>Common Core State Standards</th>
<th>Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>K.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.</td>
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<td>K.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.</td>
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<td>K.OA.5 Fluently add and subtract within 5.</td>
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</table>

**Count to tell the number of objects.**

<table>
<thead>
<tr>
<th>Emphasized Standards for Mathematical Practice</th>
<th>1. Make Sense and Persevereing while Solving Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior Knowledge Needed</td>
<td>2. Reason Abstractly and Quantitatively</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>5. Use Appropriate Tools Strategically</td>
</tr>
<tr>
<td>Materials</td>
<td>8. Look for and Express Regularity in Repeated Reasoning</td>
</tr>
</tbody>
</table>

**Prior Knowledge Needed**

- making sets of objects (within 5), counting sets of objects consistently with accuracy (within 5)

**Vocabulary**

join, more, fewer

**Materials**

Whole class: number cube, five frame

Tasks in the Lesson

**Engage 3-5 minutes**

During whole group time, the teacher rolls a number cube (0-5) and shows it to the class. Use this number cube as your start number.

*We want to put 5 cookies in each bag. Right now we have ___ cookies. How many more cookies do we need to fill the bag?*

Show a Five Frame to the students and ask:

*Who remembers how this can help us solve problems?*

The teacher should say:

*We have ___ cookies. Who can put counters on the five frame to show the cookies?*

*So, how do we find out how many more cookies we need?*

Ask students to share their solutions and their strategies.

As students give their solutions, it is acceptable to allow many students to share their solution, even if they all have the same solution.

The teacher might say: *How many cookies do we need? How did you solve this problem? Did anyone use a different strategy?*
Regardless of the solution, the teacher should not lead students to think whether their solution is correct or incorrect.

Possible responses:
I counted the empty spaces.
I knew that 5 is ___ and ___.
I started at ___ and counted in my head until I got to 5.

The teacher finishes representing the problem by placing ___ counters of a different color to fill the Five Frame.

**Explore and Explain** 10-12 minutes

Give each student a Five Frame and counters.
The teacher will roll the number cube again to get a start number.
The teacher will tell the story:
There are ___ dogs in the park. Some more dogs ran there. There are now 5 dogs in the park. How many dogs ran there?

Students will use the counters and Five Frame to solve the problem.
The teacher will ask students to share their solution and strategies.
Possible responses:
I counted the empty spaces.
I knew that 5 is ___ and ___.

Continue this with 3-4 more examples. The teacher should keep asking students questions to check for understanding.

**Elaborate** 30-35 minutes

Students will spend the remainder of the lesson in independent work stations practicing concepts related to joining and number sense. The teacher’s role is to scaffold and extend students’ learning by interacting with students at each of the stations. The teacher should not be fixed at one station the entire time.

These stations are intended to focus on combinations of 3, 4, and 5 only. Each day a student should only be working on combinations of either 3, 4, or 5. This is determined by the teacher or the student.

Here is an overview of the five stations:

Station 1: Kids on the Playground
Students will start with 3, 4, or 5 counters to represent kids on the playground. Students will roll a number cube and tell a story about that number of kids leaving. No recording is needed at this station. Students continue this process.

Station 2: Sharing Toys
Students will put 5 counters on a ten frame and roll a number cube (1-3). Students will take away that many counters. Students will determine how many counters are left. No recording is needed at this station. Students continue this process.

Station 3: One More Animal
Students will select a number card (0-5) and use that number as the start number in their story problem. Students make that number using counters. From the start number, students will add one more counter and count the total. No recording is needed at this station. Students continue to select different number cards.
Station 4: One Less Animal
Students will grab a picture card and put counters on each of the people. Students will roll a number cube and take away that many counters. Students will count the remaining counters to solve the problem.

Station 5: Snap It
Students will make a train of 3, 4, or 5 cubes and hold it behind their back. Students will snap off a few cubes and count them while holding the rest behind their back. Students will figure out how many cubes are behind their back.

Evaluation of Students
Formative:

Plans for Individual Differences
Extension: The number of objects at each station can be increased.

Intervention: If students are struggling, have students only work with the numbers 3 or 4.
Five Frame

[Diagram of 7 horizontal squares]

Five Frame

[Diagram of 7 horizontal squares]

lesson 3 - Five Frame
# Picture Cards 0-5

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</table>

**Lesson 3 - Picture Cards**
Snap It!

I started with ___ cubes.

<table>
<thead>
<tr>
<th>Cubes I see</th>
<th>Cubes hidden</th>
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IF YOU GIVE A MOUSE A COOKIE

Laura Numeroff

ILLUSTRATED BY
Felicia Bond
For Florence & William Numeroff, the two best parents anyone could ever possibly want! — L.J.N.

For Stephen — F.B.
If you give a mouse a cookie,
he's going to ask for a glass of milk.
Kindergarten Adding and Subtracting

http://georgewattspta.files.wordpress.com/2008/12/sandpaper3to6.jpg

North Carolina Department of Public Instruction

www.ncdpi.wikispaces.net
CCGPS Frameworks
Student Edition

Mathematics

Kindergarten Unit Four
Investigating Addition and Subtraction
CRITICAL AREA

The Critical Areas are designed to bring focus to the standards at each grade by describing the big ideas that educators can use to build their curriculum and to guide instruction.

1. Representing, relating, and operating on whole numbers, initially with sets of objects.

Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations, such as \(5 + 2 = 7\) and \(7 - 2 = 5\). *(Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.)* Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

OVERVIEW

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

For numbers 0 – 10, Kindergarten students choose, combine, and apply strategies for answering quantitative questions. This includes quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away. Objects, pictures, actions, and explanations are used to solve problems and represent thinking. Although CCGPS states, “*Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required*”, please note that it is not until First Grade when “Understand the meaning of the equal sign” is an expectation.

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: join, add, separate, subtract, and, same amount as, equal, less, more, compose, decompose.
## Number Sense Trajectory – Putting It All Together

### Trajectory

<table>
<thead>
<tr>
<th>Subitizing</th>
<th>Comparison</th>
<th>Counting</th>
<th>One-to-One Correspondence</th>
<th>Cardinality</th>
<th>Hierarchical Inclusion</th>
<th>Number Conservation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Being able to visually recognize a quantity of 5 or less.</td>
<td>Being able to compare quantities by identifying which has more and which has less.</td>
<td>Rote procedure of counting. The meaning attached to counting is developed through one-to-one correspondence.</td>
<td>Students can connect one number with one object and then count them with understanding.</td>
<td>Tells how many things are in a set. When counting a set of objects, the last word in the counting sequence names the quantity for that set.</td>
<td>Understands numbers are nested inside of each other and that the number grows by one each count. 9 is inside 10 or 10 is the same as 9 + 1.</td>
<td>The total number of objects remains the same when they are rearranged spatially. 5 is 4&amp;1 OR 3&amp;2.</td>
</tr>
</tbody>
</table>

### Number Relationships

<table>
<thead>
<tr>
<th>Spatial Relationship</th>
<th>Patterned Set Recognition</th>
<th>One and Two-More or Less</th>
<th>Understanding Anchors</th>
<th>Part-Part-Whole Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students can learn to recognize sets of objects in patterned arrangements and tell how many without counting.</td>
<td>Students need to understand the relationship of number as it relates to +/- one or two. Here students should begin to see that 5 is 1 more than 4 and that it is also 2 less than 7.</td>
<td>Students need to see the relationship between numbers and how they relate to 5s and 10s. 3 is 2 away from 5 and 7 away from 10.</td>
<td>Students begin to conceptualize a number as being made up from two or more parts.</td>
<td></td>
</tr>
</tbody>
</table>

### Addition and Subtraction Strategies

<table>
<thead>
<tr>
<th>One/Two More/Less</th>
<th>Make a Ten</th>
<th>Near Doubles</th>
</tr>
</thead>
<tbody>
<tr>
<td>These facts are a direct application of the One/Two More/ Less than relationships</td>
<td>Use a quantity from one addend to give to another to make a ten then add the remainder. 9 + 7 = 10 + 6</td>
<td>Using the doubles anchor and combining it with 1 and 2 more/less.</td>
</tr>
<tr>
<td>Facts with Zero</td>
<td>Doubles</td>
<td></td>
</tr>
<tr>
<td>Need to be introduced so that students don’t overgeneralize that answers to addition are always bigger.</td>
<td>Many times students will use doubles as an anchor when adding and subtracting.</td>
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</tbody>
</table>

Each concept builds on the previous idea and students should explore and construct concepts in such a sequence.

---

Developed by Graham Fletcher and adapted from:
Clements & Sarama Learning and teaching early math: The learning trajectories approach (2009)
Van de Walle & Lovin Teaching Student Centered Mathematics (K-3)
STANDARDS FOR MATHEMATICAL CONTENT

Understand addition as putting together and adding to, and understand subtractions as taking apart and taking from

MCCK.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings\(^1\), sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

MCCK.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

MCCK.OA.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., \(5 = 2 + 3\) and \(5 = 4 + 1\)).

MCCK.OA.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

MCCK.OA.5 Fluently add and subtract within 5

STANDARDS FOR MATHEMATICAL PRACTICE

The standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education.

Students are expected to:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

***Mathematical Practices 1 and 6 should be evident in EVERY lesson***

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MATHEMATICS • Kindergarten • UNIT 4: Investigating Addition and Subtraction
Georgia Department of Education
Dr. John D. Barge, State School Superintendent
May 2012 • Page 5 of 93
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### Problem Types

<table>
<thead>
<tr>
<th></th>
<th>Result Unknown</th>
<th>Change Unknown</th>
<th>Start Unknown</th>
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<tbody>
<tr>
<td><strong>Join/Combine</strong></td>
<td>Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?</td>
<td>Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5</td>
<td>Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5</td>
</tr>
<tr>
<td><strong>Separate/Decompose</strong></td>
<td>Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ?</td>
<td>Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 – ? = 3</td>
<td>Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? – 2 = 3</td>
</tr>
<tr>
<td><strong>Put Together/Take Apart</strong></td>
<td>Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?</td>
<td>Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 – 3 = ?</td>
<td>Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 5 = 4 + 1 5 = 2 + 3, 5 = 3 + 2</td>
</tr>
<tr>
<td><strong>Compare</strong></td>
<td>(&quot;How many more?&quot; version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? 2 + ? = 5, 5 – 2 = ?</td>
<td>(Version with “more”): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have?</td>
<td>(Version with “more”): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have?</td>
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<tr>
<td></td>
<td>(&quot;How many fewer?&quot; version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? 2 + ? = 5, 5 – 2 = ?</td>
<td>(Version with “fewer”): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?</td>
<td>(Version with “fewer”): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 – 3 = ?, ? + 3 = 5</td>
</tr>
</tbody>
</table>

*Adapted from Box 2-4 of Mathematics Learning in Early Childhood, National Research Council (2009, pp. 32, 33).
The document contains the following sections:

**ENDURING UNDERSTANDINGS**

- When elements are added to or joined to a set, there are three quantities involved: the starting amount, the change amount, and the resulting amount.
- A *separating* problem involves three quantities; the starting amount, the change amount (the amount being removed), and the resulting amount; however, the starting amount is the largest amount with the change amount being removed which leaves the resulting amount.
- *Part-Part-Whole* problems involve three quantities: two parts that are combined into one whole.
- *Compare* problems involve the comparison between two different quantities. The third quantity does not actually exist but is the difference between the two quantities. When one quantity is compared to another, the first quantity is either more than, less than, or equal to the second quantity.
- Problems can be solved in different ways.
- Problems can be modeled using objects, pictures, and words.
- Various combinations of numbers can be used to represent the same quantity. *(see table on previous page for examples)*

**ESSENTIAL QUESTIONS**

- Does the order of addends change the sum? Give examples to justify your thinking.
- How can I compare one quantity to another?
- How can I find the total when I put two quantities together?
- How can I find what is left over when I take one quantity away from another?
- How can I represent problem situations using objects, pictures, and numbers?
- How can I represent problems using objects, pictures, and numbers?
- How can I solve problems using objects, pictures, words, and words?
- How can I use different combinations of numbers to represent the same quantity?
- How can I use models to represent addition and subtraction?
- How can I use models to represent subtraction?
- How can using benchmark numbers help me when adding or subtracting?
- How do you know when your answer makes sense?
- What happens when I decompose a quantity?
- What happens when I join quantities together?
- What happens when sets are joined or separated?
- What happens when some objects are taken away from a set of objects?
- Why is it important that I can build the number combinations for the number 5? 10?
Although many students may have attended pre-school prior to entering kindergarten, this is the first year of school for some students. For that reason, no concepts/skills to maintain will be listed at this time. It is expected that teachers will differentiate to accommodate those students that may enter kindergarten with prior knowledge.

SELECTED TERMS AND SYMBOLS

The following terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

The definitions below are for teacher reference only and are not to be memorized by students. Teachers should first present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or use them with words, models, pictures, or numbers.

- Combine
- Compose
- Separate
- Decompose
- Compare
- Quantity

STRATEGIES FOR TEACHING AND LEARNING

Provide contextual situations for addition and subtraction that relate to the everyday lives of kindergarteners. A variety of situations can be found in children’s literature books. Students then model the addition and subtraction using a variety of representations such as drawings, sounds, acting out situations, verbal explanations and numerical expressions. Manipulatives, like two-color counters, clothespins on hangers, connecting cubes and stickers can also be used for modeling these operations. Kindergarten students should see addition and subtraction equations written by the teacher. Although students might struggle at first, teachers should encourage them to try writing the equations. Students’ writing of equations in Kindergarten is encouraged, but it is not required.

Create written addition or subtraction problems with sums and differences less than or equal to 10 using the numbers 0 to 10. It is important to use a problem context that is relevant to kindergarteners. After the teacher reads the problem, students choose their own method to model the problem and find a solution. Students discuss their solution strategies while the teacher represents the situation with an equation written under the problem. The equation should be written by listing the numbers and symbols for the unknown quantities in the order that follows the meaning of the situation. The teacher and students should use the words equal and is the same as interchangeably.
Have students decompose numbers less than or equal to 5 during a variety of experiences to promote their fluency with sums and differences less than or equal to 5 that result from using the numbers 0 to 5. For example, ask students to use different models to decompose 5 and record their work with drawings or equations. Next, have students decompose 6, 7, 8, 9, and 10 in a similar fashion. As they come to understand the role and meaning of arithmetic operations in number systems, students gain computational fluency, using efficient and accurate methods for computing.

The teacher can use scaffolding to teach students who show a need for more help with counting. For instance, ask students to build a tower of 5 using 2 green and 3 blue linking cubes while you discuss composing and decomposing 5. Have them identify and compare other ways to make a tower of 5. Repeat the activity for towers of 7 and 9. Help students use counting as they explore ways to compose 7 and 9.

COMMON MISCONCEPTIONS

Students may over-generalize the vocabulary in word problems and think that certain words indicate solution strategies that must be used to find an answer. They might think that the word more always means to add and the words take away or left always means to subtract. When students use the words take away to refer to subtraction and its symbol, teachers need to repeat students’ ideas using the words minus or subtract. For example, students use addition to solve this Take from/Start Unknown problem: Seth took the 8 stickers he no longer wanted and gave them to Anna. Now Seth has 11 stickers left. How many stickers did Seth have to begin with?

If students progress from working with manipulatives to writing numerical expressions and equations, they skip using pictorial thinking. Students will then be more likely to use finger counting and rote memorization for work with addition and subtraction. Counting forward builds to the concept of addition while counting back leads to the concept of subtraction. However, counting is an inefficient strategy. Teachers need to provide instructional experiences so that students progress from the concrete level, to the pictorial level, then to the abstract level when learning mathematics.

EVIDENCE OF LEARNING

By the conclusion of this unit, students should be able to demonstrate the following competencies:

- Represent the combining of two sets
- Model and understand the concept of part-part whole addition
- Represent the difference between two sets
- Model problem situations using objects, pictures, words and numbers
- Represent number combinations up to 10
- Count one-to-one in counting order to 20
- Understand and model number relationships
- Identify more, less and equal to when comparing sets
Georgia Department of Education
Common Core Georgia Performance Standards Framework
Kindergarten Mathematics • Unit 4

- Model multiple representations of the same number
- Solve addition and subtraction word problems within 10
- Decompose numbers less than or equal to 10
- Understand the relationship 0-10 number relationships

TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all Kindergarteners. These tasks or a task of similar depth and rigor should be used to demonstrate evidence of learning.

<table>
<thead>
<tr>
<th>Scaffolding Task</th>
<th>Constructing Task</th>
<th>Practice Task</th>
<th>Performance Task</th>
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</thead>
<tbody>
<tr>
<td>Tasks that build up to the constructing task.</td>
<td>Constructing understanding through deep/rich contextualized problem solving tasks</td>
<td>Games/activities</td>
<td>Summative assessment for the unit</td>
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<table>
<thead>
<tr>
<th>Task Name</th>
<th>Task Type/Grouping Strategy</th>
<th>Content Addressed</th>
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<tbody>
<tr>
<td>Addition/Subtraction Word Problems</td>
<td>Constructing Task Individual, Whole, Small Group</td>
<td>Addition and subtraction through word problems</td>
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<tr>
<td>Building Trains</td>
<td>Constructing Task Whole or Small Group</td>
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<td>Going Bananas</td>
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<td>Tug-O-War</td>
<td>Practice Task Partners</td>
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<tr>
<td>Race to 20 Revisited</td>
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<td>Number combinations to 5 (+/-)</td>
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<tr>
<td>Shake and Spill Addition/Subtraction</td>
<td>Constructing Task Whole, Small Group or Individual</td>
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<tr>
<td>Summoning 5’s and 10’s</td>
<td>Practice Task Partners</td>
<td>Using 5 as a benchmark number, number combinations to 10</td>
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<tr>
<td>Bo Peep’s Domino Dilemma</td>
<td>Practice Task Whole, Small Group or Individual</td>
<td>Number combinations to 5 and 10</td>
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<tr>
<td>The Candy Store</td>
<td>Practice Task Individual</td>
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<tr>
<td>Calling Out Reds? (5/10) Addition/Subtraction</td>
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<td>Mental computation of number combinations to 5 or 10.</td>
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<tr>
<td>Dropping Pennies</td>
<td>Performance Task Individual</td>
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<tr>
<td>Make 5/10 Go Fish</td>
<td>Practice Task Partners</td>
<td>Mental computation of number combinations to 5 or 10.</td>
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<tr>
<td></td>
<td>Practice Task</td>
<td>Number combinations to 5 through problem solving</td>
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<tr>
<td>Farmer McDonald</td>
<td>Whole, Small Group or Individual</td>
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<tr>
<td>4 Sums in a Row</td>
<td>Practice Task Partners</td>
<td>Mental computation of number combinations to 5 or 10.</td>
</tr>
<tr>
<td>The Bike Store</td>
<td>Performance Task Individual</td>
<td>Number combinations to 5 through problem solving</td>
</tr>
</tbody>
</table>

As this unit has no Culminating Task, you may pair/modify tasks to include all unit standards in combination.
Checklists
Write the page numbers and any other identifying features to identify those parts of your lessons that employ the following strategies.

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<td>I. A. Build and Activate Background Knowledge</td>
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<tr>
<td>I.B. Develop Vocabulary</td>
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<td>3-4</td>
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<tr>
<td>I. C. Use extensive Visuals, Realia, Manipulatives, &amp; Gestures</td>
<td>4-5-6</td>
<td>3-4</td>
<td>3-4-5-6</td>
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<tr>
<td>I. D. Model (Instructions, Processes)</td>
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<tr>
<td>I. E. Create Opportunities To Negotiate Meaning</td>
<td>5-6</td>
<td>4</td>
<td>4-5-6</td>
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<tr>
<td>II. Make Text Comprehensible</td>
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<tr>
<td>II.A. Intentional Use of Graphic Organizers</td>
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<td>3-4</td>
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<tr>
<td>II.B. Modify Written Text * Modified the lesson/ no text</td>
<td>*</td>
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<tr>
<td>II.C. Amplify Number of Activities per Text</td>
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<td>III. Make Talk Comprehensible</td>
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<tr>
<td>III.A. Pace Teacher’s Speech</td>
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<td>III.B. Use of Listening Guides</td>
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<td>III.C. Use of Word Walls</td>
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<td>III.D. Frame Main Ideas</td>
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<td>III.E. Check for Understanding</td>
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<td>IV. Change Traditional Classroom Talk</td>
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<tr>
<td>IV.A. Use Teacher Question and Response Strategies</td>
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<tr>
<td>IV.B. Practice Instructional Conversations</td>
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<tr>
<td>V. Engage at Appropriate Language Proficiency Levels</td>
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<tr>
<td>V.A. Vary Question Techniques based on Student’s Language Proficiency level – in conversations, activities, and assessments</td>
<td>6-7</td>
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<tr>
<td>VI. Give Students Voice</td>
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<tr>
<td>VI. A. Challenge students to produce extended academic talk</td>
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<tr>
<td>VI. B. Model Language for Oral and Written Production</td>
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<td>4-5</td>
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<tr>
<td>VI. C. Use Group/Pr. Work to Elicit Student Talk; Students as Researchers</td>
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<tr>
<td>VI. D. Respond to Student’s Voice – Writing and Error Correction</td>
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