The Kentucky Numeracy Project

Session 3 – Structuring to Five and Ten

February 17, 2011

Alice Gabbard
Cindy Aossey
Kris Jarboe
The Kentucky Numeracy Project

INTRODUCTION

Structuring to Five

Structuring to Ten

CLOSING

INTRODUCTION
SAGE Publications 2006 (reprinted 2009),
The Learning Framework in Number

**Unitary Strategies**

- Addition and Subtraction Arithmetical Strategies Conceptual Constructs 0 - 3
- Multiplication and Division Arithmetical Strategies Conceptual Constructs 0 - 5
- Place Value: Base-Ten Arithmetical Strategies Conceptual Constructs 0 - 5

**Composite Strategies**

- Addition and Subtraction Arithmetical Strategies Conceptual Constructs 4 - 5
- Multiplication and Division Arithmetical Strategies Conceptual Constructs 0 - 5

**Forward and Backwards Number Word Sequences**

- Forward and Backwards Number Word Sequences by Ones (Levels 0 – 5)
- Forward and Backwards Number Word Sequences related to Composite Units

**Written Labels**

- Numerals (Levels 0 – 5) and Numeral Sequences, Recording Symbols

**Structuring Numbers**

- Finger Patterns / Spatial Patterns / Combining and Partitioning

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US Math Recovery Council, Add+Vantage MR Program
Teaching for Depth

Based on the work of David Webb, Freudenthal Institute
Kentucky Numeracy Project

NUMERACY DEVELOPMENT

CURRICULUM FRAMEWORK

DYNAMIC DIAGNOSTIC ASSESSMENT

DYNAMIC INSTRUCTION
Individual Longitudinal Results of Students (n=159) who Received Mathematics Intervention in First Grade during 2006/2007

Terra Nova Pre-Test National %ile, Fall 2006
STRUCTURING NUMBER

Let’s try a little experiment...
STRUCTURING NUMBER

How many did you see?
Did you have to count by ones?
Did you use the structure to tell how many?

Try again...
STRUCTURING NUMBER

If you could tell there were seven dots without counting, you were able to “subitize.”

Try again...
STRUCTURING NUMBER

A little tougher?
Most people can only subitize quantities to six or seven.

Try again, but this time with a hint. There are five red dots.
STRUCTURING NUMBER

What did you see?

Try again with a larger number...
STRUCTURING NUMBER

What did you see?
Basic Facts – Flash Cards
Message from the President, Bethany Noblitt

As I write this, my last “Letter from the President,” I reflect upon my time serving the KCTM board. Selfishly, I think of everything that KCTM has done for me! The KCTM board has been a part of my professional and personal life since 2003. I have learned so much and gained so much from this experience. First and foremost, serving on the KCTM board has given me the opportunity to work with and learn from many amazing mathematics educators in Kentucky. It is always inspiring to see the dedication with which our state’s teachers approach their profession. Whether it was the other KCTM board members with whom I worked, teachers who generously shared their expertise at the annual conference, administrators who supported KCTM and mathematics teaching in their schools, or other education professionals who contributed to the mission of KCTM – all of these people coming together in the name of mathematics education in Kentucky has been a spectacular thing to witness.

I will serve on the board for another two years as Past-President; however, my role on the board will certainly change during that time. I am thankful for the opportunity to continue my work with the KCTM over the next two years – I can’t imagine not being a part of this wonderful, dedicated group of professionals.

I would like to specifically thank the following people for their hard work and dedication. These are the KCTM Board members and regular board meeting attendees who have given KCTM (and me!) so much during the past two (or more, in some cases) years.

Maggie McGatha is the best mentor I could have asked for as KCTM President. Her judgment and advice were always trusted and true.

Kari Ostby was a truly outstanding President-Elect and Conference Program Chair. She was meticulous in the details of conference planning and will be a wonderful President.

(Continued on page 2)

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<td>NCTM Update...Did You Know?, Kari Ostby</td>
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<td>KCTM 2011 Conference, Julie Dunn</td>
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<td>Spotlight on Teaching</td>
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<td>Inch or Centimeter...What’s the Difference? Jamie-Marie Wilder</td>
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Number Sense Throughout the School Year, Julie Dunn

A ten frame of nine dots is flashed to individual second graders. The question “How many did you see?” is posed by the teacher. Consider the various responses of second graders:

- Nine. I saw five on the top and counted the rest. Five, six, seven, eight, nine.
- Nine. Well all boxes filled in is ten and there is one missing.
- Nine. I know that four and four makes eight and there is one more dot so that’s nine.
- Ten. I counted by two’s. Two, four, six, eight, ten.
- I think nine. I counted by two’s. Two, four, six, eight, and one more makes nine.
- Nine. I just knew it.
- I don’t know. I only counted to three. Can you show me again?

This task exposed ways that students are able to think about mathematics in initial, developing, and more advanced stages of thinking about number. Although a seemingly simple task, this task revealed different levels of number sense.

What is number sense?

It is easier to identify a child with good number sense than define number sense itself. Number sense, also known as numeracy, number, or number knowledge, is a difficult concept to confine into a succinct definition. Even elementary teachers who have taught for decades find it tough to conjure an explanation. Hiebert (1989) defined number sense as “an intuitive about numbers, and their relationships and the operations: the capacity to make reasonable judgments about the results of basic procedures; and the capability to recognize likenesses and differences in situations, and to use this information to make intuitive decisions.”
Kindergarten: “...quickly recognizing the cardinalities of small sets of objects...” (9)

Domains:
Counting and Cardinality
Operations and Algebraic Thinking
7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure.
The Kentucky Numeracy Project

INTRODUCTION

CLOSING

Structuring to Ten

Structuring to Five

INTRODUCTION
The 3 Aspects of Number

Quantitative

Verbal "five"

Symbolic 5
Spatial Patterns
Finger Patterns
Five and Ten Frames

5

10
<table>
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<th>KCAS Domain</th>
<th>KCAS Cluster</th>
<th>Setting (situation &amp; materials)</th>
<th>Activities: Exemplary Learning Experiences (*see glossary)</th>
<th>Numeracy Strand (from AVAR)</th>
<th>Construct/Level (from AVAR)</th>
<th>Numeracy Target (from AVAR)</th>
<th>&quot;I CAN ……” (*see glossary)</th>
<th>Assessment for Learning</th>
<th>Student Grouping</th>
<th>Video Link</th>
<th>Print Link</th>
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</thead>
<tbody>
<tr>
<td>S 292.1</td>
<td>K.CC.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).</td>
<td>Counting &amp; Cardinality</td>
<td>Know number names and the count sequence</td>
<td>Bingo Cards (see link), Bingo covers, die with regular dot pattern or numeral cube (1 to 6)</td>
<td>Give each student a Bingo Card filled with multiple representations of 1-6. Use the die (or spinner) to generate a random number 1-6. Students can place a chip on ONE square matching the amount rolled, choosing the numeral, finger pattern, dot pattern or frame. Game end when a student has 5 in a row, down, or diagonally.</td>
<td>Structuring</td>
<td>0 to 1 RED</td>
<td>none</td>
<td>… recognize numbers 1 to 6 when shown as dot patterns, finger patterns, 5 or 10 frames or numeral.</td>
<td>Flash a regular 5 dot pattern and have student write or say matching number. Repeat for a regular 3 and a regular 6. Note if student can give amounts without counting by 1s.</td>
<td>small group / whole class</td>
<td><a href="http://www.edu.gov.mb.ca/k12/cur/math/games/dot_bingo_k.pdf">http://www.edu.gov.mb.ca/k12/cur/math/games/dot_bingo_k.pdf</a></td>
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</tbody>
</table>

3 shown as a dot pattern

3 shown in a five frame

3 shown as a finger pattern

Ni 292.1
<table>
<thead>
<tr>
<th>KNP Entry</th>
<th>Kentucky Common Core Academic Standard (KCAS) (*see glossary)</th>
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<th>Setting (situation &amp; materials)</th>
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<th>Numeracy Strand</th>
<th>Construct Level</th>
<th>Numeracy Target</th>
<th>“I CAN ……” (*see glossary)</th>
<th>Assessment for Learning</th>
<th>Student Grouping</th>
<th>Video Link</th>
<th>Print Link</th>
<th>Interactive Website</th>
<th>Reference</th>
<th>Teacher Notes</th>
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<tbody>
<tr>
<td>S 295.0</td>
<td>Operations and Algebraic Thinking</td>
<td>K.OA.5</td>
<td>Fluently add and subtract within 5.</td>
<td>Understand addition as putting together &amp; adding to, subtraction as taking apart &amp; taking from regular dot cards to 6</td>
<td>Flashed images: Flash* a dot card. Ask “what do you see?” or &quot;How many dots?&quot;. If needed, flash card again.</td>
<td>Structuring</td>
<td>0 PERD</td>
<td>Intermediate structures to five</td>
<td>… recognize regular dot patterns to 6</td>
<td>Flash* a card showing 4 dots arranged in a regular dice pattern. Ask how many dots. Repeat with other regular patterns in range 1 to 6.</td>
<td>Various</td>
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</table>
Regular dot patterns to 6
<table>
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<th>KNP Entry</th>
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<th>Assessment for Learning</th>
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</table>
| S 295.1   | Dot cards showing up to 5 dots in either 1 or 2 colors and/or dominos with sums up to 5 | Flashed images: Flash* a dot card. Ask "How many dots?" When appropriate, ask about any groups visible in the card. For example, if flashing a 1 & 3 domino, ask "How many dots on each side? How many dots altogether?". If needed, flash card again. | Structuring | 0 to 1 RED | facade structures to five | ... subitize quantities to 5 | Flash* a dot card with 2 red dots and 3 blue dots. Ask student "How many dots?" Repeat for other irregular arrangements of 3 to 5 dots. | various | http://teachmath.openschoolnetwork.ca/Subitizing.h | Printables and examples of dot cards are available using the print link. (Use examples with up to 5 dots). Dot cards can be made by placing sticker dots on index cards or paper plates. In addition to dot cards, other images such as 5 frames, finger patterns or tallies can be used. The goal is for student to subitize* the whole or subitize sub-groups and determine the whole without counting by ones. Students should be proficient with activity S 295.0 before doing this activity.
Dot cards to 5
SUBITIZING

Subitizing is the ability to 'see' a small amount of objects and know how many there are without counting. Subitizing is what tells you what number you roll on a six sided dice - most adults no longer have to count the pips after playing board games for a while.

Subitizing is a fundamental skill in the development of students' understanding of number (Baroody 1987, 115). Students use patterns recognized to discover properties and skills such as conservation, compensation, unitizing, counting on, composing and decomposing numbers, as well as understanding of arithmetic and place value.

The ability to subitize can be developed, and uses a student’s pattern recognition skills. Part part whole understanding is usually used to subitize numbers over four or five. This means a student looking at this pattern doesn’t usually see 7, but instead 1 and 6, or maybe 2 and 5. This is one of the reasons larger patterns shouldn’t be used until students are familiar with various representations of numbers 1 to 5. When two colours are used in patterns, they also draw attention to smaller anchors and make the parts more obvious.

Dot Plates
A common tool is a set of dot patterns on paper plates - the dots can be easily made with a bingo dabber. Since paper plates are round, they are held up in essentially a random orientation each time. Two colours are used for advanced plates. Click the picture on the right for a pdf of...
**Dot Plates**
A common tool is a set of dot patterns on paper plates - the dots can be easily made with a bingo dabber. Since paper plates are round, they are held up in essentially a random orientation each time. Two colours are used for advanced plates. Click the picture on the right for a pdf of suggested patterns from *Elementary and Middle School Mathematics: Teaching Developmentally*.

**Dot Plate Questions / Activities**
Dot plates are very effective when used for a few minutes of mental / oral math each day. This file details questions and tools for using dot plates as part of your program.

**Dot Cards**
A set of dot cards useful for a variety of student activities. This set contains 4 representations of the numbers 1 to 10, some with ten frames.

**Dot Card Activities**
A set of six basic games and activities (War, Trains, Number Sandwiches, Go Fish, Ten and Out) for the dot cards above.

**Concentration Cards Beginner**
This is a set of cards from Manitoba Education and Youth. It includes four different representations of the numbers 1 to 6, and is suitable for playing concentration or other games in Kindergarten or grade 1.

**Concentration Cards Advanced**
This is a set of cards from Manitoba Education and Youth. It includes four different representations of the numbers 5 to 10, and is suitable for playing concentration or other games in grade 1 to 3.

**Domino Activities**
Dominoes can help develop the ability to recognize dot patterns. This is a set of games and activities that use dominoes. Double 9 dominoes are a little more versatile when students are ready.
Dominoes to 5
Structuring “Tool Box”
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<th>Numeracy Strand</th>
<th>&quot;I CAN …….&quot; (*see glossary)</th>
<th>Assessment for Learning (*see glossary)</th>
</tr>
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<tbody>
<tr>
<td>266.1</td>
<td>K.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 combination dot cards up to 5 (see link: use only the cards to 5)</td>
<td>Combination Cards to 5: Print the combination cards (up to 5) on card stock. Cut and fold as indicated. Open one flap to reveal a given number of dots and the student tells the number that goes with it to make the total indicated at top. Next time the card is used, the other flap is opened.</td>
<td>Structuring</td>
<td>0 to 1 RED</td>
<td>facile structures to five</td>
<td>... tell the combinations up to 5 given one number.</td>
</tr>
<tr>
<td>S 266.1</td>
<td>Operations and Algebraic Thinking</td>
<td>Understanding as putting together or adding to, subtracting as taking apart or taking from</td>
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</tbody>
</table>

Student Grouping: Independent / group / whole class


Assembled combination cards from S266.1
“I see 3 dots. How many dots do you think are hiding behind the door?”
“This time I see 4 dots. How many are hiding behind the door?”
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<th>Construct/Level</th>
<th>Numeracy Target</th>
<th>“I CAN ……” (*see glossary)</th>
<th>Assessment for Learning (*see glossary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 205.1</td>
<td>K.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).</td>
<td>Operations and Algebraic Thinking</td>
<td>Understand addition as putting together or adding to, subtracting as taking apart or taking from</td>
<td>Five Frame cards, 0 to 5, 4-6 of each (see link)</td>
<td>Go Fish: Each player is dealt five cards. The rest of the cards are placed in a stack face down in the center of the table. If the students have any pairs of cards that total 5, they place them down in front of them. Students take turns. On each turn, a player asks another player for a card that will go with a card in the player’s hand to make 5. If he/she receives a card that makes 5, the pair is placed on the table. This completes a turn. If the player does not get a card that makes 5, he/she takes the top card from the deck. If the card drawn from the deck makes 5 with a card in the player’s hand, the pair is placed on the table. This completes the turn. If there are no cards left in a player’s hand but still cards in the deck, that player takes two cards from the deck and continues playing. The game is over when there are no more cards left in the deck. At the end of the game each player writes a list of the number pairs he/she made. The player with the most number pairs wins the game.</td>
<td>Structuring</td>
<td>0 to 1 RED</td>
<td>facile structures to five</td>
<td>…identify two numbers that add to 5</td>
<td>Ask student “What are two numbers that add to make 5?… Another two?… Another two?”</td>
</tr>
</tbody>
</table>
$S = \text{Structuring}$

200 series also indicates \textit{Structuring} strand
### AVMR Levels and Folders

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<th>Level</th>
<th>Folder Color</th>
<th>Numeracy Target</th>
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<td>S 295.0</td>
<td>0</td>
<td>RED</td>
<td>structures to five</td>
</tr>
<tr>
<td>S 295.1</td>
<td>0 to 1</td>
<td>RED</td>
<td>structures to five</td>
</tr>
<tr>
<td>S 295.2</td>
<td>1 to 2</td>
<td>BLUE</td>
<td>structures to ten</td>
</tr>
<tr>
<td>S 295.3</td>
<td>2 to 3</td>
<td>GREEN</td>
<td>structures to ten</td>
</tr>
<tr>
<td>S 295.4</td>
<td>3 to 4</td>
<td>PURPLE</td>
<td>structures to twenty</td>
</tr>
<tr>
<td>S 295.5</td>
<td>4 to 5</td>
<td>PINK</td>
<td>structures to twenty</td>
</tr>
</tbody>
</table>
Structuring quantities 6 to 10
Five-wise structures
Pair-wise structures:
Doubles
Pair-wise structures: Near Doubles
<table>
<thead>
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<th>Assessment for Learning</th>
<th>Student Grouping</th>
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<th>Print Link</th>
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</thead>
<tbody>
<tr>
<td>S 292.2</td>
<td>K.CC.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).</td>
<td>Counting &amp; Cardinality</td>
<td>Know number names and the count sequence</td>
<td>Bingo Cards (see link), Bingo covers, cube with sides labeled &quot;5,6,7,8,9,10&quot;</td>
<td>Give each student a Bingo card filled with multiple representations of 5-10 (5 versions are available). Use the die (or spinner) to generate random numbers 5 to 10. Students can place a chip on ONE square matching the amount rolled, choosing the numeral, finger pattern, dot pattern, 10 frame. Game end when a student has 5 in a row, down, or diagonally.</td>
<td>Structuring</td>
<td>1 to 2 BLUE</td>
<td>Intermediate structures to ten</td>
<td>... recognize numbers 5 to 10 when shown as dot patterns, tally marks, finger patterns, 10 frames or numeral. Teacher should flash 6 fingers and have student write or say matching number. Repeat for 4 fingers and 9.</td>
<td>small group</td>
<td>5-10 Bingo Boards</td>
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</tbody>
</table>
8 shown as a dot pattern (pair-wise)

8 shown in a ten frame (five-wise)

8 shown as tallies (five-wise)

8 shown as a finger Pattern (five-wise)
<table>
<thead>
<tr>
<th>KNP Entry</th>
<th>Setting (situation &amp; materials)</th>
<th>Activities: Exemplary Learning Experiences (*see glossary)</th>
<th>Numeracy Strand &amp; Level</th>
<th>&quot;I CAN ......&quot; (*see glossary)</th>
<th>Assessment for Learning</th>
<th>Student Grouping</th>
<th>Video Link</th>
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<th>Interactive Website</th>
<th>Teacher Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 295.2</td>
<td>Dot cards showing 5 to 10 dots in a pair-wise or five-wise arrangement, 10 frames arranged either pair-wise or five-wise and/or finger pattern cards</td>
<td>Flashed images: Flash* a card. Ask &quot;How many?&quot; When appropriate, ask about any groups visible on the card. For example, if showing a finger pattern card with 5 fingers on one hand and 3 on the other, ask student to say the amount on each hand as well as the total. If needed, flash card again.</td>
<td>Numeracy: 1 to 2</td>
<td>... recognize quantities up to 10 shown either five-wise or pair-wise</td>
<td>Hold up 7 fingers (5 on one hand, 2 on other) for 2-3 seconds. Ask student &quot;How many fingers did you see? How many were on each hand?&quot; Repeat with 6 fingers shown as 3 on each hand and 3 fingers show as 4 on each hand. Repeat with other groups if desired.</td>
<td>various</td>
<td><a href="http://www.sparklebox.co.uk/mdl/counting/other.html">http://www.sparklebox.co.uk/mdl/counting/other.html</a></td>
<td><a href="http://www.fi.uu.nl/toepassing/007013/toepassing_rekenweb.nl">http://www.fi.uu.nl/toepassing/007013/toepassing_rekenweb.nl</a></td>
<td></td>
<td>Printable cards for finger patterns and dominos are available using the print link. The finger pattern printable is at the top. Domino cards are at the end of the list. At this level, use only the dominos in the range 5 to 10 that are shown pair-wise or five-wise more. The goal is for student to subitize the groups and then determine the whole without counting by ones. For example, if a domino with sides 5 &amp; 3 are shown, student should see a &quot;5&quot; and a &quot;3&quot; and know immediately that there are 8 dots in all. The resources available in the print link for activity S 295.1 also has a link for dot cards in a five-wise or pair-wise arrangement. The interactive website link is to a website created by the Freudenthal institute in the Netherlands. The directions are in Dutch but games are playable. At this level, the finger patterns game and the beadrack to 10 game are appropriate. Another option is the website available through the interactive link in S 295.3 (Dreambox teacher tools). On this site, the one row bead rack can be used.</td>
</tr>
</tbody>
</table>
Five-wise and Pair-wise dot cards to 10
Five-wise and Pair-wise ten frames
Counting

HOME > Numeracy > Counting > Other

Other resources

Get exclusive FREE resources with the free SparkleBox Toolbar...

Counting hands (Ref: SB663)
Ten A4 printable sheets showing hands counting from 1 up to 10.

DOWNLOAD NOW

Counting hands 2 (Ref: SB666)
Ten A4 printable sheets showing hands counting from 1 up to 10.

DOWNLOAD NOW

Counting hands - with numbers (Ref: SB2714)
A4 printable sheets showing hands with numbers counting from 0 to 10.

DOWNLOAD NOW
Finger patterns 6 to 10 arranged five-wise (S 295.2)
Dominos

Pair-wise

Five-wise
Interactive Website link – The Freudenthal Institute
<table>
<thead>
<tr>
<th>KNP Entry</th>
<th>Setting (situation &amp; materials)</th>
<th>Activities: Exemplary Learning Experiences (*see glossary)</th>
<th>Numeracy</th>
<th>Construct/Level</th>
<th>Numeracy</th>
<th>&quot;I CAN ……..&quot; (*see glossary)</th>
<th>Assessment for Learning</th>
<th>Student Video Link</th>
<th>Print Link</th>
<th>Interactive</th>
<th>Reference</th>
<th>Teacher Notes</th>
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<tr>
<td>S 294.3</td>
<td>Dot cards showing up to 10 dots in either 1 or 2 colors, dominos with sums up to 10 and/or 10 frame cards</td>
<td>Flashed images: Flash* a card. Ask “How many?” If desired, ask about any groups visible in the card. For example, if flashing a card with 4 blue dots and 3 green dots, ask student “How many dots? What groups did you see?”</td>
<td>Structuring 2 to 3 GREEN</td>
<td>Facile structures to ten</td>
<td>... quickly determine the number of dots in a flashed image with up to 10 dots.</td>
<td>Flash* a domino with 6 and 2 dots. Ask student “What do you see?” If needed, prompt student to state the total and the amounts on each side. Repeat with the 3&amp;4 domino. If desired, continue with other dominos or with dot cards.</td>
<td>Printables and examples of dot cards are available using the print link. Dot cards can be made by placing sticker dots on index cards or paper plates. In addition to dot cards, other images such as 10 frames &amp; finger patterns can be used. The goal is for student to subitize* sub-groups and then determine the whole without counting by ones. At this point, students should be linking to and building on the standard structures (i.e. doubles and five-wise) that they learned in entry 294.2. For example, if student is flashed the domino with 4 &amp; 3, a student should immediately recognize the &quot;4&quot; and &quot;3&quot;. The student might reason, &quot;since 3 and 3 is 6, this is 7 in all&quot;. Similarly, if a student is flashed the domino 6 &amp; 2, the student might reason &quot;I know 5 &amp; 3 is 8 so that is 9.&quot; The interactive website link is to the Dreambox teacher tools. There you can use the &quot;Quick images&quot; lesson &quot;Numbergram from 4 to 10&quot; to show a variety of dot patterns to 10 using a projector. Also, the website hosted by the Freudenthal institute (see the interactive website link for S 294.2) has a dice activity and an egg carton activity that children can play.</td>
<td>various</td>
<td><a href="http://teachmath.openschoolnetwork.ca/Subitizing.htm">http://teachmath.openschoolnetwork.ca/Subitizing.htm</a></td>
<td><a href="http://www.dreambox.com/teacher-tools/quick-images">http://www.dreambox.com/teacher-tools/quick-images</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A variety of dot cards to 10

Dot cards to 10
I can determine the number of dots without counting by ones.

Take turns showing your partner a card just for a moment.
SUBITIZING

Subitizing is the ability to 'see' a small amount of objects and know how many there are without counting. Subitizing is what tells you what number you roll on a six sided dice - most adults no longer have to count the pips after playing board games for a while.

Subitizing is a fundamental skill in the development of students' understanding of number (Baroody 1987, 115). Students use patterns recognized to discover properties and skills such as conservation, compensation, unitizing, counting on, composing and decomposing numbers, as well as understanding of arithmetic and place value.

The ability to subitize can be developed, and uses a student’s pattern recognition skills. Part part whole understanding is usually used to subitize numbers over four or five. This means a student looking at this pattern doesn't usually see 7, but instead 1 and 6, or maybe 2 and 5. This is one of the reasons larger patterns shouldn't be used until students are familiar with various representations of numbers 1 to 5. When two colours are used in patterns, they also draw attention to smaller anchors and make the parts more obvious.

Dot Plates
A common tool is a set of dot patterns on paper plates - the dots can be easily made with a bingo dabber. Since paper plates are round, they are held up in essentially a random orientation each time. Two colours are used for advanced plates. Click the picture on the right for a pdf of suggested patterns from Elementary and Middle School Mathematics: Teaching

NUMBER SENSE

» 5 / 10 Frames
» Subitizing
» Part Part Whole
» Near Numbers (+1, +2)
» Teen Numbers
» Place Value
» Estimating
Domino patterns

Five-wise

Pair-wise

Non-standard patterns
A common tool is a set of dot patterns on paper plates - the dots can be easily made with a bingo dabber. Since paper plates are round, they are held up in essentially a random orientation each time. Two colours are used for advanced plates. Click the picture on the right for a pdf of suggested patterns from *Elementary and Middle School Mathematics: Teaching Developmentally*.

### Dot Plate Questions / Activities
Dot plates are very effective when used for a few minutes of mental / oral math each day. This file details questions and tools for using dot plates as part of your program.

### Dot Cards
A set of dot cards useful for a variety of student activities. This set contains 4 representations of the numbers 1 to 10, some with ten frames.

### Dot Card Activities
A set of six basic games and activities (War, Trains, Number Sandwiches, Go Fish, Ten and Out) for the dot cards above.

### Concentration Cards Beginner
This is a set of cards from Manitoba Education and Youth. It includes four different representations of the numbers 1 to 6, and is suitable for playing concentration or other games in Kindergarten or grade 1.

### Concentration Cards Advanced
This is a set of cards from Manitoba Education and Youth. It includes four different representations of the numbers 5 to 10, and is suitable for playing concentration or other games in grade 1 to 3.

### Domino Activities
Dominoes can help develop the ability to recognize dot patterns. This is a set of games and activities that use dominoes. Double 9 dominoes are a little more versatile when students are ready.

### Domino Flash Cards
These are large domino cards that can be used for subitizing... for numbers over 6, domino...
Five-wise ten frames

Pair-wise ten frames

Pair-wise dot cards

Non-standard dot cards
DreamBox’s FREE Teacher Tools bring lessons to life with virtual manipulatives

You don’t need to buy DreamBox to use these free virtual manipulatives DreamBox Teacher Tools bring math to life for students. These unique virtual manipulatives can be used in large- or small-group instructional settings with your interactive white board or projector, or on computers.

Quick Images: Identifying Amounts™

Using the quick images manipulative is a great way to engage students in communicating their mathematical thinking while offering opportunities for students to subitize and conceptualize numbers using visual images. The
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Register to use the free tools
Choose a Quick Images lesson

Quick Images: Identifying Amounts™

Using the quick images manipulative is a great way to engage students in communicating their mathematical thinking while offering opportunities for students to subitize and conceptualize numbers using visual images. The ideas here can be used as stand-alone activities, as a supplement to an

You need to enter your email address above to access the DreamBox Teacher Tools

Choose a quick images lesson:
- Numbergram from 4 to 10
- Tenframe from 4 to 10
- Tenframe from 11 to 20
- Tenframe from 21 to 40
- One-Wire Mathrack from 4 to 10
- Two-Wire Mathrack from 11 to 20
- Two-Wire Mathrack from 4 to 20 (displayed as doubles)
- Ten-Wire Mathrack from 20 to 100 (multiples of 10 only)
- Ten-Wire Mathrack from 21 to 50
- Ten-Wire Mathrack from 41 to 100

Getting to know the manipulatives

Three different visual math manipulatives support students in conceptualizing numbers as groups rather than individual objects to be
Numbergram From 4 to 10
Use “Hide Card” button to hide image
Other lessons are available
<table>
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<tr>
<th>KNP Entry</th>
<th>Kentucky Common Core Academic Standard (KCAS) (*see glossary)</th>
<th>KCAS Domain</th>
<th>KCAS Cluster</th>
<th>Setting (situation &amp; materials)</th>
<th>Activities: Exemplary Learning Experiences (*see glossary)</th>
<th>Numeracy Strand (from AY19)</th>
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<th>Numeracy Target (from AY19)</th>
<th>&quot;I CAN …….&quot; (*see glossary)</th>
<th>Assessment for Learning</th>
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<tbody>
<tr>
<td>S 266.2</td>
<td>K.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)).</td>
<td>Operations and Algebraic Thinking</td>
<td>Understand addition as putting together or adding to, subtraction as taking apart or taking from</td>
<td>5-plus combination dot cards (see link - other combination cards available as well)</td>
<td>5-plus Combination Cards: Print the 5+ combination cards on card stock. Cut and fold as indicated. Open one flap to reveal a given number of dots and the student tells the number that goes with it to make the total indicated at top. Next time the card is used, the other flap is opened.</td>
<td>Structuring</td>
<td>1 to 2 BLUE</td>
<td>Intermediate structures to ten</td>
<td>… tell the combinations of 6, 7, 8, 9, 10 when shown one quantity in the form of dots.</td>
<td>Show the students the dot pattern for 3 and ask &quot;What goes with 3 to equal 8?&quot; Do the same for 2 (to equal 7) and 5 (to equal 9)</td>
</tr>
<tr>
<td>S 266.3</td>
<td>K.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)).</td>
<td>Operations and Algebraic Thinking</td>
<td>Understand addition as putting together or adding to, subtraction as taking apart or taking from</td>
<td>combinations of 10 cards with numerals</td>
<td>Numeral combinations to 10: Print the combination cards on card stock. Cut and fold as indicated. Open one flap to reveal a numeral and the student tells the number that goes with it to make the number indicated at top. Next time the card is used, the other flap is opened.</td>
<td>Structuring</td>
<td>2 to 3 GREEN</td>
<td>Facet structures to ten</td>
<td>… tell the combinations of 6, 7, 8, 9, 10 when given one number in bare numerals.</td>
<td>Show the students the dot pattern for 3 and ask &quot;What goes with 3 to equal 5?&quot; Show the students the dot pattern for 2 and ask &quot;What goes with 2 to equal 4?&quot;</td>
</tr>
</tbody>
</table>
Five-wise combination cards to 10
Examples of other combination cards to 10
Examples of Numeral combination cards to 10

S 266.3
The Kentucky Numeracy Project

INTRODUCTION

Structuring to Five

Structuring to Ten

CLOSING
Webinar Archives:

**KNP Webinar Session 1 - Introduction**

**KNP Webinar Session 2 - Number Words and Numerals**

**KNP Webinar Session 3 - Structuring to Five and Ten**

.xls - **Kentucky Numeracy Project Intervention Guide** - More to come.... KNP task groups for the different content areas are working on the Glossary denotations. This will continue to be a living document with an ever-growing collection.

| Word version of the Kentucky Numeracy Project Intervention Guide | posted February 10, 2011 |

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**Numeral Roll**

- .pdf - Numeral Roll directions and printables.
- Video: Numeral roll Test video.wmv
Nb 102.0

Kentucky Common Core Academic Standard: K.CC.1 Count* to 100 by ones and tens.

Domain: Counting & Cardinality

KCAS Cluster: Know number names and the count* sequence

Setting (situation & materials): verbal

Activities: Exemplary Learning Experiences: Count* Around Activity: Students stand in a circle. The first student starts the Count* at 5 and the students Count* around the circle with each student saying the next number in the sequence 5-1. The student who says "1" sits down and the next child begins the Count* again at 5. Repeat until only one child is left standing.

Numeracy Strand (from AVMR): Number Words (backward)

Construct Level (from AVMR): 0 to 1 YELLOW

Numeracy Target (from AVMR): Initial BNWS from 'ten' (no NWB)

"I CAN": say number words backward from 5-1.

Assessment for Learning (*see glossary): Ask students to take turns counting* from 5 to 1.

Student Grouping: small group / whole class

Reference: 1

Teacher Notes: Prior to this activity the teacher may need to have students practice saying the Backward Number Word Sequence in a repetitive manner.

Submitted By:

Reviewer & Comments: Linda Montgomery and Mary Helen Hodges

Posted: 1.3.11
Upcoming KNP Sessions, 3:30 to 4:30 p.m. ET

• March 10 – Addition and Subtraction
• March 31 – Structuring to Twenty
• April 21 – Advanced Addition and Subtraction
• May 12 – Multiplication and Division
• June 2 – Tens and Ones

http://kymath.org/intervention/iKNP.asp
Reflection Questions

1) What are your students’ abilities to recognize flashed quantities, including five-wise and pair-wise patterns?

2) What are your students’ abilities to instantly show different finger patterns for quantities 3 to 8?

3) Read the January 2011 KCTM article by Julie Dunn titled “Number Sense throughout the School Year.” Which of the ideas in the article might help you to better develop numeracy foundations?

4) How can the internalization of flashed quantities support the memorization of facts for robust automaticity?