



**Math for Young Children
CLARINGTON LESSON STUDY TEAM
KPRDSB
Kindergarten to Grade 2
APRIL 11, 2012**

Research Questions:

How can we use number patterns to help children see different ways of composing and decomposing 5 and 10?

What is the role of play in developing number sense? How can we bridge instruction and play in the K-2 years?



Educator-Researcher Team:

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Discussant: Zoe Donoahue

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AGENDA

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|----------------|---|
| 10:00 to 11:15 | Welcome, Introductions, and background provided by the planning team |
| 11:15 to 11:45 | Public Lesson |
| 11:45 to 12:00 | Snack and networking |
| 12:00 to 2:30 | Debrief: <ul style="list-style-type: none">i. Teachers who taught lessonii. Observers from teacher planning groupiii. Comments from guestsiv. Discussant |

Lesson Study Package
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I. Background

When we first began our lesson study journey, we had an interest in number patterns. Our early explorations (which included clinical interviews and exploratory lessons) led us to focus specifically on composing and decomposing number (first working with 5 and now with 10).

Our secondary focus has been on bridging play and instruction, especially how we could as a team design complementary play stations and reveal all the stages of purposeful play. We were interested in really exploring where we could take developmental play in math. Many of our exploratory lessons in our lesson study process have branched out into centres that themselves evolved as children played and interacted with the mathematics there. This is a big part of what you will see today.

We have been very interested in designing a public lesson that allows us to investigate the mathematics that children are capable of in play – in particular composing numbers to 10, while maintaining a fidelity to the reality of the Full Day Early Learning Kindergarten classroom. We wanted it to be authentic to what we do and the children do everyday.

Setting the stage for purposeful play takes time and careful intention, for example, the lesson you are about to see has been building for some time through exploratory lessons. We used a similar framework to explore composing and decomposing 5 using five frames in the context of pizza shop in this classroom (examples in other classrooms included “The 5 Bakery”). To set the stage for today’s lesson, we began nearly two weeks ago with the introduction of the theme of flowers.

Today you will see the co-creation of the “Ten-in-a-pot Flower Shop” centre. This lesson is a launching point. The centre will continue to evolve and change over time, and in fact, in the next couple of weeks we will film the final consolidation of the centre before we move on to another theme.

Today’s lesson incorporates a lot of student voice; we are co-creating the centre with the children and we anticipate it will be “messy”. Student choice also features prominently in our design, choice being such an important feature of play. This is a high-risk lesson – it will be fluid and elements will appear spontaneous, but it occurs within a highly structured framework for learning through play and careful attention to anticipated student responses.

A. Clinical interviews and findings

Question 1:

Subitizing with dot plates (1-5): 3, 2, 4, 1, 5

THEN HOLD UP: 3 and 1

What did you see?... how did you know that is a pattern?

Question 2:

Make a pattern: (Materials: red, blue, and yellow tiles mixed on a paper plate)

Tell me about your pattern? How do you know it's a pattern? What is a pattern?

Continue the pattern: show abab pattern – blue yellow blue yellow blue yellow

What comes next? What comes after that? Here are some tiles, can you continue the pattern/keep the pattern going?

Show second pattern: Red red red red blue x 2)

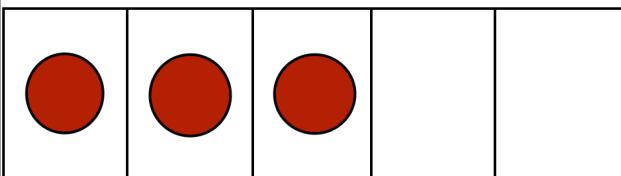
How many are in this [first] row?

(Observe if they are counting – bobbing their head, counting with fingers/aloud – or if they just know.)

How many tiles are in the next (second) row? How many would be in the next row? Here are some red and blue tiles, make the next row.

Question 3: “Same, less and more...” (with 5 frames)

(Materials: 5 frames for JK/SK, 10 frames for Grade 1/2, counters, cards/stickies reading “less”, “same”, “more”)



Show me the same...

...show me more...

...now show me less...

FINDINGS:

Assets: Students were having success with Some were easily able to subitize – we were surprised. If they can subitize then counting on is easier.

Materials issues – Colin struggling with the two different shades of red

Repeating patterns? How students filled in the 3rd row.

From Debbie's class: Troy (Grade 2, multiple exceptionalities)

Troy had strong visual sense, solid with patterning tasks, was able to handle the same-less-more using some interesting strategies.

USE OF FINGERS:

Interesting to note the comparisons, where students couldn't necessarily manage the same-less-more task with the chips, but when asked to show with fingers, they could manage same and more. Not less – this is challenging for kids for many reasons (fewer experiences with less, emphasis on more in our culture and naturally with sharing food for example, also related to difficulties with subtraction). This gets us thinking about fingers as a manipulative – so immediate for kids.

From Bacall's class: Georgia (JK)

From Virginia's class: Ellie (JK)

Misconceptions: What we noticed that students struggled with

- Not knowing how to use the tool, going outside the frame
- Using all the counters
- Focused on patterning
- Virginia's wanted to sort, others were focused on patterning
- Use of language – Ellie and Keeley

B. Literature/Influential articles

Baroody, A. 2006. Why children have difficulty mastering the basic number combinations and how to help them. *Teaching Children Mathematics*. NCTM.

Fosnot, Catherine Twomey. 2008. Bunk Beds and apple boxes: Early number sense. Heinemann, USA.

Jung, Myoungwhon. 2011. *Number relationships in preschool*. Teaching Children Mathematics, 17:9.

Lewin-Benham, Ann. 2006. One Teacher, 20 Preschoolers, and a Goldfish Environmental Awareness, Emergent Curriculum, and Documentation. *Young Children*, v61 n2 p28-34. National Association for the Education of Young Children, Washington, DC.

Mathematics in focus: K-6 (Pearson) – mostly with contexts/stories/application

Sousa, D. (2008). *How the brain learns mathematics*. Thousand Oaks, CA: Corwin Press.

C. Exploratory Lessons

LESSON: “MAKING 5” (AKA “The Monkey Lesson”)

ACTIVATION: Whole group at carpet

1. Kids come to the carpet and we sing/read five little monkeys
Use your fingers if you want to as we sing/tell the story.
Observe which students use their fingers

2. Whole group use hands, while 5 students use their bodies to be the monkeys (students can each sit down when they fall off the bed)

Key Question: At each stage ask students: “How many monkeys are on the bed? How many are off the bed? How many monkeys are there all together?

(Fill in the chart below as you are talking with the students)

Coteacher is recording:

- on bed, off bed, all together

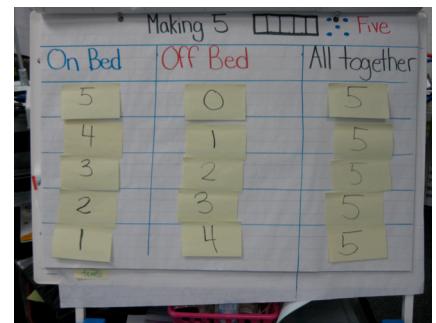
3. Connect the story to the five frame with 2 colours as an opportunity to demonstrate how to use the five frame:

“If I was going to show 3 monkeys on the bed and 2 monkeys off, what could that look like on the five frame? Do in pairs on a five frame mat. Teacher check in; immediate feedback.

DEVELOPMENT: Students use five frames and tiles, make as many stories of 5 as you can, then make number stories of 5 on the 5 frame, recording it using the coloured crayons.

CONSOLIDATION: WHOLE GROUP

Students select one of their coloured paper strips and put it on the board.



FINDINGS:

Sometimes story can be a distractor from the math

Unanticipated issues with the context of on/off the bed – the “off” were still present led us to think carefully about context

Tried to accomplish too much with one lesson (Lit connections, addition, subtraction, anchor chart, five frames), was too long, needed to be drawn out over time

Not authentic to the way we really teach



ADAPTATIONS based on findings:
more small group, more chunking

Took away the distractors (to address problems with context) but it was still too long, and too big a group

Took away the colour

More gradual building up of a concept

More authentic

LESSON: "MAKING 5"

Activating:

"How many different ways can you use the hands of both fingers to make five?"

Get a student to show. Then name it:

"Okay, Tara's made 2 and 3. Did anyone do it a different way?"

"Is it different? Agree, disagree? (Thumbs up, thumbs down.) How do we know it's different?"

Discussion if students come up with 2 and 3, or 3 and 2: "are those the same?"

Teacher then summarizes: "Tara made 2 and 3, Johnny made 4 and 1."

"Did anyone make it a different way?"

"Have we found all the ways?"

Developing:

- Individual student activity, making five on individual five frames using tiles.
- Give one five frame at first, then when finished give another, and so on.
- "Now we are going to get out some tiles. I want you to make five with the tiles using your five frame.
- Rule: Colours have to stay together."
- Once students have make all the combinations on the five frame using tiles, instruct students: "Pick your favourite. Then colour in another five frame."

Consolidating:

Students will build an anchor chart, using a colour-neutral chart of combinations and having matching their favourite.

Possible key questions for consolidation:

"Did we get them all in the right spot?"

Can you help your friend find the right spot?

Where do you think it would go?

These are all different colours – how do we know they belong here?

What's the same about them?

Do you see a number pattern here?

Other contexts for later lessons/experiences and centres (from Laurie's Pearson handout):

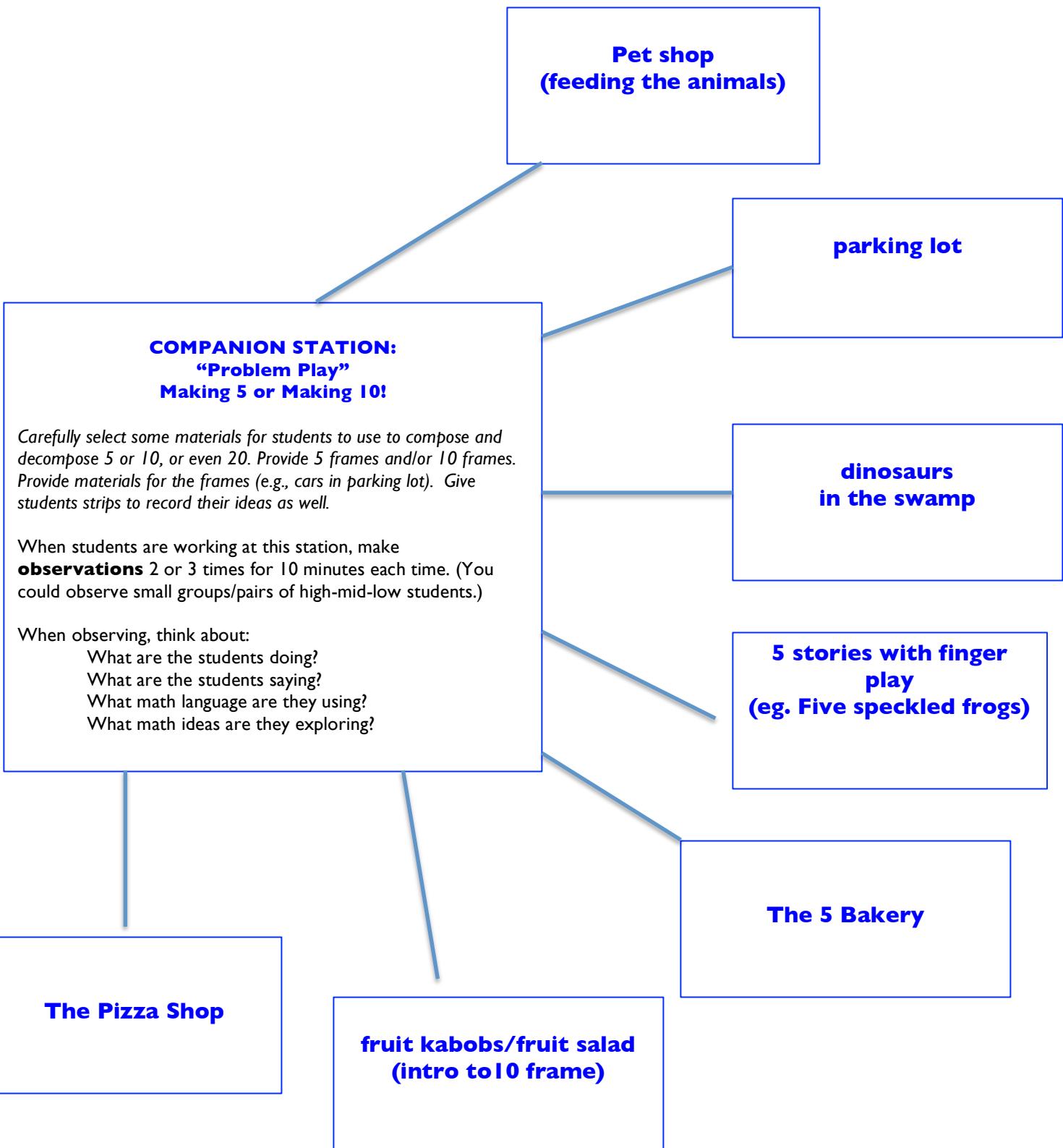
- leaves on a tree
- bears on playground equipment
- two colour of ornaments on a tree
- two colours of birthday candles on a cake
- frogs and toads in a pond

OBSERVATIONS:

Still too long

Needed further chunking and sequencing over several days

Still did not feel authentic to the JK/SK classroom



Mathematical focus: composing and decomposing number

Summary of learning

- Use of fingers for counting and making sense of numbers to 10 is natural and helpful.
- Children bring important assets to school in terms of number sense (rote counting, subitizing to 3, and relative quantities such as more, less, same).
- Slowing down and to provide multiple rich experiences to build number sense also builds student confidence in mathematics.
- Sometimes story or artificial contexts can obscure the mathematics. Children are naturally interested in mathematics, so it does not need to be hidden or masked.

Instructional focus in the early years context: bridging play and instruction

- bridging play and instruction requires time and intention while also being ready to respond in-the-moment to student thinking
- more powerful if ideas come from students
- allow opportunities for students to revise the centres
- teacher input in guided contexts at the beginning can pay off in independent play later on

We started to think about levels of play and instruction:

- Flat out play with any materials
- Play with selected materials
- Problem posing – at station (DK: same problem at different stations with different manips, see what they do)
- “Problem play”: eg. Bacall had an activity where she had kids build structure for rubber turkey to keep him safe, kids loved it (and we love that term, “problem play”)
 - o we need to have broad definition of what a problem is (eg. Making 4 is a problem for JK to solve)
- Direct input/direct instruction or teaching (Keeping in mind that this is always student-directed, student-centred because it comes from what teachers know about kids and what they need at that time.)

ADDITIONAL EXPECTATIONS WE HAVE TOUCHED ON IN OUR STUDY

Big Idea: Young children have a conceptual understanding of mathematics and of mathematical thinking and reasoning.

(Number sense and Numeration)

Overall Expectation NS1: demonstrate an understanding of numbers, using concrete materials to explore and investigate counting, quantity, and number relationships

Specific Expectations:

NS1.2 investigate some concepts of quantity through identifying and comparing sets with more, fewer, or the same number of objects (e.g., find out which of two cups contains more or fewer beans, using counters; investigate the ideas of more, less, or the same, using five and ten frames; recognize that the last number counted represents the number of objects in the set [concept of cardinality])

NS1.3 begin to make use of one-to-one correspondence in counting objects and matching groups of objects (e.g., one napkin for each of the people at the table)

NS1.4 demonstrate understanding of the counting concepts of stable order (i.e., the concept that the counting sequence is always the same – 1 is followed by 2, 2 by 3, and so on) and of order irrelevance (i.e., the concept that the number of objects in a set will be the same regardless of which object is used to begin the counting)

NS1.5 recognize some quantities without having to count, using a variety of tools (e.g., dominoes, dot plates, dice, number of fingers) or strategies (e.g., composing or decomposing numbers, subitizing)

Personal and Social Development

Big Idea: Children are connected to others and contribute to their world

Overall Expectation 1: identify and use social skills in play and other contexts

1.2 demonstrate the ability to take turns in activities and discussions (e.g., engage in play activities with others, listen to peers and adults)

Overall Expectation 2: demonstrate independence, self-regulation, and a willingness to take responsibility in learning and other activities Professional Learning Conversations After attending a workshop on self-regulation in the early years, the members of the EL-K team talk about how they can support the children in learning how to wait their turn to talk without asking them to raise their hands to speak. They discuss how self-regulation is very different from compliance. They decide to try a think-pair-share activity to scaffold the children's experience with listening and taking turns to talk in group discussions.

2.2 demonstrate a willingness to try new activities (e.g., experiment with new materials/tools, try out activities in a different learning centre, select and persist with challenging activities, experiment with writing) and to adapt to new situations (e.g., having visitors in the classroom, having a different teacher occasionally, going on a field trip, riding the school bus)

2.3 demonstrate self-motivation, initiative, and confidence in their approach to learning by selecting and completing learning tasks (e.g., choose learning centres independently, try something new, persevere with tasks)

Language

Big idea: Children are effective communicators

Overall Expectations

By the end of the Full-Day Early Learning–Kindergarten program, children will:

1. communicate by talking and by listening and speaking to others for a variety of purposes and in a variety of contexts;

1.4 follow and provide one- and two-step directions in different contexts (e.g., in classroom routines; in music, drama, and dance activities; in outdoor play; in learning centres; in large-group activities)

1.5 use language in various contexts to connect new experiences with what they already know (e.g., contribute ideas orally during shared or interactive writing; contribute to conversations at learning centres; respond to teacher prompts)

1.6 use language to talk about their thinking, to reflect, and to solve problems

1.7 use specialized vocabulary for a variety of purposes (e.g., terms for things they are building or equipment they are using)

1.8 ask questions for a variety of purposes (e.g., for direction, for assistance, for obtaining information, for clarification, for help in understanding something) and in different contexts (e.g., during discussions and conversations with peers and adults; before, during, and after read-aloud activities and shared reading; while making observations on a class walk; in small groups at learning centres)

4. Public Lesson

Goal of public lesson:

Engage students in thinking about:

1. How to compose numbers to make 10
2. All possible combinations of two numbers to make 10
3. How to set up a play station for math

Specific Learning Goals (curricular expectations):

By the end of these lessons, students will:

- demonstrate an understanding of number relationships for numbers from 0 to 10, through investigation (e.g., show small quantities using fingers or manipulatives)
- use, read, and represent whole numbers to 10 in a variety of meaningful contexts (e.g., use a hundreds chart to read whole numbers; use magnetic and sandpaper numerals to represent the number of objects in a set; put the house number on a house built at the block centre; find and recognize numbers in the environment; write numerals on imaginary bills at the restaurant at the dramatic play centre)
- investigate and develop strategies for composing and decomposing quantities to 10 (e.g., use manipulatives or “shake and spill” activities)
- investigate addition and subtraction in everyday activities through the use of manipulatives (e.g., interlocking cubes), visual models (e.g., a number line, tally marks, a hundreds carpet), or oral exploration (e.g., dramatizing of songs)

SECONDARY GOALS of the team:

- To enact a lesson that reflects authentically the reality of the All Day-Every Day JK/SK classroom and the collaborative relationships possible between teachers and ECEs and SERTs.
- To expose important the stages of purposeful play.

Materials:

plastic pots	Red, yellow flowers (plus a few in purple)	Green foam
Red and yellow tiles	Yellow, red crayons (and a few purple)	Pencils
Tens frames (some with blank number sentences)	Number lines (for students who need it)	Clipboards
Whiteboards and markers	Sticky labels	Baskets for order forms and tens frame labels

Success criteria:

An educator will record an “I can” chart – success criteria – as they come up in the lessons.

“I can make a flower pot using a total of ten flowers.” [and stick empty ten frame beside it]

“I can keep the same colours together.” [Deb can draw two yellow dots and two red dots beside each other...red/yellow/red/yellow with an x through it.]

“I can write a number sentence that matches my order.”

“I can check my order with a friend.”

I) Input lesson (yesterday, see video): “Making 10” (10 - 20 minutes)

THE “TEN-IN-A-POT” FLOWER SHOP:

Making of 10-frame order forms to order flower bouquets of two different colours. Students play with all the different ways to make 10 using two different colours of flowers to make “flower pots” on 10 frames.

Activating student thinking:

Re-introduce the flower topic.

- “On our walk we saw flowers...”
- “What are some other places we see flowers?” eg. “Where could you buy flowers?” [Leading towards thinking about the flower shop, flowers in pots, eg. flowers for Valentine’s Day, Easter]
- “Last time we were talking about how many flowers each person should get when they go to the flower shop...”

Re-activate the 10 frame and relate to the pizza shop and pizza shop orders.

- “How did we make orders before?”
- “In the pizza shop we used the five frame, what would be a good way to place our orders for our flower shop if we are using bigger numbers than five?”
- What strategy could we use to organize/keep track?

Introduce today’s activity:

- “Today we are going to think of all the different ways we could fill pots with 10 flowers with our red and yellow.”
- “We’ve got our tens frame and we’ve got our coloured tiles that we’ve looked at before, to show our red flowers and our yellow flowers – we need to put ten flowers in our tens frame.”
- “Once you’ve got one, see if you can make another one that’s different.”
- “Any strategies we need to remember while we are filling out our tens frames?” [Eg. What is the colour rule?]
- “Colour rule – the same colours stay together because that makes it easier for us to fill up.”

Developing student thinking:

- “Now we are going to use our tools and come up with all the flower combinations you can think of.”
- Students will make different tens frames, then: “We are going to do some math thinking now. Think in your head, what’s your favourite combination that you made. Think of something different/unique. Maybe something different than your neighbor. We are going to keep that favourite one and get rid of the other ones.”
- Teacher provides instructions to transfer that onto the tens frame.

Student sharing:

- “Hold up your favourite one so your friends can take a look, then put it up on the elmo.”
- Teacher prompts:
“Tell me about your flower pot.”
“Let’s write that into a number sentence.”
- Teacher models hers.
- Math thinking questions:
If you have the same number of reds, stand up and say, that’s me!
If you have the same number of yellows, stand up and say, that’s me?
More reds, more yellows etc!
If you have a different addition sentence...tell us your addition sentence

Deb/Carolyn will help Bacall to choose an example from the student work.

Wrap up:

“We want to use these in our flower shop when we open it up so you can make your very own pot to hold and show to your math thinking! And maybe even share at the genius board! Keep them in a safe spot. Can you find the basket that matches your order? Once you put it in the basket, you can go to a play station. [ticket out the door]

AFTER: Grand opening day is tomorrow. What do we need? [Highly emergent, based on student thinking about all the things available to them in the classroom and how they can be used at the play station. Eg. Seeds, labels.]

2. Application lesson – at the play centre making the flower arrangements (today's lesson)

THE “TEN-IN-A-POT” FLOWER SHOP: “Play with all the different ways to make 10”

10 minutes to model
20 minutes developmental play
10 for wrap up

Activating student thinking:

- “Yesterday we made these order forms, you chose your favourite and today we are going make the flower pots.”
- “We were playing with different ways of making ten and seeing what our flower pots could look like.”
- “Let’s remember the pizza shop, how did we start? What did we have to do first?”
 - we made our orders
- what would you tell a friend, how do we fill in order forms and then make the orders?”
- fishbowl modeling – with two kids to show
 - Students will take their favourite one to the flower shop.
 - Read it, remind ourselves what it looks like.
 - Get the flowers they need.
 - Bring them to the table, arrange the flowers
 - Need to make sure our order is correct.
 - Add to chart: “I can check my order with a friend.”
 - Where should we put these pots?

Developmental play starts

Students go on to the flower shop and fill their orders.

Explain to students: “We have to look at the things that we’ve made to make sure it’s right. Check with a friend to make sure.”

Elements of choice at the centre:
Choosing the combination of numbers to make 10

Writing the number sentence on a sticky on the pot

Placing pot on shelf

Completing order form basket
Labeled with black and white ten frames
Later down the road can take it up

Students can have more time with five if they need it

Introducing a third colour for students who are ready

Wrap up and reflection*

	Key questions:
“Time to tidy up. We’ve had some time to play, I saw some really neat math thinking. Let’s do a little reflection.”	How many flowers do you have? How many red, how many yellow? What did you try? What worked, what didn’t? If you wanted to help your friend do this, what would you tell them? What math thinking can you tell me about your flower pot? What strategy did you use? (the most) because some go between 3 different strategies. <ul style="list-style-type: none">○ I counted in my head○ I filled my tens frame○ I used my fingers
“Write your name on the genius board (students asked by teacher or self-selected), then back to the carpet and “why you put your name on the genius board. We are going to share with our friends who are using the centre next.”	How did your tens frame help you?
“We are going to be using this for the next week or so as one of our centres.”	Tell your friends about your math thinking.
“What worked well, what could we add, what could we change?” (Co-creation piece.)	What did you notice ____ was doing? Did yours have more yellow? How many red did you have? How many more did you have? Other possibilities: If students fill in the tens frame with one colour and then know the remaining without filling it out: <ul style="list-style-type: none">○ How did you know that ____ were going to be yellow?
* Consolidation of the centre will come later. We will share what that will look like at the end of a week or so of playing and investigating.	If we see someone doing something different, stop and point it out.

Possible next steps for lessons and play:

Finding the number patterns: All the different ways to make 10 with two colours

- “Let’s try and organize these – do you think we’re missing any or do we have them all?”

The person putting in the order could hide one part – “I have 3, how many do I need?”

Introducing a third colour (making 10 with three numbers).

Use two different colours to draw attention to the numbers and enable comparisons.

Date: April 11, 2012

Name:

Observation Guide I:
Composing and decomposing 10

**How did you observe children composing and decomposing 10?
(What strategies are they using to make 10?)**

Independently	Through/with peers
Through prior connections (pizza shop, monkeys)	Through anchors

What combinations are we seeing most frequently?

Does two colours limit the students' thinking? What about that 3rd colour (if it's introduced?)