Collaborative Inquiry Learning in Mathematics: Supporting Aboriginal Learners
How the CIL-M has impacted our teaching practice...
Math Class Challenges...

- Effective Collaborative Work
- Meeting all student needs
- Understanding the Math
- Resources
What a CIL-M day looks like...

• How many sessions were there?
• What does a co-planning, co-teaching day look like?
• What are the roles of the teachers involved?
The Journey of Learning begins…

Personal reflections of the first CIL-M day…

Host Teachers

Administrator

Curriculum Coordinator

Co-teacher
“Learn by Doing”

Understanding the three-part lesson...

1. **Before – Getting started** (5 to 10 minutes). Revisiting mathematical ideas and strategies from a previous lesson that relates to the learning goal of the lesson

2. **During – Teaching/learning** (15 to 20 minutes). Solving the lesson problem in pairs, small groups or individually

3. **After**
   
   (a) **Consolidation** (20 to 25 minutes). Co-ordination of whole-class discussion and analysis of student solutions
   
   (b) **Highlights/summary** (5 minutes). Recounting key mathematical ideas and strategies related to the learning goal of the lesson
   
   (c) **Practice** (5 to 10 minutes). Solving a problem that is similar to the lesson problem in order to practise applying new ideas and strategies
Let the Collaborative Planning begin...

Teacher shares strand and focus for planning.

Grade 6/7 Patterning and Algebra

Overall 6: Describe and represent relationships in growing and shrinking patterns (where the terms are whole numbers), and investigate repeating patterns involving rotations
• Grade 7: Represent linear growing patterns using concrete materials, graphs, and algebraic expressions

Specific:
Grade 6:
• make tables of values for growing patterns, given pattern rules in words ...

Grade 7:
• Represent linear growing patterns, using a variety of tools and strategies...
De-construct the curriculum

<table>
<thead>
<tr>
<th>What students need to know.....</th>
<th>What students need to be able to do/learn.......</th>
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Resource: Guide to Effective Instruction in Mathematics : Patterning and Algebra (page 20)
Co-create a Learning Goal

Learning Goal:
We will understand that a pattern can be represented in different ways.
3-Part Lesson

Before

‘Activating Prior Knowledge’ (5-7 min.)

Given this pattern, represent or show the pattern in as many ways as you can.
1,3,5...
3-Part Lesson

‘During’

Working on It: 15-20 min.

“At a community fair, a student wins first prize – a collection of miniature toys. He has a choice to have 25 toys immediately or have toys delivered every day to his home for the next 10 days. For the next ten days the toys would be delivered to the student’s home in a most unusual way. On the first day the winner’s package contains 1 chipmunk; on the second day the package contains 2 blue jays and 1 chipmunk; on the third day the package contains 3 puppies, 2 blue jays, and 1 chipmunk; on the fourth day the package contains 4 kittens, 3 puppies, 2 blue jays, and 1 chipmunk. The same pattern continues until, on the tenth day, the package contains 10 caterpillars, 9 ladybugs, 8 goldfish, 7 rabbits, 6 ducklings, 5 butterflies, 4 kittens, 3 puppies, 2 blue jays, and 1 chipmunk. The question is: Which way of receiving the prizes is the best choice for the winner?”
OPEN-ENDED QUESTION

Create a growing pattern that starts with 2, 6, .... and represent the pattern in at least two ways.

How would you describe the pattern rule?
3-Part Lesson – ‘After’ Consolidation

Coordination of whole-class discussion and analysis of student solutions.

This is where the learning takes place...

Resources to Support:
LNS Monographs: Communication in the Mathematics Classroom

Student Interaction in the Math Classroom: Stealing Ideas or Building Understanding

Grand Conversations in Primary Classrooms
Consolidation...

"The role of the teacher during whole-class discussion is to develop and the build on the personal and collective sense-making of students rather than to simply sanction particular approaches as being correct or demonstrate procedures for solving predictable tasks."
(Stein, Engle, Smith, & Hughes, 2008, p. 315)
you would get more toys if
you waited 10 days because each
day you get what you got the
last day and + 1 so on the 10 day
you get 220
If you do it all in 1 day you
get 25 toys I would get it
in 10 days

1
+3
6
10
15
21

1 = 1
1 + 2 = 3
1 + 2 + 3 = 6
1 + 2 + 3 + 4 = 10
1 + 2 + 3 + 4 + 5 = 15
1 + 2 + 3 + 4 + 5 + 6 = 21
1 + 2 + 3 + 4 + 5 + 6 + 7 = 28
1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 = 36
1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = 55

Travis, Dakota

The best way is
To get them in ten
days because you
get 220 instead
of getting 25 in
one day.

The best way is
to get them in ten
days because you
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<table>
<thead>
<tr>
<th>Days</th>
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<th>Amounts</th>
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<tbody>
<tr>
<td>1st</td>
<td></td>
<td>1 chipmunk</td>
</tr>
<tr>
<td>2nd</td>
<td>1 chipmunk 2 bluejays</td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>3 puppies 2 bluejays 5 chipmunk</td>
<td></td>
</tr>
<tr>
<td>4th</td>
<td>4 kittens 3 puppies 2 bluejays 1 chipmunk</td>
<td></td>
</tr>
<tr>
<td>5th</td>
<td>5 butterflies 3 puppies 2 bluejays 1 chipmunk</td>
<td></td>
</tr>
<tr>
<td>6th</td>
<td>6 ducklings 3 puppies 2 bluejays 1 chipmunk</td>
<td></td>
</tr>
<tr>
<td>7th</td>
<td>7 bunnies 2 ducklings 1 butterfly 4 kittens 3 puppies</td>
<td></td>
</tr>
<tr>
<td>8th</td>
<td>8 goldfish 6 ducklings 3 puppies 1 butterfly 4 kittens 1 chipmunk</td>
<td></td>
</tr>
<tr>
<td>9th</td>
<td>9 ladybugs 1 butterfly 4 kittens 2 bluejays 1 chipmunk</td>
<td></td>
</tr>
<tr>
<td>10th</td>
<td>10 caterpillars 1 butterfly 4 kittens 2 bluejays 1 chipmunk</td>
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</table>

He should choose delivering for 10 days because he'll get 220 toys. 220 is 145 more toys than 25 immediately.
1 chipmunks x 10
2 blue jays x 9
3 puppies x 8
4 kittens x 7
5 butterflies x 6
6 ducklings x 5
7 rabbits x 4
8 goldfish x 3
9 ladybug x 2
10 caterpillars x 1

10 chipmunks + 9 b.j.'s
19

10 chipmunks + 10 caterpillars = 20 toys
18 x 8 = 36
24 x 2 = 48
28 x 2 = 56
30 x 2 = 60

20 + 36 = 56
48 + 60 = 108
56 x 2 = 112
108 + 112 = 220.

Well, no duh.
220 is waaaaaaayy bigger of a number than 25. So if I was that kid, I'd have it delivered to me in the next 10 days. So, yeah...
I guess that's math for you.
‘After’ continued

- **Highlight and Summary** – recounting key mathematical ideas and strategies related to the learning goal

- **Practice** – solving a problem that is similar to the lesson problem in order to practice applying new ideas and strategies
Resources...

Questions and Prompts....

Guide to Effective Instruction in Mathematics, Kindergarten–Grade 6, Pages 81–Volume 2, Problem Solving and Communication

- Questions to pose
  - How did you solve the problem?
  - What did you do?
  - What strategy did you use?
  - What math words did you use or learn?
  - What were the steps involved?
  - How did your strategy work?
  - What did you learn today?
  - What do you think the ______ mean to you?

- Prompts to use
  - I solved the problem by ______.
  - The math words I used were ______.
  - The steps I followed were ______.
  - My strategy was successful because ______.
  - Area (or other concept) is ______.
  - Explain to a young child ______.
  - Draw a picture to show how you solved that problem.

These questions and prompts help students to tell, list, choose, recite, name, illustrate, and summarize.

- Questions to pose
  - What mathematics were you investigating?
  - What questions (feelings) arose as you worked?
  - What were you thinking when you made decisions or selected strategies to solve the problem?
Areas of professional growth that I am interested in pursuing

- Increasing my knowledge and comfort with the mathematics curriculum at the grade 3/4 level
- Increasing my understanding and improving my implementation of the 3-part problem solving approach in mathematics
- Increasing my knowledge and comfort with using the Smart board
- Refining my ability to integrate subject area content within my literacy block

Areas of professional growth that I am interested in pursuing

This year, my classroom is equipped with a SMARTboard. I have attended SMARTboard training twice, but have never had the opportunity to put my learning to use. In the past, I have also set goals on my ALP to learn more about the Elmo and also to increase my knowledge of 3-part problem solving in Math. I’m excited to explore ways to use this engaging tool to enhance student learning in various subject areas and increase my own technological abilities in the classroom. I am particularly interested in using the SMARTboard in Mathematics to improve instruction and student learning in this area.

Areas of professional growth that I am interested in pursuing

1. Continue to refine my use of writing workshop, focusing on providing and ensuring student implementation descriptive feedback, through the writing conference process and performance/continuum wall, to improve student writing at individual levels.

2. Implement regular use of the three part problem process in math to refine my use of questioning in student learning, as well as to help students move toward using questioning to explore and develop their own deeper understanding of mathematical principals.

3. Learn new technologies and applications that will enhance student learning, specifically SMART board training.

Areas of professional growth that I am interested in pursuing

- Math - use the 3 part math problem solving model effectively.
- Enhancing communication and understanding through the use of visual tools, e.g., first, next then board.