support every child reach every student

K to 12 Capacity Building in Mathematics
Day 2 – p.m. session
Fall 2013
Session Overview

• Explore the profile of the K-12 learner, with a focus on students with learning disabilities

• Investigate mathematical ideas related to algebraic reasoning
Engaging in the Math

- Below is a pattern that was made with toothpicks.

  Figure 1
  Figure 2
  Figure 3

- How many toothpicks are needed to build the 10th figure?
- How many toothpicks are needed to build the 100th position?
Unpacking the Math

• How did the variety of representations support your understanding of the mathematics?

• What challenges do students from K - 12 face when asked to solve this problem?

Figure 1

Figure 2

Figure 3
Learner Profile Focus

Supporting Students with Learning Disabilities in Mathematics
Learner Profile Focus

• Why students with learning disabilities?
  
  ❖ largest group represented within students with Special Education needs, K-12
  
  ❖ large proportion of these students are within reach
  
  ❖ shared understanding of learner profile is needed
  
  ❖ understanding how to support students with learning disabilities with various strengths and needs in the mathematics classroom
Cognitive Processes & Learning

Information:
- Storage
- Processing
- Retrieval

Information: In
  Information: Out
  Information: In
Cognitive Processes

- Verbal Comprehension
- Perceptual Reasoning
- Memory
- Processing Speed

+ Executive Functioning
Normal Distribution

York Catholic DSB
Sample Profile: Individual with Average Cognitive Ability

% ile

AVERAGE

Verbal Comprehension  Perceptual Reasoning  Memory  Processing Speed  Executive Functioning

Cognitive Domain

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support every child reach every student
Sample Profile: Individual with a Learning Disability

% ile

Verbal Comprehension
Perceptual Reasoning
Memory
Processing Speed

Executive Functioning

Cognitive Domain

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Profile:
Student with a Learning Disability

• Overall average to above average intelligence, i.e. the potential to learn
• May have difficulty with input or output
• May have difficulty with information processing, storage or retrieval
• **Academic Achievement may not be reflective of ability**

*York Catholic DSB*
Reflecting as a Board Team

How does awareness of the profile of a student with a learning disability inform your K-12 mathematics work within your role and as a team?
One Cognitive Process: Perceptual Reasoning
Select each of the following that are **different** for the Patterns A and B:

- [ ] the *number of squares* in Positions 1, 2, and 3
- [ ] the *multipliers* in the pattern rules
- [ ] the *steepness* of the trend lines.

**Pattern A**
- Pictorial Representation
- Pattern Rule Representation
  \[
  \text{Number of Tiles} = (\text{Position Number}) \times 3 + 2
  \]

**Pattern B**
- Pictorial Representation
- Pattern Rule Representation
  \[
  \text{Number of Tiles} = (\text{Position Number}) \times 4 + 2
  \]

2. **Graphical Representations**

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**Math CLIPS, Linear Growing Patterns – Representing, Comparing Families of Linear Growing Patterns, 3.4 Check Your Understanding, Scene 3**
What a Student Might See...

Math CLIPS, Linear Growing Patterns – Representing, Comparing Families of Linear Growing Patterns, 3.4 Check Your Understanding, Scene 3
Toothpick Task: A Different Look

• How many toothpicks would there be in Figure 10?

VS

York Catholic DSB Middle Years Collaborative Inquiry Project, 2012-13
Paying Attention to Representations

- Benefits of working with concrete objects
A Patterning Task

- Use tiles to build the first 3 positions for the following pattern rule:

  \( \text{Number of Tiles} = \text{position} \# \times 3 + 4 \)

  How many tiles would there be in position 10?

- Examine the two sample representations.
  - What do you notice? What does the student know/understand? What partial/transitional understandings does the student have?
  - How might the student determine / describe the number of tiles in position 10?
A Sample Student Representation

Number of Tiles = position # x 3 + 4

• Sample #1

York Catholic DSB Middle Years Collaborative Inquiry Project, 2012-13
A Sample Student Representation

Number of Tiles = position # x 3 + 4

• Sample #2

York Catholic DSB Middle Years Collaborative Inquiry Project, 2012-13
Perceptual Reasoning

- Perceptual reasoning involves:
  - the ability to understand visual-spatial information, such as part-whole relations, patterns and sequences
  - the ability to generate visual representations in the mind, problem-solve and present ideas in a visual format

*Supporting Students with Learning Disabilities in Mathematics, York Catholic DSB (2012)*
Reflecting as a Board Team

How does awareness of the profile of a student with a learning disability inform your K-12 mathematics work within your role and as a team?
From Specific to General Instances
Math Facilitator Planning Made Explicit

• Everyone is a mathematical thinker
• We focused on precise mathematics content
• The mathematics task allowed for a shared experience
• We allocated time for dialogue
• Discussion about the content of the mathematics task is the segue to the complexity of teaching and learning
Opportunities for Further Learning

• Adobe Presenter:
  ❖ Algebraic Reasoning
  ❖ Supporting Students with Learning Disabilities in Mathematics

• Adobe Connect Series:
  ❖ Paying Attention to Algebraic Reasoning, K-12
  ❖ Supporting Students with Learning Disabilities in Mathematics

• Register for an RSS feed for professional learning opportunities, www.edugains.ca
Resources

• Paying Attention to Algebraic Reasoning, K-12

• Math CLIPS, [www.mathclips.ca](http://www.mathclips.ca) (Critical Learning Instructional Paths Supports)

• A Resource for Parents and Students: Mathies website, [www.mathies.ca](http://www.mathies.ca)
Presenter Information

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