Paying Attention to Mathematics Education

K – 12 Capacity Building in Mathematics

Welcome
Mathematics Professional Learning Facilitators
Fall 2014 Session
# Today’s Agenda

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<td>I Have…, Who Has…?</td>
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<td>Building Flags: A Mathematics Task</td>
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<td>Ministry Resources</td>
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Intended Learning

• Increase mathematics content for teaching through a focus on fractions
  – Connect to spatial, algebraic and proportional reasoning
  – Focus on key concept of unit fractions

• Build Mathematics Professional Learning Facilitators’ efficacy
  – Make explicit the roles and actions
No area of elementary school mathematics is as mathematically rich, cognitively complicated, and difficult to teach as fractions, ratios, and proportionality. These ideas all express mathematical relationships: fractions and ratios are “relational” numbers. They are the first place in which students encounter numerals like \( \frac{3}{4} \) that represent relationships between two discrete or continuous quantities, rather than a single discrete (“three apples”) or continuous quantity (“4 inches of rope”).

*Litwiller & Bright, 2002, p. 3*
Prior Learning which Supports Fractions Understanding

Fractions understandings are underpinned by:

- proportional reasoning (Moss & Case, 1999)
- spatial reasoning (Mamolo, Sinclair, Whitely, 2011)
Subsequent Learning which Connects to Fractions

• Fractions themselves underpin:
  – probability (Clarke & Roche, 2009)
  – algebraic reasoning (Brown & Quinn, 2007; Empson & Levi, 2011)

• The College Mathematics Project identified fractions as an area in which students struggled in their first year college math courses.
I have ... Who has ... ?

I have

Who has \( \frac{1}{2} \)?

Who has \( \frac{3}{8} \)?
FACILITATING MATHEMATICS PROFESSIONAL LEARNING
Understanding the Role of the Mathematics Professional Learning Facilitator

• It is challenging to describe, since:
  – It is a complex role.
  – The work is often invisible.
  – The mathematics content is embedded and central to the inquiry.

• There is an assumption that the “soft” skills of a facilitator are sufficient across disciplines.
Facilitation vs. Presentation

Both,

• involve participants developing knowledge and skills.

• can lead people to new knowledge and new ways of thinking.

• require clear communication and clear goals/intentions.
## Distinctions

### Facilitation

- Discussion and two-way sharing of information and ideas
- Facilitator speaks regularly but is continually soliciting ideas from the group; ideally the group members are contributing more than the facilitator
- A process of knowledge creation where the group is generating ideas, trying things out, analyzing results, solving a problem, making decisions

### Presentation

- Lecture or interactive presentation
- Speaker does majority of talking as the knowledgeable leader
- A process of information delivery to the audience as a form of educating, informing, persuading, inspiring and/or entertaining
## Distinctions

### Facilitation
- Shared question finding and goal setting through listening, demonstrated curiosity and resourcefulness
- Participants take on various roles throughout the session, roles may switch and fluctuate
- Supporting positive group dynamics is key to the role but content knowledge is equally valued

### Presentation
- Imparting knowledge to motivate participants into taking action
- Participants are audience members who engage in the learning set out by the presenter
- Pace, visuals, and capturing attention are key to the role but content knowledge is also valued
Actions of Mathematics Professional Learning Facilitators

• Reflect on your actions within the role.
  – What are the important actions of a mathematics professional learning facilitator?

• Identify three actions of a mathematics professional learning facilitator. Write one per sticky note.
  – e.g. listen and echo back participant statements
Actions of Mathematics Professional Learning Facilitators

• Share your actions or roles with your table group.

• Sift and sort your sticky notes into piles at the table.
Facilitating Mathematics Professional Learning

Ontario Research Findings

Facilitating Mathematics Professional Learning

Facilitating and presenting are different. The purpose of the professional learning session determines the structure and the type of session to deliver it. Facilitating and presentation involve participants developing knowledge and skills. Both can lead to new knowledge and new ways of thinking. Both require clear communication and clear goals and objectives. Some distinctions are outlined below.

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The Visible

These aspects of facilitation that may be:

- Planner: establish the process, he agenda; pre-plan all activities to sharpen their focus
- Listener: echo statements back to group
- Observer: notice and feedback to the group
- Coordinator: oversee technical details; a team leader
- Tone setter: set a group's pace with value, honour, and challenge, and interest the listener and risk taker
- Learning together: participate in the participants' dialogue and content of the inquiry and learn from students
- Collaborator: ongoing sharing of engage

Some Mathematics Facilitator Paradoxes

- Focus on the big stuff: anticipate and focus
- Honour individual differences: create new knowledge as a co-learner
- Validate decision making: empower others
- Be flexible: be problem oriented
- Narrow in on the details: be open to surprises
- Fine perspectives and goals: convey known knowledge
- Facilitate simultaneously: not obviate every decision
- Suffer self-doubt: be powerful
- Be goal oriented: be student oriented
- Have clear expectations

Facilitator as Juggler

Facilitator as Navigator

Facilitator Reflection, 2013

Read the roles and actions on pages 2 and 3.

Connect your sticky note pile to the roles and actions in the brochure.

The Invisible Actions and Interactions

When a facilitator decides to remain silent, read members of the group for engagement, highlight one direction but not another, or encourage the group to follow a new idea further, the participants are unaware that these decisions have been made. Some of these invisible actions are discussed below.

**Anticipating:** Anticipating pathways of the group, making accurate estimations of, and leveraging, cultural capital of group members

**Confidence Building:** Setting participants up for mastery experiences in the learning and teaching of mathematics, showing vulnerabilities of self as facilitator

**Embracing the Messiness:** Encouraging the messy questions, the wonderings, the 'Mud', helping the group gently find their way

**Supporting Transformation:** Helping participants get inspired, naming...
## Most Frequent Actions of Facilitators

As revealed by coding facilitator artefacts

<table>
<thead>
<tr>
<th>Visible Actions</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Planner</td>
<td>Longest Bar</td>
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<tr>
<td>Listener/Observer</td>
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<tr>
<td>Tone Setter</td>
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<td>Learning Together</td>
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<td>Knowledgeable Other</td>
<td>Longest Bar</td>
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<td>Collaborator</td>
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<td>Dynamics Monitor</td>
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<td>Navigator</td>
<td>Longest Bar</td>
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<td>Challenger</td>
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<table>
<thead>
<tr>
<th>Invisible Actions</th>
<th>Frequency</th>
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<tr>
<td>Confidence Building</td>
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<td>Embracing the Messiness</td>
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<td>Supporting Transformations</td>
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<tr>
<td>Window Finder</td>
<td>Longest Bar</td>
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<td>Fusing Horizons</td>
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<table>
<thead>
<tr>
<th>Challenges</th>
<th>Frequency</th>
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<td>Being Knowledgeable</td>
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<tr>
<td>Mismatch</td>
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<td>Complexities</td>
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</table>
Mathematics Professional Learning Facilitation

What new insights do you have about the roles and actions of a mathematics professional learning facilitator?
Why Focus on Mathematics Content Knowledge?

• Urgency to address mathematics achievement in Ontario

• Important component of the complexity of learning and teaching (COLT)

• Strong correlation between…
  – content knowledge and teacher efficacy
  – teacher efficacy and student efficacy
  – student efficacy and student achievement
Dr. Cathy Bruce on Teacher Efficacy
Teacher Efficacy

• How will you support increasing teacher efficacy this year?
  – Consider specific actions you will take to achieve this.

• How will this support connect to the information on the Professional Learning Facilitator brochure?
BUILDING FLAGS:
A MATHEMATICAL TASK
Building Flags

Step 1: Create a Flag

• Using the materials provided, create a multi-colour flag. Your flag must:
  – contain at least three non-congruent shapes
  – cover the entire area of the whole, which is the white paper
  – not have overlapping pieces.

Step 2:

• Answer the questions on the handout.
Lunch
Let’s Debrief the Task

As a learner,

1. How did you determine the fractional amount of each piece?

2. What strategies did you use to see equivalent fractions?

3. How did you use the shapes to decide on your number sentence?
Let’s Unpack the Task

As an educator,

• What mathematics does this task expose?
• How does this task support a flexible conceptual understanding of fractions?
• How does this task support students with persistent achievement challenges?
Learn More About Unit Fractions

• Read either:
  – Unit Fractions one-pager (from top to below the graphic of different number systems)
  OR
  – Paying Attention to Fractions – Equivalency (page 14-middle of page 15)

• Be prepared to share the following with your table members:
  – Three key points.
  – One connection to the Flag Task.
The Power of Unit Fractions

• How can we use unit fractions to
  – compare:

\[
\frac{7}{8} \text{ and } \frac{9}{10} \quad \frac{11}{12} \text{ and } \frac{12}{13}
\]

– visualize

\[
\frac{3}{4} \div \frac{1}{4} = 3
\]
\[
\frac{3}{4} \div \frac{1}{4} = 3
\]
Unit Fractions Counting Game

• Count around your table using the unit fraction of \( \frac{1}{8} \).

• The first person in the circle would say “one one-eighth”, the second person would say “two one-eighths”, the third person would say “three one-eighths” and so on. When a person arrives at a whole number (such as eight one-eighths) they need to stand up and say the whole number equivalent.

• Be sure to count well past one.
Student Resources (Fractions)

- CLIPS, games, tools
- Gap Closing and epractice
- OERB activities

www.mathies.ca
Educator Resources (Fractions)

• Digital paper *Professional Learning about Fractions: A Collaborative Action Research Project*

• Literature Review *Foundations to Learning and Teaching Fractions: Addition and Subtraction*

• One Pagers *Math Teaching for Learning*

• Planning for Mathematical Understanding: Fractions Across the Junior Grades

• *Paying Attention To Fractions*

• (Coming) *Fractions Learning Pathway with tasks*
Coming Soon

Paying Attention to Fractions Supports, pg. 24

• Actions to Develop Fractions Understanding
• Intentional Tasks to Develop Fractions Thinking
• Fractions across Strands and Grades: Sample Tasks
• Being Responsive to Student Thinking
And lots more at www.edugains.ca, including:

**Adobe Presenter**
# Professional Learning series

**Building PROPORTIONAL REASONING Series**

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<td>Session 3 - November 4</td>
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<td>Session 4 - November 18</td>
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**Featured Speaker session**

Dr. Marion Small, February 25th, 2015.

- Audience: Professional Learning Facilitators

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**Building FRACTIONS Series**

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<td>Session 3 - March 5</td>
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<td>Session 4 - March 12</td>
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**Featured Speaker Session**

Dr. Cathy Bruce, November 12th, 2014.

- Audience: Professional Learning Facilitators

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**Building ALGEBRAIC REASONING Series**

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<td>Session 4 - November 26</td>
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COMING SOON
# Professional Learning series

**COMING SOON**

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## Supporting Students with Learning Disabilities in Mathematics Series

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<th>Target Audience I</th>
<th>School level teams</th>
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<tr>
<td>Format</td>
<td>4 - 90 minute afterschool Adobe Connect</td>
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<td>March 10</td>
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<td>March 31</td>
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<td>April 14</td>
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<table>
<thead>
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<th>Target Audience II</th>
<th>DSB teams of 5 or more</th>
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<tr>
<td>Format</td>
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<tr>
<td>Dates</td>
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<td>October 30 a.m.</td>
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<td>November 18 a.m.</td>
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<td>December 5 a.m.</td>
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# Professional Learning series

**COMING SOON**

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## Supporting Principals and Vice Principals with Instructional Leadership in Mathematics

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<th>Target Audience</th>
<th>Principals and Vice Principals</th>
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<tr>
<td><strong>Format</strong></td>
<td>Three 90 Min Adobe Connect series during the school day</td>
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</table>
| **Dates**             | **November 28**  
                        | **January 26**  
                        | **March 26**                                              |
| **Featured Speaker**  | Dr. Chris Suurtamm                                                 |
Connecting Today to Tomorrow…

How will you use the materials, information, activities, and professional learning opportunities to support your work this year?

Be prepared to share your journey at the spring session.
Provincial Mathematics Facilitators

- There are a number of educators who are available to support school boards in the planning and implementation of professional learning.
- The school board covers the cost of their time and Curriculum and Assessment Policy Branch covers the cost of their travel.
- For more information, contact your regional Provincial Mathematics Lead, XXX (email) - Contact info on next slide
# Mathematics Team

## Curriculum and Assessment Policy Branch

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
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<tbody>
<tr>
<td>Sandy Dilena</td>
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## Provincial Mathematics Leads

<table>
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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Danielle Blair</td>
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</tr>
<tr>
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## Literacy & Numeracy Secretariat

<table>
<thead>
<tr>
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<tr>
<td>Lynn Strangway</td>
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<td>Jennipher Torney</td>
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<tr>
<td>Sharon Ulett-Smith</td>
<td><a href="mailto:Sharon.Ulett-Smith@ontario.ca">Sharon.Ulett-Smith@ontario.ca</a></td>
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## Student Success

<table>
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<tr>
<td>Melissa Weyland</td>
<td><a href="mailto:Melissa.Weyland@ontario.ca">Melissa.Weyland@ontario.ca</a></td>
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http://tinyurl.com/osmmsux