

Facilitating Mathematics Professional Learning

Spring 2014

Ontario Research Findings

There is increasing emphasis on inquiry-based professional learning in mathematics as educators build precision in their mathematics teaching. This in turn expands the demand for nuanced and effective facilitation of inquiry-based professional learning - but do we really understand the role of a mathematics professional learning facilitator? Describing this role is challenging when: a) it is a complex role; b) the work is often invisible; and c) mathematics content is embedded and central to the inquiry. Information and 'training' on how to facilitate professional mathematics inquiry situations have been limited to date. Further, there is an assumption that the soft skills of a facilitator are sufficient across disciplines; however it is worth considering how mathematics content may be a foundational and particular quality of mathematics facilitation. A team of mathematics facilitators in Ontario engaged in Collaborative Action Research (CAR) to learn more about the skills and knowledge facilitators use and need. Some of the findings from this project are summarized in this document.



Facilitation vs Presentation

Facilitating and presenting are different. The *purpose* of the professional learning session determines the structure and the skill set used to deliver it. Both facilitation and presentation involve participants developing knowledge and skills. Both can lead people to new knowledge and new ways of thinking. Both require clear communication and clear goals/intentions. Some distinctions are outlined below.

FACILITATION	PRESENTATION
<ul style="list-style-type: none"> • 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 • 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 	<ul style="list-style-type: none"> • 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 • 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

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Mathematics Content for Facilitators

Content knowledge is important for teachers of all subjects. However, challenges with mathematics content knowledge and content pedagogical knowledge have been well documented as distinct from other disciplines over the past 30-40 years. Mathematics content knowledge involves a complex combination beyond understanding of discreet ideas: understanding how content connects across the grades and strands (such as how multiplication of whole numbers connects to multiplication of decimals and fractions and to scaling of diagrams); recognizing transitional thinking in student responses; anticipating student responses; making precise decisions regarding selection of tools and strategies for content; and understanding the underlying mathematical thinking.

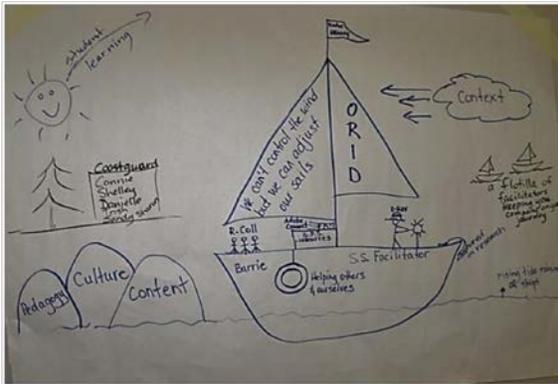
Assets for the Facilitation of Mathematics Professional Learning

Mathematics knowledge for teaching

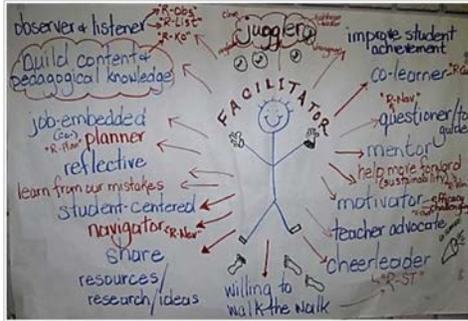
Knowledge of mathematics across the grades

Understanding of how we learn mathematics

Attentive to respectful and deliberate opportunities to deepen mathematics understanding for participants



Facilitation as Sailing



Facilitator as Juggler



An Apple as a Metaphor

Visual metaphors for mathematics facilitator roles created by participants of a provincial mathematics camp.

The Visible

Those aspects of facilitation that may be easily spotted by others or articulated by the mathematics facilitator

There are a number of roles that a facilitator assumes as he/she leads a group through action research. Some roles that have been identified in CAR facilitator research are listed.

Planner: establish the process; help with goal setting and agenda; prepare/select activities that might help the group sharpen their focus

Listener: echo statements back to the group; be the ears of the group

Observer: notice and feed back to the group; be a fresh pair of eyes for the group

Coordinator: oversee technical details such as dates and room bookings; be a time keeper

Tone setter: set group at ease with humour and/or positivity; value, honour and challenge participants; participate as an interested learner and risk taker; be brave

Learning Together: participate in the mathematics learning alongside the participants; dig deep into the mathematical content of the inquiry and learn from one another and from students

Collaborator: ongoing sharing of goal setting and invitations to engage

Knowledgeable Other: prepare and bring mathematics content, materials and information to the group; build own mathematics knowledge; anticipate the mathematics content most relevant to participants

Dynamics monitor: intervene when necessary; address group dynamics and management

Navigator: narrow in and broaden out as needed; refine key questions and points of inquiry; move things forward linking ideas and mathematics content; give opportunities for reflection; leave responsibility for learning with the participants and synthesize ideas

Challenger: encourage positive dissonance; challenge preconceived notions; uncover misunderstandings about mathematics content and the learning and teaching of mathematics; engage in discourse

Some Mathematics Facilitator Paradoxes

focus on the big stuff	yet	narrow in on the details
anticipate	yet	be open to surprises
honour individual differences	yet	fuse perspectives and goals
create new knowledge	yet	convey known knowledge
participate as a co-learner	yet	facilitate simultaneously
reveal decision making	yet	not obviate every decision
use cultural capital	yet	suffer self-doubt
empower others	yet	be powerful
be flexible	yet	be goal oriented
be problem oriented	yet	have clear expectations



One facilitator stated that she engages her participants in the mathematics content learning by: "using a variety of sources for learning such as video, group work, quiet reading, reflecting time, talk time and time for collaborating. As often as possible, I try to bring the student voice/student work to the table."

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 shifts in thinking and practice

Window Finding: identifying and revealing windows of opportunity or new avenues of inquiry for the group at the right moment; connecting back to key mathematics concepts and research-affirmed instructional strategies

Fusing Horizons: bringing together multiple perspectives, views, angles and finding a shared horizon in the learning; bring the layers together – mathematics content, process, pedagogy – synergy

Building Moral Imperative: building accountability in the group; explicitly bridging research and practice as related to mathematics content, teaching and learning

Acknowledging Challenges

Some substantial challenges faced by facilitators of mathematics professional learning include:

Being Knowledgeable: Having and accessing mathematics content and pedagogical knowledge that is important to the group while avoiding “telling” or pre-empting risk-taking and discovery.

Lack of Cultural Capital: The group does not have confidence in the facilitator's capacity to facilitate, knowledge of mathematics or experience with students.

Anticipating Needs: Being well-prepared to anticipate all the directions a group might take.

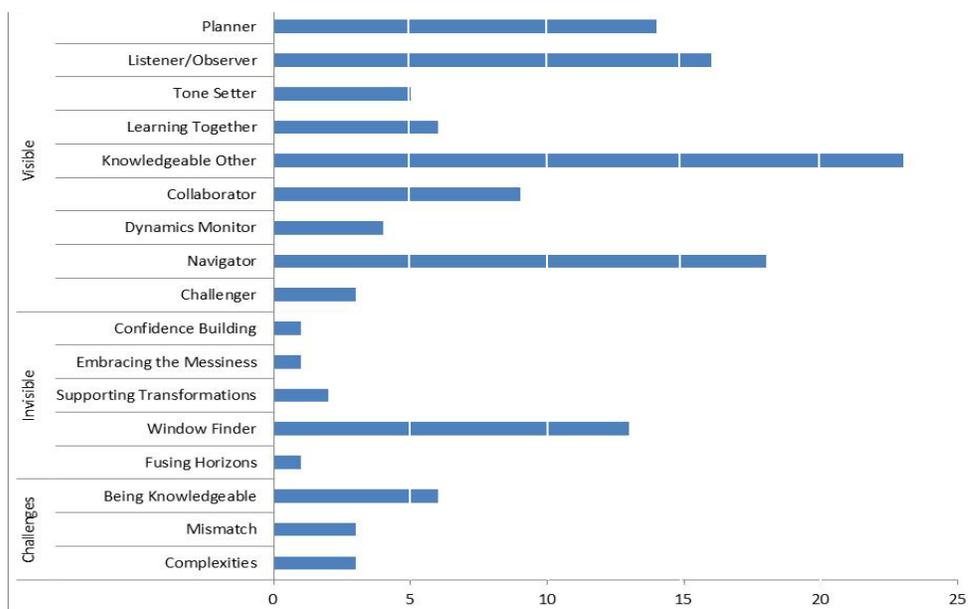
Loneliness: The group contains a limited number of supporters and/or participants who understand the mathematics facilitator role. There are limited opportunities for critical feedback and much of the work of the facilitator goes unnoticed.

Mismatch: The goals of the facilitator do not match with those of the group or members of the group, “my passion is not your passion”, and buy-in of the group is difficult to measure.

Complexities: Teaching and learning mathematics is complicated, often over-simplified, and sometimes overlaid with literacy strategies which are assumed to work universally.

Most Frequent Actions of Facilitators

As revealed by coding facilitator artefacts



“Just as with children, it is sometimes useful to “let a wrong idea stand” in order to allow the misconception to fully surface so we can shed some light on it and address it. It is helpful to think about the parallels between pedagogy, which refers to the teaching of children, and andragogy, which relates to adult learners. Learning needs to be personally relevant – and can’t come at the embarrassment of participants. Slowing down the learning to address misconceptions is often useful for all participants, including those building their mathematics content knowledge.”

Facilitator Reflection, 2013

Noticing and Reflecting

Honing our skills as facilitators requires constant reflection and awareness. We are all familiar with the importance of reflection for deepening our practice as educators; reflection is also key to the development of our craft as facilitators of educator learning in mathematics. Reflection is more than just “thinking back” to a session and how things went, but rather involves a more active, systematic approach to help us make sense of events, to highlight successes and challenges, and to internalize our observations and learning. In the early 1900s, Dewey pointed

out that this is how learning occurs – through purposeful reflection. An enormous body of work in education and other fields has affirmed this. Purposeful reflection is a powerful tool for uncovering the visible and invisible processes at play. More research is required, but early findings showed that facilitators who engaged in reflection benefited from greater awareness of the nuances of their practice and increased self-efficacy as they (i) noted their responses to complex situations and (ii) developed flexibility in their range of responses.

Strategies to support facilitator reflection

For facilitators, decision-making is lightning-quick and time is in short supply. Making time for systematic reflective thought is incredibly challenging. Here are some creative strategies for capturing reflections before, during and after inquiry sessions:

- Keep a binder or portfolio to keep track of notes, reflections, and key artifacts; use sticky notes to annotate further.
- Take photos of student samples and group artifacts using a camera, smart phone, or tablet. Photos can help us remember key moments and discussions and to focus in on key mathematics learning. These can be annotated later to include more comments about the discussion.
- If using PowerPoint to help structure the session, record in-the-moment reflections in the “notes” section to come back to later. If using the slides again for another session, these notes can help to tweak materials and to anticipate issues raised by participants.
- Use an App such as Evernote or 3Ring to track key moments of facilitator learning at the end of each meeting.

Needs of the adult learner

Facilitators of professional learning in mathematics need to keep the needs of adult learners in mind. The art and science of helping adults learn – or androgogy – requires that we think first and foremost about the need for all participants to experience self-directed learning as much as possible. While the facilitator may need to operate within system frameworks and directives, participants need legitimate opportunities to:

- discover personal questions of relevance to daily teaching practice (individual reasons for inquiring into student thinking and mathematics content),
- make choices for how they will pursue the answers to those questions,
- see themselves as curious learners.

KEY REFLECTION QUESTIONS

Some basic questions we can ask ourselves as facilitators: before, during and after sessions.

Before: What are my goals for this session? Articulating facilitator goals prior to any session helps to develop a clear focus and plan. It also helps when re-visiting goals with the group.

During: What is working? What is not working? Often facilitators make mental notes during a session, when gauging the responses of the group and responding accordingly. Finding a way to gather these minute-by-minute observations, even on a sticky note, can help us to repeat our successes and avoid pitfalls in future sessions. Garmston & Wellman call these “in-flight notes” (1994).

After: What did we actually achieve? How does this compare with the goals for the day?

