

Math in *Motion*

a K–12 resource

Issue #2 • January 2014

A K–12 newsletter fostering mathematics awareness
and successful practices across Ontario school boards

‘Mathies’ website launched

Mathies.ca, hosted by the Ontario Association for Mathematics Education (OAME), is designed for Ontario K – 12 students and parents. This website includes games, learning tools, activities, and additional supports for students to explore, build and enhance their mathematical thinking. A parent ‘Frequently Asked Questions’ section includes: “How can I help with the learning of mathematics?”, “What mathematics activities can we do together?”, “What digital supports are available?” and “What additional support is available?”

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Partnering with Your Teen in Mathematics 7–12

Partnering with Your Teen in Mathematics Grades 7 to 12 is a resource for parents, guardians, caregivers and other family members to support the development of their teen’s mathematical abilities. The document addresses key aspects of understanding of the adolescent learner, different ways of learning, engaging in conversations with your teen, and supporting mathematical thinking, learning and work habits. For the document, click [here](#).

Digging into Math Builds Efficacy

“Procedures and concepts go hand-in-hand. They are not diametrically opposed... Rich problems treat students as capable mathematics thinkers. We want to build a generation of problem-solvers, producers of knowledge – not unquestioning consumers. This is why innovation, problem-solving and mathematics matter!”

– Dr. Cathy Bruce,
OFIP Symposium, October 23, 2013.

Dr. Cathy Bruce led educators from around the province at the Ministry of Education’s recent Ontario Focused Intervention Partnership (OFIP)

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Math in Motion is published monthly except during the summer. For more information about this newsletter or to make a comment, email the editor. Editor: Roderick Bennis (roderick.bennis@ontario.ca)

Digging into Math Builds Efficacy – Continued

symposium to look more deeply at the Algebraic Reasoning pathway. The focus was on how a firm foundation of understanding mathematics develops right from Kindergarten through the elementary grades with support of rich problems and manipulatives. Participants worked through creative and powerful mathematics to bridge early patterning to growing linear patterns and equations into graphing linear equations (still using manipulatives).

There were many “Aha!” moments in the audience as they saw how the bridging could be led through these rich problems in ways that could help struggling students, and all students to retain the mathematics they encountered. Dr. Bruce’s suggestions of key areas for focus in math included:

- Increasing time on task
- Focusing on difficult to teach and difficult to learn areas: proportional reasoning (especially fractions), algebraic reasoning (especially generalizing and complex patterns) and spatial reasoning (a key that opens doors to other mathematics)
- Investing in explicit early mathematics supports for students
- Engaging in high quality professional learning in math at the school and district levels (i.e., sustained, content rich, supported)

How can we support students and teachers towards greater success in mathematics?

According to Dr. Bruce, the answer is efficacy!

In education, efficacy is the belief in one’s own ability to learn. Dr. Bruce notes students who believe they will be successful set higher goals for themselves, try harder to achieve those goals, and persist through obstacles. Students with low efficacy experience a fear of failure.

Data collected from the Programme for International Student Assessment (PISA) shows that self-efficacy has the strongest impact on mathematics achievement, outranking math anxiety, previous performance, self-concept and general ability.

High quality teaching, including precise and targeted support to individual students, is the number one influential factor on student learning and achievement.

Teacher efficacy is built in similar ways and supports student efficacy, which supports student achievement.

To find out more click [here](#). (OFIP Symposium site includes video, slideshows, links to resources and more!)

Why focus on math?

Math is the best predictor of school success:

- Duncan et al. (large scale studies; 2007, 2009, 2011) identified early math skills as the best predictor of school success in math, language and social studies.
- Math is a better predictor of language skills than early reading is of later language skills.
- A good predictor of overall credit accumulation (Ontario data).
- Without early intervention, children with math difficulties may experience a “cascade of mathematics failure” from which it is extremely difficult to recover (Jordan & Levine, 2009).

And yet...less time is devoted each day to math learning (7–17% of day) than on literacy (18–30%) or on social studies (13–24%) (Phillips, Gromely & Lowenstein).

New All-Math Version of 'Leaders in Educational Thought'

A new all-math version of the popular *Leaders in Education Thought* webcasts has been released. According to the website found [here](#), seven educators offer their thinking about different aspects of learning mathematics, doing mathematics and thinking mathematically.

Dr. Daniel Ansari describes what dyscalculia is, the characteristics of dyscalculia and the implications of this cognitive dysfunction. He speaks of mathematics anxiety, growth mindsets and gender outcomes.

Dr. Douglas H. Clements has conducted research and published widely in the areas of the learning and teaching of early mathematics and computer applications in mathematics education. His most recent interests are in creating, using, and evaluating

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Financial Literacy Resources to Close the Gap in Students' Learning of Mathematics

Classroom-ready lessons and accompanying SMART notebook files are now available from the Ontario Association for Mathematics Education (OAME) for Financial Literacy for educators of Grades 4, 5 and 6 and Grade 12 (MAP4C and MEL4E) mathematics. Financial literacy is the focus of these lessons that encompass mathematics curriculum expectations. Grade 11 (MCB3C) resources will be posted soon. These resources complement financial literacy resources previously posted for Grade 7-10 educators. Click [here](#) to access all of the grade specific resources developed by OAME for Financial Literacy.

Understanding How to Use Algebra Tiles

Tips from edugains.ca

How do Algebra Tiles help students?

Algebra tiles are used to build concrete area representations of abstract algebraic concepts. The concrete representations help students become comfortable with using symbols to represent algebraic concepts.

Algebra tiles are typically used to explore integers, algebraic expressions, equations, factoring, and expanding. They can also be used to explore ractions and ratios.

How many tiles are recommended?

Students usually work in pairs or small groups when using algebra tiles. Each pair of students needs an x set, a y set, and a plastic organizer. Students can use card stock to create algebra tile sets. Other representations can also be created using card stock, e.g., z sets. A transparent set of tiles is useful for overhead demonstrations by students and/or teachers. When students first use algebra tiles, allow for exploration time.

For more information on algebra tiles, including sample activities, click [here](#).



New All-Math Version of 'Leaders in Educational Thought' – Continued

a research-based curriculum and in taking successful curricula to scale using technologies and learning trajectories.

Dr. Alex Lawson's research and work with teacher candidates has uncovered the importance of mathematical models in thinking mathematically. She shares this with us through examples using the number line and the arithmetic rack and describes how these models can become accessible through the use of contexts.

Dr. Lucy West prompts us to be creative in our own thinking and to recognize creativity in the thinking of our students. She speaks of innovation and

creativity as integral parts of mathematics and states that math is everywhere and very important to our lives.

Other featured speakers include Dan Meyer, Cathy Bruce and Marian Small.

Seven leading educators and researchers offer their thinking about different aspects of learning mathematics, doing mathematics and thinking mathematically.

Spotlight on: Paying Attention to Proportional Reasoning K–12

Directions Evidence and Policy Research Group' is conducting an evaluation of the dissemination, use and usefulness of K–12 English and French language mathematics resources created by the Ontario Ministry of Education. Once the review is complete, we will share the results of the evaluation in this newsletter. Each month we feature a different resource. This month we highlight 'Paying Attention to Proportional Reasoning – K–12'.

This is a support document for the Paying Attention to Mathematics Education discussion tool. Geared towards educators, it focuses on understanding Proportional Reasoning and its importance and implications in real life. It explores key concepts and provides concrete examples on ways to teach and learn proportional reasoning, taking into consideration the seven foundational principles for mathematics.

It includes teaching tips and proportional reasoning are provided and analyzed to help reveal student thinking, misconceptions, and strategies. A comprehensive list of resources is included.

To access the document click [here](#).

