Fraction Strips Tool to solve a problem, open up the Settings and press Save.

Pressing the Save button will bring up the system dialog with a suggested file name and file type (e.g., .FractStrips for Fraction Strips). It is recommended that you do not change the file type, since the *Open* operation only finds files with that extension (or with .txt and .xml). The suggested file name is based on the date and time of saving and should be unique.

To retrieve this saved file at a later time, use the Open File button in Settings. Pressing this button will bring up the system dialog that allows you to find the folder in which you have saved the file.

Open and Save functionality is also available on mobile devices. Files saved on one device can be opened on another! For detailed support, you can visit **www.mathclips.wikispaces.com/File+Operations**.

Currently, Fraction Strips saves and opens only the actual state of the tool at the time of saving. When you open a file, the representations are entirely interactive and you can continue to add to your work. In the near future, you will also be able to undo back through the history of steps that led up to the point of saving. The development team believes that this feature will support a variety of assessment opportunities for students to explain their thinking.

Feedback and Future Requests

Please feel free to send us your feedback about any mathies tool, using the Feedback Form button inside the Information Dialog, accessed from the *i* button. Visit the support wiki page for more examples and detailed descriptions of the functionality of the tool.

You can also send your comments to **WhatsNew@oame.on.ca**. You can share your experiences on Twitter, using the hashtag **#ONmathies**, and follow or message us at **@ONmathies**. There is an increasing set of interesting posts of student and teacher work on Twitter. To be among the first to find out about the latest digital-tool developments, sign up for our email list at **www.mathclips.ca/WhatsNewEmailList.html**. ▲

▲ Hey, It's Elementary: Why We Need Specialized Preparation for Teaching Kindergarten

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You may have heard about the Math Knowledge Network (MKN), hosted by the Fields Institute for Research in Mathematical Sciences (Fields) through its Centre for Mathematics Education (CME). As one of the Knowledge Networks for Applied Education Research (KNAER), the MKN will bring together diverse mathematics education stakeholders from across Ontario, in both official languages. One of its goals is to mobilize evidence from research and professional practice in mathematics education and facilitate the use of evidence-based practices for mathematics instruction to support improved educational achievement. This will contribute to the Ontario Ministry of Education's Renewed Mathematics Strategy (RMS) in partnership with educators, researchers, and organizations across Ontario.

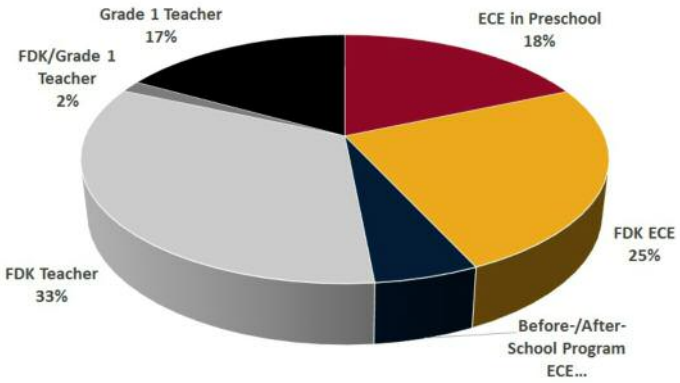
I am honoured and privileged to be the Lead for the Community of Practice (CoP) that is focusing on *Critical Transitions in Student Mathematical Development*. Currently, this CoP has four initiatives related to critical transitions: Early Childhood (which I coordinate); Grade 8 to Secondary School (Dr. Daniel Jarvis, Nipissing University); Grade 9 Locally Developed to Grade 10 (Dr. Ann Kajander, Lakehead University); and Secondary School to Post-Secondary (Dr. Peter Taylor, Queen's University). Over time, each of the individual projects within this CoP will report on its activities, resource development, and knowledge-sharing enterprises through multiple venues, and I will distribute summaries through this column in the *Gazette*. All materials generated by each unique project within the *Critical*

Transitions CoP will be available on the MKN website (**www.mkn-rcm.ca**) and through TeachOntario (**www.teachontario.ca**).

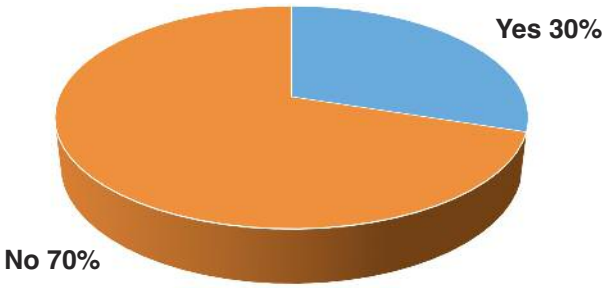
I am excited to report here on one of the early activities undertaken by the Early Childhood CoP: the results of an online Survey for ECEs, Kindergarten teachers, and Grade 1 teachers about their Early Math Education training. The survey also collected data about beliefs and practices. For this first phase of our work, participants were limited to personnel in the Greater Essex County District School Board and active members of the Association of Early Childhood Educators Ontario. The survey will be distributed provincially in Fall 2017 and the results published in Winter 2018.

There were 178 participants for the Phase I survey; however, 27 participants were removed from the data because of incomplete responses or consent not being given. For data analysis, 151 participants' responses were included. On average, the Early Childhood Educators (ECEs) had 13 years of experience, and the teachers, 15 years (11 of which were in early primary division, i.e., Kindergarten or Grade 1).

To get a sense of the demographics of the participant pool, we asked survey-takers to identify the role that they currently held. The graph below summarizes this information. (Note: FDK is Full-Day Kindergarten.)



The graph below shows participants' responses to the question, "Did you learn about early math development and education (preschool to Kindergarten) during your educator training?"



While we will report on the complete findings of the survey at a later time, it was the stunning response to this question that was the catalyst for an important event for the Early Years CoP.

On August 17, 2017, we hosted individuals from Faculties of Education, who teach Primary/Junior curriculum courses, and instructors from Community College ECE programs, at a full-day event to learn about the importance of early mathematics development (courtesy of Dr. Jean Clinton). We heard about the correlation between specialized professional preparation for pre-K and K educators and student achievement. Further, we will design an action plan for stronger mathematics preparation requirements for those who will be teaching in specialized early childhood environments.

Teaching in the Kindergarten program may be the most important assignment in a teacher's or ECE's professional career. However, in Ontario, we are doing little to prepare and support our Kindergarten educators to provide the robust mathematical knowledge children need in their earliest years of formal schooling. Here is our CoP's rationale for action:

1. An important predictor of children's achievement is the quality of the Early Years ECE and classroom teacher (e.g., Darling-Hammond, 2000; Darling-Hammond & Youngs, 2002; Hanhushek, Kain, & Rivkin, 1998).
2. There is compelling research to suggest that teacher preparation influences teacher effectiveness (Barnett, 2003).
3. Specific training in early childhood development, in particular, influences educator effectiveness in pre-K and K. Many studies have found significant relationships between specialized training in early childhood education and positive results for children. Teachers with specialized training have been found to provide more appropriate direction, build upon children's prior knowledge, "scaffold"—or layer—activities to develop emerging understanding and skills, and engage students in activities that are appropriately challenging, rather than merely repetitive. There is an abundance of research to demonstrate that teachers with training in early childhood development are better equipped to facilitate young children's language, cognitive, social-skills, and mathematics development (Pianta, Barnett, Burchinal, & Thornburg, 2009).

Why is teacher effectiveness in early mathematics so important? Because mathematics achievement is correlated to academic success in all subjects. Mathematical thinking is cognitively foundational, and children's early knowledge

of math strongly predicts their later success in math. It is surprising to note that preschool mathematics knowledge predicts achievement into high school, and also predicts later reading achievement even better than early reading skills (Duncan & Magnuson, 2011).

In spite of the fact that much is known about how young children think about and learn math, that research is not finding its way into the pre-service or professional development of those who are in pre-K and K classrooms. In numerous countries, professionals in multiple educational roles vastly underestimate beginning students' abilities. One study showed that groups of teachers, teacher educators, and ECEs who worked with preschoolers underestimated the mathematical competencies of these very same students when they entered Kindergarten. For example, more than 80 percent of the students could count out nine marbles, but the adults' estimates were from 20 percent to 50 percent. More than 40 percent of the students could calculate the subtraction 10 – 8 without objects, but all adults estimated less than 10 percent. If teachers and those who work with teachers underestimate what students already know and can learn, they will not present appropriate, challenging mathematics activities that move the children along a positive learning trajectory (Van den Heuvel-Panhuizen, 1990).

While the previous examples emphasize the fact that many early childhood professionals are not aware of the mathematics developmental milestones that young children can meet, other research suggests that play alone is insufficient as a learning strategy. Mathematics concepts may be learned and conveyed through activities that children experience as play—but mathematics learning does not automatically happen through play. It is true that play or games can effectively reinforce and expand upon what children learn during more focused instructional times (Ginsburg, Lee, & Boyd, 2008; Klibanoff, Levine, Huttenlocher, Vasilyeva, & Hedges, 2006), but the success of the play-based environment is a function of teacher effectiveness and the implementation of *higher-level* free play. Well-prepared teachers (i.e., those who have specialized knowledge about how young children think about and learn math, and who have a clear sense of the mathematical goals for their students) are more sensitive and responsive to young children's mathematical thinking. According to researchers, it is only this specialized cadre that does not need to employ a structured curriculum in the early primary grades (Carpenter, Ansell, Franke, Fennema, & Weisbeck, 1993).

In conclusion, high-quality instruction has meaningful effects on children's mathematics knowledge, and high-quality instruction is designed and delivered by ECEs who have specialized knowledge. It is time to take a long, hard look at what we, as teacher educators, at the university (pre-service) or college level, or the in-service and AQ level, are doing to ensure that children in Kindergarten learn, and learn to love, mathematics. For that to happen, we need effective educators in every Kindergarten classroom in Ontario. For that to happen, their preparation must include mathematics education as a mandatory component. The importance of strong mathematics educators, especially in Kindergarten, cannot be overstated.

References

Barnett, W.S. (2003). Better teachers, better preschools: Student achievement linked to teacher qualifications. *Preschool Policy Matter, 2*.

Carpenter, T.P., Ansell, E., Franke, M.L., Fennema, E., & Weisbeck, L. (1993). Models of problem solving: A study of kindergarten children's problem-solving processes. *Journal for Research in Mathematics Education, 24*, 428–441. doi: 10.2307/749152

Darling-Hammond, L. (2000). Teacher quality and student achievement. Education Policy Analysis Archives, [S.l.], 8, 1. Retrieved from **epaa.asu.edu/ojs/article/view/392**. doi: 10.14507/epaa.v8n1.2000

Darling-Hammond, L., & Youngs, P. (2002). Defining "highly qualified teachers": What does "scientifically-based research" actually tell us? *Educational Researcher, 31*(9), 13–25.

Duncan, G., & Magnuson, K. (2011). The nature and impact of early achievement skills, attention and behavior problems. In G.J. Duncan & R.J. Murnane (Eds.), *Whither opportunity: Rising inequality, schools, and children's life chances.* New York, NY: Russell Sage.

Ginsburg, H.P, Lee, J.S., & Boyd, J.S. (2008). Mathematics education for young children: What it is and how to promote it. *Society for Research in Child Development Social Policy Report, 22*, 1–23.

Hanushek, E.A., Kain, J.F., & Rivkin, S.G. (2002). Inferring program effects for specialized populations: Does special education raise achievement for students with disabilities? *Review of Economics and Statistics, 84*, 584–599.

Klibanoff, R.S., Levine, S.C., Huttenlocher, J., Vasilyeva, M., & Hedges, L.V. (2006). Preschool children's mathematical knowledge: The effect of teacher "math talk." *Developmental Psychology, 42*(1), 59–69. doi: 10.1037/0012-1649.42.1.59

Pianta, R.C., Barnett, W.S., Burchinal, M.R., & Thornburg, K.R. (2009). The effects of preschool education: What we know, how public policy is or is not aligned with the evidence base, and what we need to know." *Psychological Science in the Public Interest, 10*(2), 49–88, doi: 10.1177/1529100610381908

Van den Heuvel-Panhuizen, M. (1990). Realistic arithmetic/mathematics instruction and tests. In K.P.E. Gravemeijer, M. Van den Heuvel-Panhuizen, & L. Streefland (Eds.), *Contexts, free productions, tests and geometry in realistic mathematics education* (pp. 53–78). Utrecht, The Netherlands: OW&OC. ▲