

Count Me In

Fingers & Math - Build the Connection

This is our final newsletter for participants in the Count Me In study. Last spring, over 300 children from schools in Ottawa, Peterborough, and Winnipeg participated in our project and completed a variety of math-related activities. This newsletter highlights some of our study findings for parents and educators.

We are very appreciative of the efforts of all the teachers, parents, principals, and especially the children, who helped us with this study. Thank you to everyone!

What's Next?

We will continue to analyze our data over the next two years. Results will be updated on our website - www.carleton.ca/cmi -so check it out! We will continue to refine our understanding of how math knowledge develops in the home and how we can best prepare children for learning math at school. We may begin to explore the relation between foundational math skills and children's ease and enjoyment of mathematical tasks in later grades. So...you may hear from us again in the future!

Hold your hands out in front of you and picture counting on your fingers. Almost all of us used our fingers to learn to count. Our research shows that's okay!

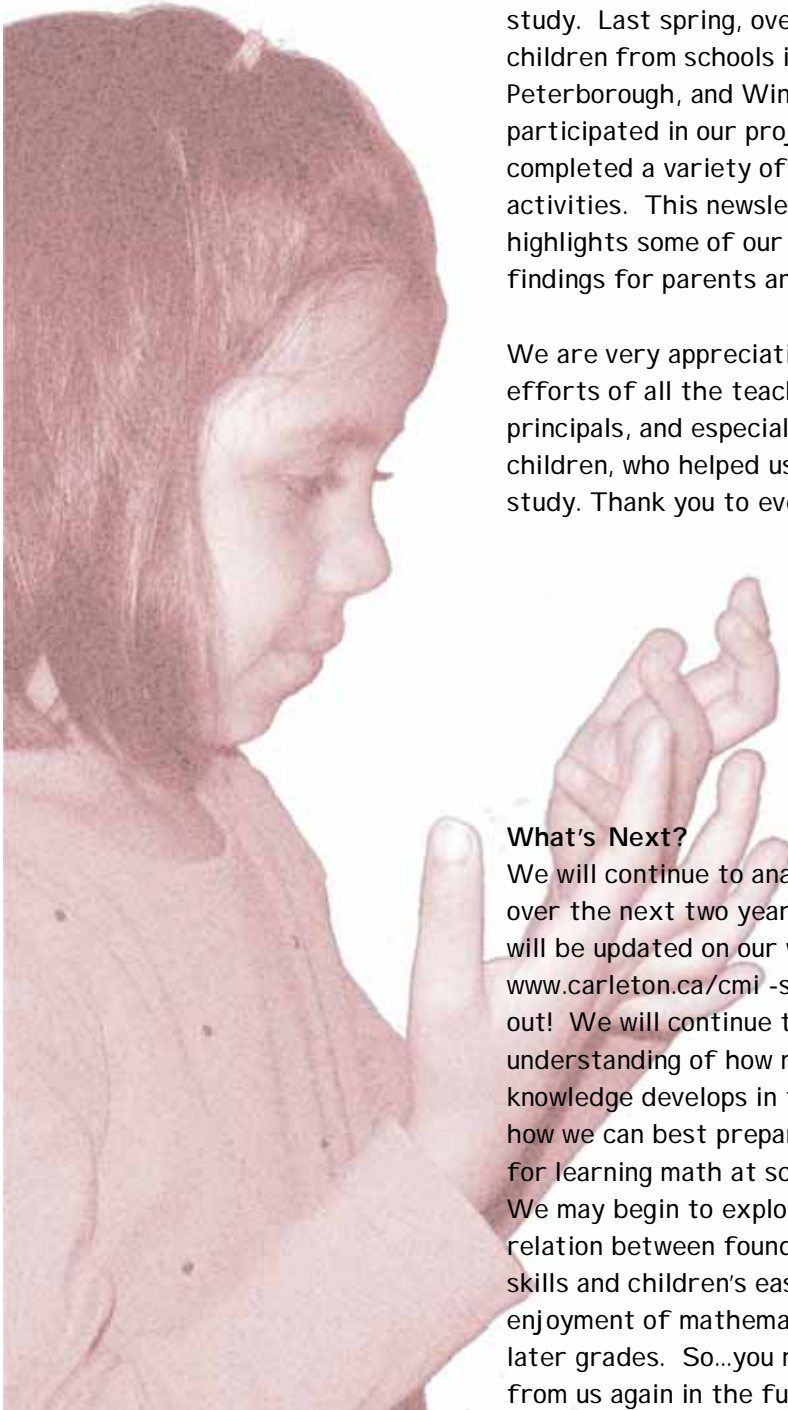
The connection between fingers and numbers is as old as human history. Roman coins show a finger counting system that was used into the 18th century. Search for 'Finger Counting' using Google and you will find many ways to use fingers for counting and arithmetic. Scientist Brian Butterworth speculates that finger use plays a critical role in the development of conceptual and procedural math skills and continues to be important, even in adults!

We have found three number-specific factors that are related to the development of Grade 1 children's numeracy:

- the child's finger agility
- the child's finger sensitivity
- the child's ability to quickly tell the number of items in a small set without counting.

Finger actions may help children to make quantities in the world 'connect' to numbers in the brain.

These discoveries, and others like them, suggest that encouraging young children to represent numbers by using their fingers, using an abacus, and pointing when they count may help them to develop strong and stable number knowledge.



Paths to Math Success

The goal of Count Me In was to understand how children learn mathematics from preschool to the early school years. Our study has enabled us to test a unified view of the multiple pathways to arithmetic success.

Just like on a map, having multiple pathways means that there are alternative routes to the destination. A person with good knowledge of all the different routes will be able to get there efficiently and reliably. On our map, the destination is arithmetic skill in Grade 3 and the beginning was Kindergarten cognitive predictors. Our pathways show the different skills that children rely on as they develop their arithmetic knowledge.

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One route to success is the **Language** route. Learning the rules and vocabulary of language can be applied to learning the vocabulary and rules of the number system, and number system knowledge contributes to arithmetic. The curriculum in Canadian schools emphasizes using language as a route to mathematics. Practice number names with your child - what comes after 99,999? What comes before 1 million?

Neuroscientists brought our attention to another important pathway to arithmetic achievement. We call this pathway '**Quantity Awareness**' because it is reflected in a child's ability to notice and use their understanding of quantity. Quantity awareness is fundamental to arithmetic because arithmetic is all about quantity and manipulations of quantity. Practice counting from car windows - the speed helps the process. Play games that involve calculating, like Snakes and Ladders or cribbage, to help children develop skill.

The **Spatial Attention** pathway reflects a child's ability to pay attention, remember spatial cues, and manage complex tasks. Sometimes this skill is called working memory. Development of spatial attention will enhance a child's skill at the verbal and quantitative paths in addition to contributing directly to arithmetic skill. The memory game 'Concentration' uses many of these skills - and kids enjoy it. So does following a recipe.

Understanding that there are multiple pathways can help parents and educators choose techniques that develop all the routes. Using fingers or other concrete counters may reinforce children's quantitative awareness. Playing an instrument or doing crafts might enhance children's spatial skills. Breaking down number words may help children with poor language skills better understand the number system. Although all three pathways contribute to arithmetic performance, some children will find some routes harder to master than others. We think that awareness of such differences may turn out to be useful for helping all children do their best in arithmetic.