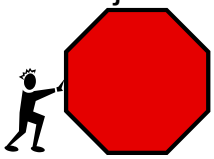
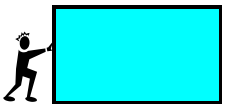
What Research Tells Us About Teaching Mathematics Concepts To Young Children

In order for students to develop their innate number sense, and a working knowledge of mathematically related concepts they must have a great variety of interactions with their environment, exploring and manipulating, comparing, arranging and rearranging real objects and sets of objects. Many of these types of interactions and experiences occur incidentally for the sighted child but the child that is visually impaired or blind is at great risk for missing valuable and relevant incidental information. Therefore it is critical that teachers and parents provide both structured and informal opportunities to handle and explore, note likenesses and differences, match, group and classify, order and experience other relationships with real objects to prepare them for understanding the same relationship with numbers.

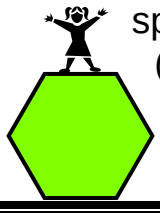


(Project Math Access, Texas School for the Blind and Visually Impaired, 1997-2006)

Most children acquire considerable knowledge of numbers and other aspects of mathematics before they enter kindergarten. This is important, because the mathematical knowledge that kindergarteners bring to school is related to their mathematics learning for years thereafter – in elementary school, middle school, and even high school.
(The National Math Panel NMP, 2008, pg. xvii).
(Clements and Sarama, 2009, pg. 2)



Development of mathematics abilities begins when life begins.
Young children have certain mathematical-like competencies in number, spatial sense, and patterns from birth.
(Clements and Sarama; 2009, pg. 4)



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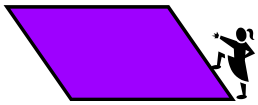
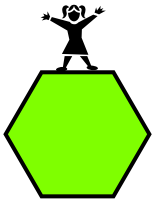
Subitizing is being able to quickly label a collection of items with a number without counting. Subitizing small numbers appears to precede and support the development of counting ability. Subitizing forms a foundation for all learning of number.

(Sarama and Clements, 2009, pg. 46)

Subitizing introduces the basic ideas of cardinality, how many; ideas of more and less, ideas of parts and wholes and their relationships; beginning arithmetic, and in general ideas of quantity. (Clements and Sarama, 2009, pg. 10)



The following suggests why we use the term "verbal counting" rather than "rote counting". Without verbal counting, quantitative thinking does not develop. Children who can continue counting starting at any number are better on all number tasks. Children learn that numbers derive order and meaning from their embeddedness in a system, and they learn a set of relationships and rules that allow the generation, not recall, of the appropriate sequence.
(Clements and Sarama, 2009, pg. 21)



Children's ideas stabilize as early as 6 years of age. It is therefore critical to provide better opportunities to learn about geometric figures to all children between 3 and 6 years of age. (Clements and Sarama, 2009, pg. 132)

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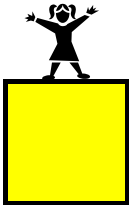
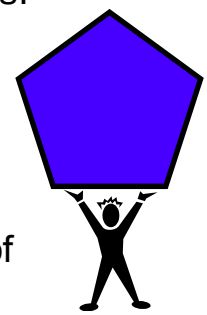
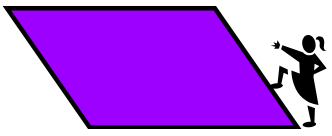
Early knowledge strongly affects later success in mathematics. (Denton and West, 2002). Specific quantitative and numerical knowledge in the years before first grade has been found to be a stronger predictor of later mathematical achievement than tests of intelligence or memory abilities. (Krajewski, 2005). Mathematics knowledge on school entry is a stronger predictor than any of a host of social-emotional skills. (Claessens, Duncan, & Engel, 2007). (Clements and Sarama, 2009, pg. 6-7)



Through our interactions with children, we contribute to their learning in many and often unconscious ways such as whether they: remain curious about the world; develop flexible ways of thinking; become effective problem solvers; love to learn; or take risks in their learning. With this in mind the goal is to develop ways of interacting mathematically with children that promote and nurture these attributes and abilities. One way that we can communicate to children that we consider their mathematics and mathematical thinking to be complex, is to avoid closing off potential opportunities for them to learn by labeling their responses simply as, right or wrong. More often than not, the reasoning connected to a child's responses possesses valid and even logical aspects of mathematical understanding and thinking.
(Liedtke and Thom, 2009, pg. 9)



All children should know that they live in a colour filled world. Even the child who is blind should understand that colour is one method that people use to define things. By this age, the child has heard everyone around him or her talking about the world using colour words. While he or she may or may not see colour, those around him or her should expect him or her to be aware of it.
(Anderson, Boigon, Davis, deWaard, The Oregon Project for Preschool Children Who are Blind or Visually Impaired, Sixth Edition, 2007 – Cognitive section age 2 - 3)



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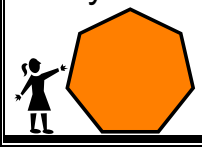
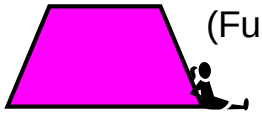
Cardinality is one of the most frequently neglected aspects of counting instruction. (Linnel & Fluck, 2002) When observing children, teachers are often satisfied by accurate enumeration and do not ask children "how many?" following enumeration. Use this question for assessment and to prompt children to make the count to cardinal transition. (Clements and Sarama, 2009, pg. 25)

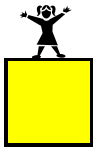


Counting easily and quickly predicts arithmetic competence in kindergarten, and in turn predicts overall mathematics achievement. (Penner-Wilger et al., 2005). (Sarama and Clements, 2009, pg. 112)

Teaching useful finger addition methods accelerates children's single-digit addition and subtraction as much as a year over traditional methods in which children count objects or pictures. (Fuson, Perry, & Kwon, 1994). (Clements and Sarama, 2009, pg. 68)



Shape is a fundamental construct in cognitive development in and beyond geometry.
(Jones and Smith, 2002). (Sarama and Clements, 2009, pg. 199)



RESEARCH REFERENCES

Learning and Teaching Early Math

The Learning Trajectories Approach – D. Clements and J. Sarama, 2009

Early Childhood Mathematics Education Research

Learning Trajectories for Young Children - J. Sarama and D. Clements, 2009

Oregon Project for Preschool Children who are Blind or Visually Impaired

- This curriculum focuses on teaching preschoolers with visual and multiple impairments and parent-teacher partnerships.

The Oregon Project.
Sixth Edition 2007
S. Anderson, S. Boigon, K. Davis, C. deWaard
Southern Oregon Education Service District

Making Math Meaningful - Braille Resource Kit (2008)

- The MMM Braille Resource Kit includes research articles, resource and materials information, activity examples, video, and strategy suggestions that support the development of early mathematics concepts.

http://www.setbc.org/setbc/vision/making_math_meaningful.html
http://www.setbc.org/download/public/making_math_meaningful.pdf
http://setbc.org/

Making Mathematics Meaningful - For Children Ages 4 to 7

Werner W. Liedtke and Jennifer S. Thom, 2009

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