

Foundations of *We Discover Math*

The title *We Discover Math* says it all. It describes a rich mathematical environment where students and teachers work and play together to “discover” the mathematics in every part of their day. It combines the free exploratory nature in which four-year-olds should learn with developmentally appropriate math activities.

Young students are capable of important mathematical thinking. They learn mathematics in much the same way as they learn anything else, through making connections to their own experiences. Mathematics in preschool predicts not only success in mathematics but also in literacy and reading (Duncan, Claessens, and Engel 2004). Mathematics is a general cognitive skill (Clements and Sarama 2008). One of the National Council of Teachers of Mathematics’ (NCTM) guiding principles, Equity, expresses the need to have high expectations for all students. Support and thoughtful planning, along with a quality pre-K program, make this an achievable goal.

Through the use of activities and trade books, *We Discover Math* provides a mathematical environment appropriate for all students. *We Discover Math* is based on the best research, guidance, and experience available in the field of early childhood education.

The *Principles and Standards for School Mathematics* (NCTM 2000), *Curriculum Focal Points* (NCTM 2006), and the position papers from the National Association for the Education of the Young Child (NAEYC) provide a coherent structure for looking at the development of mathematical concepts and skills. In pre-K, the focus is on the content strands of Number and Operations, Geometry, and Measurement. Data Analysis and Probability and Algebra are integrated to support the exploration of the three focus content strands. All five strands weave together to create an avenue for students to experience all areas of mathematics. Opportunities for applying NCTM’s Process Standards: Problem Solving, Reasoning and Proof, Communication, Connections, and Representation are embedded in the content structure.

Cross-Curricular Connections such as the important areas of motor skills and social/emotional development are embedded in the activities and are indicated by icons on the Unit Planner. Additionally, students interact with various forms of fine arts and media/technology.

Literature Connections provide the opportunity to anchor mathematics in engaging contexts. Trade books are used in every unit, often in multiple ways. These books offer rich problem solving scenarios while encouraging students to continue to explore important ideas in imaginative play. The books were selected not only for their contributions to mathematical conversation but because they are very good children’s literature.

Exploration Station opportunities are suggested within many of the activity guides, as well as indicated on the Unit Organizers. The stations offer ideas for further exploration, for continuing the activity, or for capitalizing on an interesting idea.

Manipulatives are used consistently and purposefully and play a critical role in the exploration of concepts and skills. Students need time with all of them before and after they become tools of mathematics. Classification and sorting, with inherent opportunities to count objects, permeate the program. It is important that students begin to develop critical thinking skills early.

Games provide students with opportunities to explore numbers and number relationships, geometry, and spatial sense. The games are introduced at school and may be played repeatedly both there and at home, as interest dictates.

Differentiation is incorporated in *We Discover Math* in a variety of ways:

- Through the use of open-ended activities that also allow for a range of entry points
- Exploration Stations provide additional time with an idea or concept.
- Assessment is on-going, embedded in explorations and activities, and is used to show a continuum of learning for individual students. This allows for informed flexibility within the activities.

Content is revisited throughout, allowing for individual student understanding to grow. Units often address multiple areas of mathematics. For example, most of the activities in Unit 1 focus on number. Two lessons though, investigate common geometric shapes. The unit is written this way to allow for an informal introduction of this topic. It also reminds us that children do not learn in a linear fashion and their minds can and do work in many directions. The pacing of these activities is reliant upon consistent and on-going student assessment. The program is constructed to allow for flexibility in implementation, whether the pre-K program meets everyday or several times a week.

CREATING A MATHEMATICAL ENVIRONMENT

Throughout the program, the children in the pre-K classroom are referred to as students and indeed, they are students of important mathematics. Mathematical power and confidence develop in children who learn that mathematics makes sense and who trust their own abilities to make sense of it. Opportunities for mathematical conversations take place throughout the day. When students are waiting in line, on the playground, or enjoying interest centers like the kitchen or blocks, listen to their discussions, pick up on the mathematics involved, and enter the conversation. Students constantly surprise us with their understanding, problem solving, and enthusiasm for learning. Enjoy!

Resources for the Program

- Carpenter, T.P., E. Fennema, M.L. Franke, L. Levi, and S.E. Empson. *Children's Mathematics: Cognitively Guided Instruction*. Heinemann, Westport, CT, 1999.
- Clements, Douglas H. "Subitizing: What Is It? Why Teach It?" *Teaching Children Mathematics* 5. National Council of Teachers of Mathematics (NCTM), Reston, VA, 1999.
- Clements, Douglas H., and Julie Sarama. "Focal Points Pre-K to Kindergarten." *Teaching Children Mathematics*. NCTM, Reston, VA, 2008.
- Clements, Douglas H., and Julie Sarama, editors. *Engaging Young Children in Mathematics: Standards for Early Childhood Mathematics Education*. Lawrence Erlbaum Associates, New Jersey, 2004.
- Copley, Juanita V., editor. *Mathematics in the Early Years*. NCTM, Reston, VA, 1999.
- Copley, Juanita V., editor. *Showcasing Mathematics for the Young Child*. NCTM, Reston, VA, 2004.
- Copley, Juanita V. *The Young Child and Mathematics*. National Association for the Education of Young Children (NAEYC), Washington, DC, 2000.
- Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence*. NCTM, Reston, VA, 2000.
- Duncan, Greg J., Amy Claessens, and Mimi Engel. "The Contributions of Hard Skills and Socio-Emotional Behavior to School Readiness." Working paper. Institute for Policy Research at Northwestern University, 2004.
- Mathematics Assessment: A Practical Handbook for Grades K–2*. NCTM, Reston, VA, 2003.
- NAEYC and NCTM. *Early Childhood Mathematics: Promoting Good Beginnings*. Joint Position Statement on Math, Washington, DC, NAEYC, 2002.
- Principles and Standards for School Mathematics*. NCTM, Reston, VA, 2000.
- Richardson, Kathy. *Developing Number Concepts, Book 1*. Pearson Learning, New Jersey, 1999.
- Wright, Robert J., Garry Stanger, Ann K. Stafford, and Jim Martland. *Teaching Number in the Classroom with 4–8 Year Olds*. Paul Chapman Publishing, London, 2006.
- Van de Walle, John A., LouAnn H. Lovin. *Teaching Student-Centered Mathematics, Vol 1*. Pearson Education, Boston, 2006.