

▲ PARENTS: THE LOGICAL LINK FOR SUPPORTING CHILDREN'S MATHEMATICAL UNDERSTANDING (PART 2)

**BARRY ONSLOW, GAIL EDMUNDS,
NANCY CHAPPLE, JOHN FORSYTHE,
ROSETTE BURAKARI-ADERA, JUDI WATERS**
ESSO FAMILY MATH CENTRE
FACULTY OF EDUCATION
THE UNIVERSITY OF WESTERN ONTARIO



Barry Onslow is the Maurice Price Foundation Director of the Esso Family Math Centre. He teaches pre-service, in-service, and graduate courses at the Faculty of Education, UWO, and is a former president of OAME.



Gail Edmunds is the Researcher for the Esso Family Math Centre. She also works as an independent consultant primarily in the areas of program evaluation and curriculum development.



Nancy Chapple is co-author of the Grades 2 - 5 Family Math Resource book, and Resource Specialist with the Esso Family Math Centre. She is a part-time instructor at the Faculty of Education, UWO.



Judi Waters is an Early Years Coordinator at the Esso Family Math Centre, and one of the authors of the Early Years Resource book. She has presented many Family Math sessions to a variety of communities.



As the Family Math Facilitator, Rosette Burakari-Adera manages the Centre, and connects the team at Family Math with resource people in the community. Rosette's appreciation of community development has helped build constructive partnerships.



John Forsythe, with more than 20 years of computer related experience, is web-master for the Esso Family Math Centre. He is also the research assistant for The Centre of Communicative and Cognitive Disabilities at The University of Western Ontario.

Introduction

The first part of this article appeared in the June, 2002 issue of the *Ontario Mathematics Gazette*. There, strategies were discussed that we have used to effectively inform and involve parents in their children's mathematics education. In Part 2, we share some of the activities and resources utilized during the Esso Family Math evenings.

Math Walks

Many teachers take their children on a math walk, but parents are often unable to build on this experience because they do not know why the activity is mathematical, what their children are looking for, what it is that they should listen for from their children that signals understanding, and/or what questions to ask that might foster a deeper understanding. During a Family Math session, we take the families on a geometry walk (either inside or outside, depending on the weather) to illustrate ways that parents can take advantage of the environment in helping their children see mathematics in the real world. This aspect is crucial if mathematics is to make sense and be more than abstract symbolism (Onslow, 1991). We also explain how, in the real world, parents and their children will not usually see perfect spheres or cones, and finding close replicas is fine. When the families have completed the walk, what they have seen is discussed, together with objects found by most of the families and those seen by very few. We use the geometry walks from OAME's *Linking Assessment and Instruction in Mathematics: Primary Years* document. Concrete examples such as a sugar cube, an ice cream cone, the triangular prism used as the

container for the Toblerone bar, and a cylindrical can of juice, help children learn the language of geometry. For a Home Challenge, we ask families to take a geometry walk around their house. The following week, we discuss all the three-dimensional objects they observed.

Once parents become comfortable with an activity such as a Home Challenge, similar experiences can occur on a trip in the car or on a bus, walking their child to or from school, playing in the park, or shopping at the grocery store. Math walks are limited only by one's imagination, and as described in the *Linking Assessment and Instruction in Mathematics: Primary Years* document, they can take place in all five strands.

Literature and Music

Children develop a love for reading when parents

read to them on a regular basis. Enjoyment of mathematics develops in a similar way. An important component of the Esso Family Math Project is our *Literature Connections*. Literature is featured frequently in the Early Years Program, and the Grades 2-5 Program contains one math-related story each night. Building a good relationship with the local library is vital since we often read only part of a book and then ask parents to finish it with their children at the public library. As you have no doubt guessed, there is a hidden agenda in our plan! We feel very fortunate to have established excellent relationships with our local librarians who have been very supportive of the program. They have purchased copies of the books we use, and they have even attended sessions to read to our families and to explain the extensive number of library materials that are

String Activity

Material

Piece of string per family approximately 3 metres long

Instructions

Leader asks family to put string in the shape of a square or triangle.

1. Family follows leader's directions:
 - Go around your shape;
 - Jump inside your shape;
 - Wiggle inside your shape;
 - Jump outside your shape;
 - Tiptoe forward around your shape;
 - Move backwards around your shape;
 - Etc.
2. Change the shape of the string.
3. Have parent (mom or dad) give directions.
4. It is at this point where developmental understanding will vary with each child. These differences must be respected.
5. Change the shape of the string.
6. Now have the child give directions to the parent. The ability to communicate is a crucial part of a child's mathematical development.

Song: Hokey Pokey

Materials

- Family Math CD
- CD player

Instructions

1. Families use string from the *String Activity*.
2. While the leader plays the selection *Hokey Pokey* from the CD, the families follow the directions from the song while standing around their string shape.

Where's the Math?

Where's the math in this figure pertains to both the activity and song.

This is an active representation of such spatial relationships as:

around	on	beside
inside	outside	through, etc.

It engages the family in happy, productive early geometric activity. Spatial relationships are the basis of early geometric understanding.

Kindergarten expectation

- use language accurately to describe basic spatial relationships

Grade One expectation

- explore and identify two-dimensional shapes using concrete materials and drawings (e.g., circle, rectangle, triangle)

Figure 1 © Esso Family Math Centre

available, free of charge.

The music connection is part of the Early Years Program. A group of music students and their professor at the Faculty of Education at Western, Carol Beynon, worked with the writers of the Early Years material to produce a CD and cassette tape. They used public domain music (so that families would know many of the tunes, and we could avoid royalty payments) and rewrote the lyrics to include early math concepts. The songs (and actions that often accompany the songs) are a part of each night's program, and families are given a CD or tape to use at home. We have had an excellent response from parents who tell us that their children

enjoy the songs and quickly learn the lyrics. It is also great fun to see Dad do the *Hokey Pokey* with his young daughter as she learns the concept of inside, outside, and round about (See Figure 1).

Games and Activities

Parents can help their children see the patterns and relationships in mathematics by: playing card games to practice basic skills; finding and discussing mathematics in numbers around the home; posing simple math challenges, and talking about math in the daily world in which the child lives. Whenever possible, we use materials for our games and activities that are available

Race for a Loonie*

Materials

- Game boards
- Two dice
- Pennies
- Dimes
- Loonies
- Container for the "bank"

Instructions:

1. Use a game board for each player.
Give each player 10 pennies, 10 dimes, and 1 loonie to act as "the bank" during the game.
2. The first player rolls the dice and adds the numbers together.
That sum is the number of cents the player receives from the bank.
The player places them in the "Cents" column of their game board.
Whenever there are 10 pennies in the "Cents" column, the player should exchange them for a dime from the bank.
Likewise, 10 dimes are exchanged for a loonie.
3. The first player to get a loonie is the winner.

LOONIE	DIMES	PENNIES

*"Loonie" is the term applied to the Canadian one dollar coin.

Spend the Loonie

(A more difficult game of subtraction)

This game is the reverse of *Race for a Loonie*.

Instructions:

1. Players start with a loonie and try to get rid of it.
2. Players roll two dice, add the numbers together, and put that many cents into the "bank".
3. The first player to "spend" all their money is the winner.
4. The most difficult roll is the first one. The player will need to exchange the loonie for 10 dimes. Then they will exchange one of the dimes for 10 pennies.

N.B. Consider the difficulty of $100 - 6$. It is the regrouping that causes problems for so many children. Once they know how to regroup (and why), subtraction is mastered quite quickly.

Where's The Math?

Our number system is based on groups of ten. This activity has the children trading every time they get, or need, a group of ten. It also links math to real world money. The first game, *Race for a Loonie*, is linked to the idea of "carrying", whereas the second game, *Spend a Loonie*, will assist children with the notion of "borrowing" in subtraction.

Grade 2 Expectation

- identify place-value patterns (e.g., trading 10 ones for 1 ten) and use zero as a place holder

Grade 3 Expectation

- model numbers grouped in 100's, 10's, and 1's and use zero as a place holder

Figure 2 © Esso Family Math Centre

Deer Buttons

(Game for younger children*)

Materials

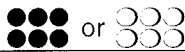
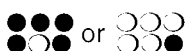

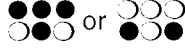
- About 50 small stones, pebbles, or counters for each family
- Container to hold them
- 6 pennies per family

Background

Many First Nations' People, especially those of the Woodlands area, play a version of this game. The game can be played with 6 two-sided counters or "buttons". The circular buttons were often made from deer or elk horn, and had a diameter of approximately 2 cm. Designs were burned onto one side of the button. Today, many household materials can be used to play the game. However, the players must be able to distinguish the difference between the two sides. Coins, real buttons, or checker pieces, with one side clearly different from the other, make good "buttons".


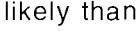


Instructions

1. A pile of approximately 50 stones is placed in the middle of the players.
2. To play the game, the "buttons" (in this case, pennies) are thrown onto a flat surface.
3. Points are scored according to the table shown.
4. Each time players score points they take that many stones.
5. Play continues until all the stones are gone. The player with the most stones is the winner.

Words	Picture	Scoring
When 6 sides turn up the same.		Take 5 stones from the pile.
When 5 sides turn up the same, and one is different.		Take 2 stones from the pile.
If 3 sides turn up the same, and 3 are different.		Take 1 stone from the pile.
When 4 sides turn up the same, and 2 are different.		Take 0 stones from the pile.

(*Older children of lower ability might enjoy this game more than Mancala.)

Where's The Math?

Deer Buttons is a First Nations game introducing young children to some early ideas of probability. It is important for the children to understand when they toss six two-sided counters onto the ground that  and  are more likely than  and . Talking about these ideas help children understand the notion of chance.

Grade 2 Expectations

- explore through simple games and experiments the likelihood that an event may occur
- investigate simple probability situations

Grade 5 Expectation

- predict probability in simple experiments and use fractions to describe probability

Figure 3 © Esso Family Math Centre

in most homes. For example, many teachers in grades two and three play the game *Race for a Flat* to help their students understand the concepts of place value, trading, and the regrouping process associated with addition. However, most parents do not have base ten materials in their home. Consequently, we use money and play the game *Race for a Loonie*. The more difficult concepts of trading and regrouping in subtraction are developed through the game *Spend a Loonie* (See Figure 2).

Multicultural games and activities are also used in the Grades 2-5 Program to provide a context that makes mathematics significant and meaningful for all Canadians. First Nations' games such as *Deer Buttons*

(See Figure 3) and *Awithlakhannai* help children understand the early ideas of probability and problem solving; thus demonstrating that mathematics is evident in all cultures. The African game of *Mancala* has proven to be well-liked, as is the ever popular Chinese *Tangram* puzzle. Finding a *hook* is often all that is required to get parents and their children involved in mathematics. It is also rewarding to see persistence, so essential for mathematical problem solving, developed and practiced through the playing of these games.

Family Math Certificates

As a way of saying, "Congratulations!" to all of our families and "Thank you!" to all of our facilitators, we end our Family Math program with a celebration in which all

participants are presented with a Family Math Certificate. After obtaining permission, we take digital photographs of all participants and facilitators and merge them onto the certificates (See Figure 4). We hope that this lasting memory of Family Math will encourage families and volunteers to continue their involvement in mathematics.

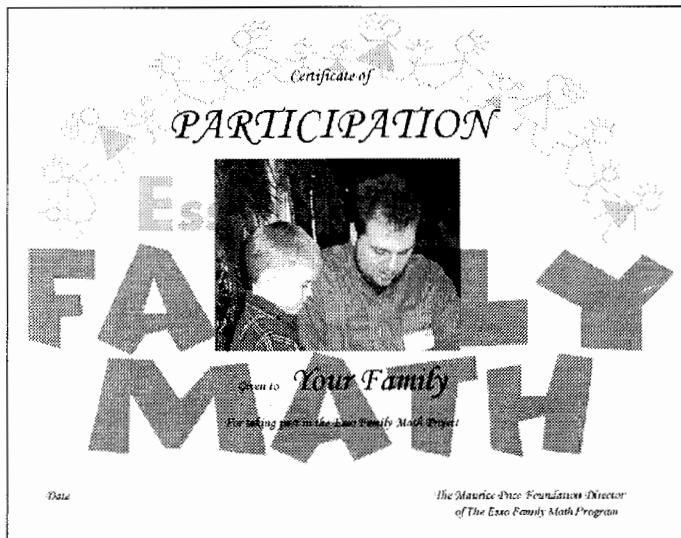


Figure 4

Closing Remarks

The focus of our attention in education is the child. However, for children to gain the most from our education system, parents and teachers must work in harmony. Parents need opportunities to recognize why teachers do what they do, and they also need support to develop some of the skills that will assist their children's learning at home. Teachers need to be aware of the diversity represented by the various families in their community, and share strategies and resources with parents that equip them with productive methods for helping their children's mathematical understanding. When positive learning environments are established between home and school, teachers and parents can see themselves working towards a common goal, lines of communication are opened, and there are opportunities for mathematical growth rather than frustration (See Figure 5).

The community building of Family Math helps everyone realize that in today's society we all have busy lives, but by working together, we will ultimately enhance children's attitudes and self-esteem, as well as their potential to understand mathematics. Of course, Family Math¹ will not resolve all of the difficulties associated with

¹ For further information go to the Esso Family Math web site at <http://www.edu.uwo.ca/essofamilymath>.



Figure 5

the teaching and learning of mathematics. Education is far too complex for any one strategy to provide a quick fix. However, Family Math does provide a venue for actively sharing with parents the strategies and resources that they can use at home to assist their children's learning. When teachers and parents appreciate each other's efforts, and work together as a team, everyone wins, and the children are the beneficiaries.

References

- Connelly, R., McPhail, S., Onslow, B., & Sauer, R. (Eds.). (1999). *Linking assessment and instruction in mathematics: Primary years*. Rosseau, ON: Ontario Association for Mathematics Education.
- Onslow, B. (1991). Linking reality and symbolism: A primary function of mathematics education. *For the Learning of Mathematics*, 11(1), 33-37. ▲