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▲ Editorial



LOUIS LIM, EDITOR
E-MAIL: Louis_Lim@edu.yorku.ca

I am writing this editorial, the first for Volume 41 of the *Ontario Mathematics Gazette*, on July 3, an uncomfortably hot, humid, and smoggy day. I feel like a prisoner in my own home, unable to take my canine buddy, Grover, on long "walkie breaks". Grover, my eight year old half husky and half golden retriever, seems content on sitting/lying all day beside an air vent blowing cold air into his very thick coat of fur.

This issue of the *Gazette* contains two articles that should be of interest to all educators – involving parents in mathematics education. Lynda Colgan provides readers with three resources to help parents be partners in mathematics education, while Onslow et al. share activities that are used in their Family Math program at the University of Western Ontario.

During the past six years as an educator, in three different schools, all of my administrators have told teachers that it is important to phone home if students are not performing well, that parents do not want surprises. We are told to keep records of our phone contacts for future reference. Litton's quote in Onslow et al.'s *Parents: The Logical Link for Supporting Children's Mathematical Understanding (Part I)* in the June, 2002 *Gazette* really struck me: "Wouldn't it be lovely if we could just teach our students and not have to deal with their parents?!" (p. 28). With school councils, parents have the authority to make decisions regarding the operation of the school. The new Ontario teacher appraisal program will seek student and parent input. Parents, probably now more then ever, have more power.

For my Additional Basic Qualifications (ABQ) Junior course, completed on-line with the University of Western Ontario from May to July, I chose to explore the issue of parental involvement in mathematics education to fulfill the requirements of my "Reflective Practice Project". Colgan and Onslow et al.'s articles served as springboards for me to explore, "Why am I so anxious about increased parental involvement?"

I came across an article by Dominic Peressini (1998), who used Foucault's (1980) regime of truth as a theoretical framework for his doctoral dissertation:

"Truth and power function in a circular fashion because we are subjected to the production of truth through power and we cannot exercise power except through the production of truth" (p. 560). Graham and Johnson (1998) mention: "Teachers are frustrated because they are not afforded the same level of professional respect, as are, say doctors or lawyers. They believe that they have the expertise and experience to know what skills and concepts are essential…" (p. 86). These and other fascinating articles allowed me to realize that increased parental involvement does not have to be threatening. It does not mean parents telling us what to do or how to teach. Rather, parents may be anxious when they see their children learning mathematics differently from when they were in school.

For parents to be supportive of the reforms in mathematics education, they need to be convinced that the student-centred, hands-on approach, using calculators, and learning through exploration, are better than focussing solely on skill and computational development, with teacher lecture and demonstration (Brahier, 2000). Graham and Johnson (1998) add: "poor communication between the schools and the community can result in misinformation and myths about what change in mathematics education is all about" (p. 74). That is probably why the "New Math" failed during the 1960s (Fey (1978), in Peressini). Former NCTM president, Jack Price, acknowledged NCTM's shortcomings: "Our efforts to inform parents better have fallen short…we have to help those parents bridge their fears and encourage them to join hands in providing a solid mathematics education for all children" (p. 606).

With education receiving so much negative press, it is not surprising that parents are worried and concerned. Osborne (1999) reminds us that "the more parents get to know their children's school, to understand the problems it faces and what it is doing to solve them, the more supportive they are of what it is doing" (p. 166). Both Colgan and Onslow et al. provide excellent strategies to make that happen. Parents need to be partners in the education process. As a colleague in my ABQ Junior course mentioned, "Children are taught at school, they learn at home."

References

Brahier, D. (2000). *Teaching secondary and middle school mathematics.* Needham Heights, MA: Allyn and Bacon.

Colgan, L. (2002). Mathematics at home. *Ontario Mathematics Gazette, 41*(1), 12-15.

Graham, K., & Johnson, L. (1998). What is the role of parents and community members? In Ferrini-Mundy, J., Graham, K., Johnson, L., & Mills, G. (Eds.). *Making changes in mathematics education: Learning from the field* (pp. 73-86). Reston: VA: National Council of Teachers of Mathematics.

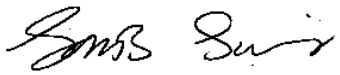
Onslow, B., Edmunds, G., Chapple, N., Waters, J., Burakari-Adera, R., & Forsythe, J. (2002). Parents: The logical link for supporting children's mathematical understanding (part II). *Ontario Mathematics Gazette, 41*(1), 6-10.

Onslow, B., Edmunds, G., Chapple, N., Waters, J., Burakari-Adera, R., & Forsythe, J. (2002). Parents: The logical link for supporting children's mathematical understanding (part I). *Ontario Mathematics Gazette, 40*(4), 27-31.

Osborne, K. (1999). *Education: A guide to the Canadian school debate – Or, who wants what and why?* Toronto: Penguin.

Peressini, D. D. (1998). The portrayal of parents in the school mathematics education reform literature: Locating the context for parental involvement. *Journal for Research in Mathematics Education, 29,* 555-582.

Price, J. (1996). President's report: Building bridges of mathematical understanding for all children. *Journal for Research in Mathematics Education, 27*, 603-608.



Louis Lim
Editor, *Ontario Mathematics Gazette* ▲

Call for Gazette Editor

The Ontario Mathematics Gazette is taking applications for a two-year term as editor commencing with the September 2003 issue.

If you are interested, or would like to recommend a colleague for this position, please contact: Executive Directors, Dave and Sue Hessey, at (519) 471-6324, or oame.hessey@sympatico.ca

▲ President's Message

MARG WARREN

"I can't do math" is a common phrase, which even adults might utter. This phrase usually evokes little, if any, surprise and might even elicit a nod of agreement from a good percentage of the population. "I can't read" is considered an embarrassing admission seldom made by anyone greater than eight years old and certainly responded to with shock and chagrin.

It was only a few years ago that there was raging debate about the definition of literacy. While some felt that literacy simply meant the ability to read and write, there were many others lobbying for a much broader interpretation. In recent years, much emphasis has been placed on literacy – both early and late literacy programs have been researched, developed, and funded. Teachers have been extensively trained to deliver a variety of strategies and approaches for the teaching and learning of reading, writing, and oral and visual communication.

For some time, it seemed that the advocates of phonics and isolated grammar instruction were pitted against those who believed in a whole language approach. The outcome of extensive debate however is a much more inclusive approach to language instruction where teachers now draw upon many different strategies to ensure that students are continually increasing their level of literacy.

There seems to be almost parallel developments now taking place in the area of numeracy and mathematics. Recently, the Ontario government made a press announcement to commit extensive funding to an "early math" initiative. The choice of the word "math" is interesting. The rationale for using the word math instead of numeracy went something like this:

> *It was felt that generally people do not have a common understanding of the word "numeracy". There is a fear that many would think of numeracy just as arithmetic or fluency with basic computation skills. Thus, we wanted to use the word "math" to imply something broader.*

Doesn't this seem similar to the literacy debate? Frustration would arise from those who believe that the response to low literacy scores should be more drilling of grammar, more practice of spelling lists, and more focus on conventions. Similar frustration occurs from the mathematics community when their response to poor scores is a return to the "basics" – memorizing multiplication tables, formulas, and rules, completing pages of paper and pencil drill or mastering mindless manipulation of algebraic symbols.

It is interesting that throughout the entire literacy debate, there was never a thought to abandon the word "literacy" just because there was not consensus on its definition or on the agreed upon methods to reaching it. To abandon the word "numeracy" is a serious mistake. It is of paramount importance that every citizen in the world today becomes numerate. It is less important that every citizen understand the discipline of mathematics. Again to make a comparison, we would all agree that there is nothing more important than to be literate. Teaching students about Shakespeare would be intended to broaden their appreciation of the English language and literature but we would not consider it essential to becoming literate in a functional sense. It would be part of the study of English as a discipline. Similarly there would be many things that students learn about in mathematics class that would not be considered necessary in helping them to become numerate.

We must educate people about the meaning and broad scope of the term "numeracy". What does it mean to be numerate in today's world? Children begin developing a sense of numerals and shapes at a very early age just as they begin developing a sense of letters and the alphabet. Becoming literate happens as children begin to make meaning by putting the letters together to make words, putting the words together to make sentences, putting the sentences together to make paragraphs, by understanding how the diagrams or pictures contribute to the message, and by using these words, sentences, paragraphs, and diagrams to understand and describe phenomena in their world. Becoming numerate happens as children begin to make meaning by putting the numerals together to make numbers, putting numbers together to make number sentences or expressions, putting lines together to make shapes, putting shapes together to make solids, and using these shapes, solids, and numerical expressions to understand and describe phenomena in their world. Computation is certainly an important aspect of being numerate as is developing strong number sense, spatial sense, and data sense. Young children need to "see" number and spatial patterns in their head. They need to be able to estimate and predict. They must be encouraged to explore and create models of things in their world. People of all ages must continue to learn to make good inferences and conclusions and to communicate using numbers and other symbols. These would be some of the indicators of a numerate citizen. Being literate and numerate are essential in order to be able to learn important skills in any of the disciplines including mathematics and English.

There are still a lot of students performing at level 1 and below on EQAO assessments. This would indicate a level of numeracy not adequate to cope well in the world. The theme for this year's OAME Leadership conference will be "Leave No Child Behind". We must begin to forge new ground. We must go where none or few have gone before. We must learn more about different learning styles, special education, using technology as an enabler, and motivation issues in order to teach numeracy and mathematics more effectively to all people. ▲

▲ Letter to the Editor

Dear Editor:

When I fly, I have two very important items in my carry-on bag, a mathematical puzzle book and a calculator. On a flight home from Las Vegas, Jim Balcom, who was sitting next to me, was also doing mathematics. He had quite a few charts in front of him and we had a conversation about them. He needed to know the tangent of an angle and sine of an angle for calculating the length of the slope, but until that moment, he relied on ready-made charts. Several weeks after I returned home, I received an e-mail from Jim. He thanked me for helping him understand how degrees and trigonometric ratios could help him understand his charts for building ramps. I asked him to provide an example for our mathematics journal and this is his reply:

Hi Frances,

I would be happy to provide an example of what I need to know before I can recommend a particular ramp for a customer. On a recent Saturday, a woman in a wheelchair was going to be a bridesmaid in a wedding for a very good friend. The wedding was being held in an old, historical church in Bonanzaville near Fargo, North Dakota. The steps are 56 inches high, and from past experience, I know that an electric wheelchair can climb a 15˚ slope, but that is about the limit. Using the formula you gave me on the plane, I was able to determine an 18 foot ramp would get me under the 15˚ (the actual result is 14.53446˚). We made up the ramp and set it up for the lady to try and it worked as it was supposed to. By doing the math ahead of time, we were able to tell the woman that we could make it possible for her to attend the wedding and we didn't just guess that we would be able to help her.

Sincerely, Jim Balcom

I will never forget Jim's excitement when he discovered that he could check his ramp charts using the trigonometric functions on a scientific calculator. His charts basically gave rise, run, and length of ramp. I noticed that the ramp lengths were in feet while rise and run were in inches or feet. Sometimes the ramp height was inches and no measure for run but he knew the length of the ramp in feet. 12 inches = 1 foot was an important piece of information to know.

Submitted by: Frances Schatz ▲

Harcourt

PSYCAN

▲ 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
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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.	●●● or ○○○	Take 5 stones from the pile.
When 5 sides turn up the same, and one is different.	●●● or ○○○	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.	●●● or ○○○	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 ●●○○○○ or ○○●●●● 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 *Awithlaknannai* 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.

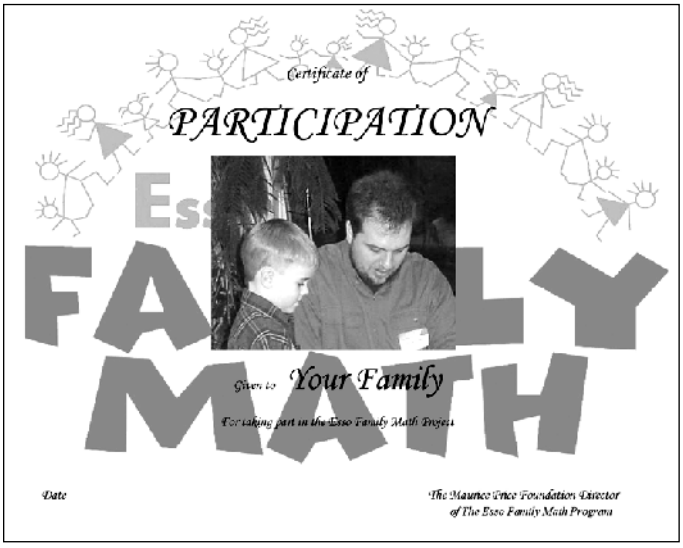


Figure 4

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 Math[1] will not resolve all of the difficulties associated with



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. ▲

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

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OAME/AOEM AWARDS NOMINATION PROCESS

DEADLINES

Nominations for awards to be presented at the Annual Conference must be received by January 31 of the calendar year in which the conference takes place.

Nominations received after January 31 will be considered for awards to be presented during the next three calendar years. A nomination will be allowed to stand for three consecutive years. After that time, the nomination must be renewed. A standing nomination may be amended at any time by the original nominator. The nominator need only inform the chair of the Awards Committee in writing of the proposed changes to the nomination form.

THE OAME/AOEM NOMINATION FORM

Write a letter supporting the nomination of your candidate for the indicated award. Provide specific and detailed information about the nominee's activities as they relate to the following areas of consideration:

- demonstrations of excellence and creativity in mathematics education;
- specific contributions to mathematics education in the school, region, province or nation;
- demonstrates leadership in mathematics education in the school, region, province or nation;
- support of and contribution to the activities of OAME/AOEM, and
- contribution to the development of students both within and outside of the classroom.

Please include any additional information that you feel may be relevant to the nomination, but which may not be specifically mentioned above.

THE NOMINATION COVER PAGE

Complete the Nomination Cover Page and attach it to your letter of recommendation for the nominee.

Incomplete or inaccurate information may cause a nomination to be withheld from consideration.

OAME/AOEM LIFE MEMBERSHIP AWARD

The Life Membership Award is given to recognize a person who has contributed in a significant way to OAME/AOEM; demonstrated outstanding leadership in mathematics education; and has accumulated 10 or more years of membership in OAME/AOEM.

KENNETH D. FRYER AWARD

In Memory of the late Kenneth D. Fryer, OAME/AOEM, in conjunction with the Grand Valley Mathematics Association, established the Kenneth D. Fryer Award. The award is to be given annually to recognize a mathematics department which fosters collegiality, team work, and excellent classroom teaching; contributes to the overall development of students; and demonstrates leadership in the mathematics education community.

AWARD FOR OUTSTANDING CONTRIBUTION TO OAME/AOEM AND MATHEMATICS EDUCATION IN ONTARIO

This is to recognize an individual who has made significant contribution to OAME/AOEM, but who is not necessarily an educator or a member of OAME/AOEM.

AWARD FOR EXCEPTIONAL AND CREATIVE TEACHING IN ELEMENTARY MATHEMATICS

The award is to be given annually to recognize an elementary teacher who has demonstrated excellence in mathematics education, as well as contributing to the overall development of students beyond classroom activities.

AWARD FOR EXCEPTIONAL AND CREATIVE TEACHING IN SECONDARY MATHEMATICS

The award is presented annually to recognize an exceptional and creative secondary school mathematics teacher who enhances the teaching of mathematics in Ontario.

AWARD NOMINATION COVER PAGE

INTENDED AWARD: (please check one)

☐ Life Membership Award
☐ KENNETH D. FRYER AWARD
☐ AWARD for outstanding Contribution to OAME/AOEM and Mathematics Education in Ontario
☐ AWARD for exceptional and Creative Teaching in Elementary Mathematics
☐ Award for exceptional and Creative Teaching in SecondaryM athematics

NOMINEE'S INFORMATION:

Name of Nominee _____
(Principal and Department Head for K.D. Fryer Award)
School / Organization _____
Business Address _____
Telephone Number ( ) _____ Fax Number ( ) _____
Home Address _____
City _____ Home Phone ( ) _____

NOMINATOR'S INFORMATION:

Name of Nominator _____
School / Organization _____
Business Address _____
Telephone Number ( ) _____ Fax Number ( ) _____
Home Address _____
City _____ Home Phone ( ) _____

SEND TO: STEWART CRAVEN

▲ Mathematics at Home

LYNDA COLGAN



Lynda Colgan has been at the Faculty of Education at Queen's for four years, teaching in the B.Ed., M.Ed., and Ph.D. programs. Her primary focus is the classroom and her research is aimed at improving the mathematics learning experience of the child by supporting teachers and parents.

Introduction

There is thirty years of irrefutable research that shows that greater family involvement in children's learning is a critical link to achieving high quality education. "Families play a vital role in educating children. What families do is more important to student success than whether they are rich or poor, whether parents have finished high school or not, or whether children are in elementary, junior high, or high school" (Coleman et al., 1966; Stevenson & Baker, 1987; de Kanter, Ginsburg, & Milne, 1987; Henderson & Berla, 1994; Keith & Keith, 1993; Liontos, 1992; Walberg, 1984). Children whose families read to them, help them with homework, talk to their teachers, and participate in their learning in other ways have a tremendous advantage in school as well as higher grades and test scores; long term academic achievement; and positive attitudes and behaviour.

While parents can usually find time and the comfort level to read a story to their children, thereby instilling a love of reading and books, they are often at a loss as to how to instil a love and appreciation for mathematics. Over the years, mathematics educators have developed a range of materials and a repertoire of strategies for assisting parents to help their children achieve success in mathematics at school and for life. Perhaps the most widely-recognized of these initiatives is the *Family Math* program developed by EQUALS at the Lawrence Hall of Science at the University of California at Berkeley.

In Canada, many provincial boards and schools have initiated some type of *Family Math* course or fair in order to provide opportunities for families in their community to learn and enjoy mathematics together. In fact, *Family Math* programs have been enormously successful across North America (and in a number of sites in Australia, New Zealand, Central America, and Korea), largely due to the fact that they give parents a first-hand experience of what goes on in today's classroom. Participation in *Family Math* activities gets parents (or grand-parents or older siblings) involved in a "hands-on/heads-in" way as learners of mathematics.

Though the outcomes of the direct learning experience provided to parents/caregivers by *Family Math* are varied, it can be said that schools that offer such outreach opportunities send a powerful message to the community. Clearly, administrators and teachers who design and implement such initiatives care enough to inform parents about what is going on in the school's efforts to improve mathematics education. More importantly, they are taking positive steps to empower parents, so that they will feel valued in the educational process. Through *Family Math* courses and nights, parents meet a different kind of mathematics than the one they encountered in their own school experience. By encountering mathematics that is applied, creative, open-ended and fun, parents begin to recognize that mathematics is something that everybody does on a daily basis in a myriad of ways, and they begin to believe their children (grandchildren, next door neighbours, and friends) can and should do mathematics regularly.

Using inexpensive hands-on manipulatives such as beans, toothpicks, and coins, children and their parents gain a concrete understanding of space and numbers, develop problem solving strategies, and become more confident and willing to tackle new problems. The focus is on the process of mathematics, as well as getting the right answer. For example, at a *Family Math* course, parents may learn how to use macaroni to help them visualize how three groups of three add up to nine. As an alternative to purchasing flash cards and drill-based workbooks, parents may learn that they can reinforce basic skills and practice mental arithmetic by assigning escalating dollar values to each letter of the alphabet and challenging their children to add up the "price" of each member of the family's name. They may learn that the notion of circumference and diameter can be taught using ribbons and lids from jars, or that fractions can be practiced by doubling or halving recipes. Families may calculate the price difference between buying ice cream from the ice cream store, and getting it at the grocery store.

The Challenge

Through the activities selected for use at the *Family Math* course, parents learn that the most meaningful math curriculum presents situations and employs materials from everyday experience. However, as anyone who has hosted a Family Math course will tell you, the greatest challenge comes when the course is over. Parents sincerely desire to put into practice, at home, all the wonderful ideas they've seen developed in the *Family Math* class and they want to help their children by maintaining the momentum. But where do they get rich variety of activities that will help children learn and apply mathematical concepts in areas as diverse as geometry, algebra, measurement, statistics, and probability in a useful and fun way? Where do they find activities that relate math to everyday life and complement many of the math lessons that children are learning in school? Where do they turn to find activities that they can do with their child at home? At the grocery store? While travelling? Just for the fun of it? And more importantly, how do schools find the time to create and distribute quality resources?

Three Possible Solutions

In August 2000, a collaborative project began at the Faculty of Education at Queen's University in partnership with a small number of schools in the Limestone District School Board, the Algonquin and Lakeshore Catholic District School Board, and the Catholic District School Board of Eastern Ontario. Funded by the Imperial Oil Charitable Foundation and The Social Sciences and Humanities Research Council of Canada, with support from the MSTE Group at Queen's University, fourteen schools have undertaken *Family Math*-like programs in their schools.

In the first year, teams (comprised of one administrator, one primary division teacher, one junior division teacher, and one representative from the school council) from seven schools attended a summer *Family Math* institute. In addition to experiencing first-hand a range of *Family Math* activities over two days, the schools were provided with a handbook that included sample letters to parents, recommended schedules and room set-up information, a collection of openers, and templates for preparing take-home activities. In the second year, each of the seven schools agreed to be part of an "Each One, Reach One" initiative in which they mentored a new school that they had introduced to the program.

Part of the research involved debriefing with parents, teachers, and administrators who were involved in the project. Their enthusiasm was extremely heartening and their long list of suggestions for extension initiatives to support mathematics at school and at home was simultaneously practical and original. The ideas were prioritized and three were selected for immediate implementation: a parent handbook, an on-line family math calendar, and a monthly newsletter.

From A(lgebra) to Z(ero): A Guide to Mathematics in School

In order to address much of the confusion and many of the concerns that a lot of parents had expressed about their child's mathematics learning experience, a fridge-friendly handbook that addresses important issues, ranging from the myth of the math gene to how to use storybooks to encourage the reluctant mathematician, was created. The *Family Math* partners were adamant that they did not want a lengthy book nor did they want it to be written in "teacher-ese". They wanted something that was full of rich mathematical information and ideas, yet not intimidating. Whatever, the product, it had to be portable – shoved in a glove compartment, easily placed in a brief case or diaper bag for a quick read during a commute, and readable while exercising on a treadmill or supervising playground activities from a park bench. Moreover the text needed to appeal and be useful to caregivers of all elementary school-aged children. Perhaps the greatest challenge was that the dream-product could not be expensive or difficult to obtain since the goal was to get it into the hands of as many parents and grandparents as possible. To this end, *From A(lgebra) to Z(ero): A Guide to Mathematics in School* was produced (Figure 1). We have distributed this small but enormously rich resource to our local schools, and through word-of-mouth, the message about *A to Z* is reaching teachers, parents, and principals across Ontario and across the country.

A complimentary copy of this resource has been provided for each member of OAME to supplement this article. It is hoped that you will share it with other teachers, administrators, and parents and perhaps decide to acquire additional copies for use in take-home math kits, at curriculum nights, as fund-raisers, or in community partnerships. Contact information is available on the flip-side of the book.

M@H

The second response to the *Family Math* partners'

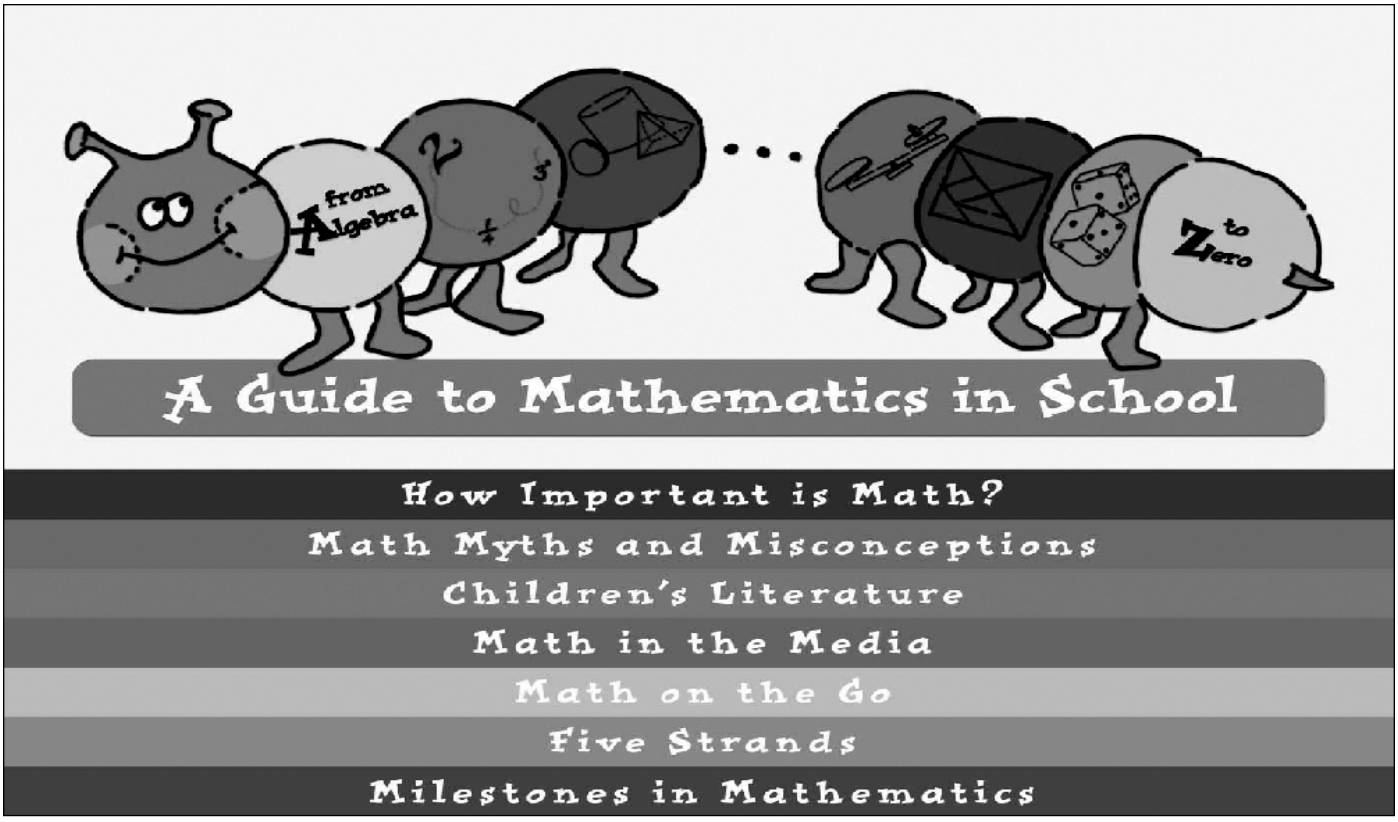


Figure 1. The cover and table of contents for From A(lgebra) to Z(ero): A Guide to Mathematics in School.

concerns was the creation of a free on-line mathematics calendar (www.educ.queensu.ca/~fmc). Parents and teachers had expressed frustration over the dearth of inexpensive and easy-to-access math materials for use not only on those evenings when there was no formal homework, but also on those occasions when children needed a fresh and creative look at math because of feelings of failure or inadequacy.

The *M(athematics) at H(ome)* or *M@H* calendar was researched by a B.Ed. student and the web design was done by another student (future editions of the calendar will be created by Primary/Junior teacher candidates as part of the mathematics curriculum assignment for their B.Ed. program).

Like many commercially-available mathematics calendars, including the Toronto District School Board's annual *Calendar Math* and Theoni Pappas' classic *Joy of Mathematics* calendars for adults and children, for each month, *M@H* has a theme and a corresponding title screen (shown in Figure 2). Each day of the month has a related problem (and solution), riddle, poem, or historical fact. Every effort has been made to feature "classic" problems and famous mathematicians and to address all content and process strands of the Ontario mathematics curriculum. On a monthly basis, there are some problems that are best suited for primary children, some that are primarily intended for students in Grades 4 to 6, and others that are directed at the intermediate-aged student. Every non-original entry on the calendar is sourced and an extensive bibliography and collection of related resources is included for those teachers and parents interested in pursuing topics of interest through print- or electronic-based publications. To emphasize the importance of longer-term problems and projects, each week-end projects details an activity that would require more time and perseverance. Examples range in difficulty from the creation of a simple π necklace using multicoloured beads, to opportunities for students to examine and reflect on the effects of changing the dimensions of two-dimensional objects on the volume of related three-dimensional objects. Visitors to M@H will find a wealth of open-ended and multicultural activities like the creation of a "Jeu de Parquet" that emphasize that parents do not need to purchase specialized or expensive materials to engage their children in meaningful kitchen-table mathematics.

OAME members are invited to visit the web site and to share the URL with interested parents, teachers, and administrators. Since this is the first year for the on-line calendar, we invite your constructive criticism, feedback, and suggestions for improvements.

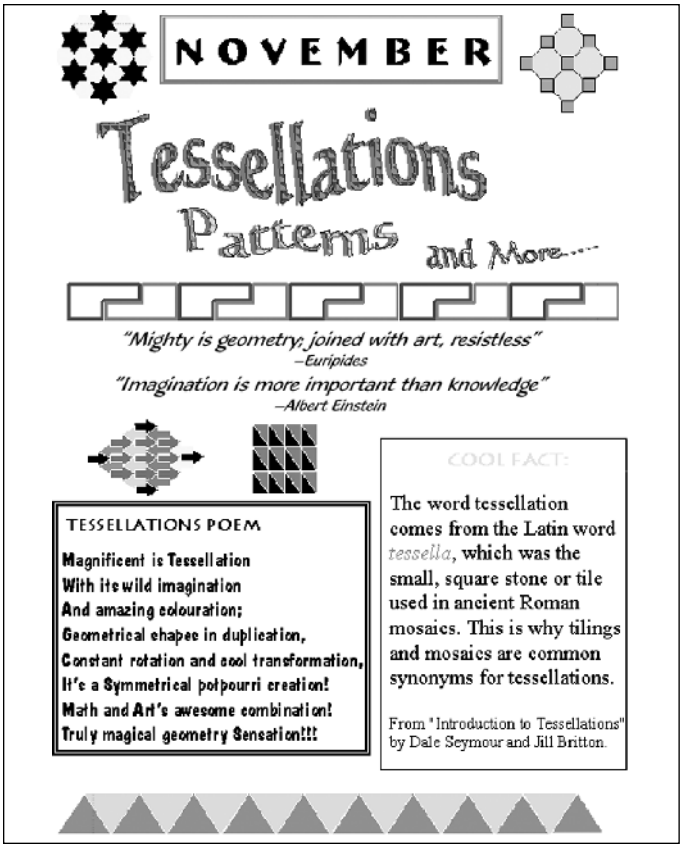


Figure 2. Opening screen for November, 2001 – Tessellation Month.

Your Prime Newsletter

The third project designed to help bridge the mathematics communication gap between school and home is the monthly *Prime Newsletter* which is available to download free of charge from the Connect-ME web site at Queen's University (http://hydra.educ.queensu.ca/CM/). In some schools, teachers are downloading the newsletter and they include it as a supplement to the regular communication package to the home that describes units that are being undertaken in class or detail school-wide mathematics-focussed innovations. In others, the school council has assumed responsibility for downloading and distributing the newsletter. In others still, the administrative team selects one or two parts of the newsletter to include in the school newsletter.



Each month, the newsletter features a mathematician, an historical or multicultural mathematical tidbit, some friendly advice for parents, and several high-quality kitchen-table math activities.

OAME members are invited to download and share the newsletters. We would be delighted to hear what you have to say about the newsletters and to share your ideas for using them in your community.

Conclusion

Clearly, there is a great need to help parents to integrate classroom learning with appropriate daily life experiences with confidence. Currently, there are few easily accessible and inexpensive resources to assist parents/guardians to become mathematical mentors for their own children. The *Family Math* initiative at Queen's University, which now includes *From A(lgebra) to Z(ero): A Guide to Mathematics in School*, *M@H*, and *The Prime Newsletter* is attempting to emphasize the need to move beyond the "math night" at the school. Through our widely-available and easily-accessible high-quality print and electronic resources, we are hoping to support and sustain parental interest and participation long enough so that we can begin to change people's habits and attitudes about math. You are invited to share in the first phase of our project, make suggestions for improvements and new directions, and of course, spread the word. In the true spirit of *Family Math*, our goal is to live the motto: *Together is better!*

References

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., & York, R. L. (1966). *Equality of educational opportunity.* Washington: U.S. Government Printing Office.

de Kanter, A., Ginsburg, A. L., & Milne, A. M. (1987). *Parent involvement strategies: A new emphasis of traditional parent roles.* Washington: U.S. Department of Education.

Henderson, A. T., & Berla, N. (1994). *A new generation of evidence: The family is critical to student achievement.* Washington: National Committee for Citizens in Education.

Keith, T. Z., & Keith, P. B. (1993). Does parental involvement affect eighth-grade student achievement? Structural analysis of national data. *School Psychology Review, 22*(3), 474-496.

Liontos, L. B. (1992). *At-risk families and schools becoming partners.* Eugene: University of Oregon, ERIC Clearinghouse on Educational Management.

Stevenson, D. L. & Baker, D. P. (1987). The family-school relation and the child's school performance. *Child Development, 58,* 1348-1357.

Walberg, H. J. (1984). Families as partners in educational productivity. *Phi Delta Kappan, 65,* 397-400. ▲

Pearson

▲ Review of NCTM's *Developing Data-Graph Comprehension in Grades K-8, Second Edition*

(ISBN 0-87353-505-7)

REVIEWED BY: JOANNE HARRIS



Joanne Harris teaches grades 7 and 8 mathematics at Centennial Middle School in Georgetown. She is an avid quilter and loves the action of a great hockey game. She is always on the lookout for ways to make her mathematics program more relevant for students.

The second edition of *Developing Data-Graph Comprehension in Grades K–8*, written by Frances R. Curcio, is a revised and expanded edition of a resource first written in 1989. It specifically focusses on how to construct graphs, how to select the right type of graph to display data, and how to interpret the meaning of a graph. The resource is suitable for Elementary and Middle School students.

The book is divided into three sections. The first section contains detailed information about the different types of graphs, including how to construct them and which type of graph to select to display a specific kind of information. From the importance of using manipulatives to develop graphing sense in young students, to the selection and construction of the best form of graph to display data with older students, each step in the continuum is developed clearly and logically with specific examples. In order to develop an understanding of the power of graphs, the author believes that students must first construct graphs manually using manipulatives. Once a basic understanding of graphs is in place, then it is appropriate to begin to use graphing software. To facilitate the evaluation and selection of a specific graphing software package, the author provides a list of seven criteria to consider when making the decision.

The second section of the book contains 28 activities organized by grade range (K-4, 3-4, 5-6, and 7-8). Each activity follows the same format. First, the specific topic is given, followed by the graph form to be used. Graph titles are suggested. For the teacher, the objectives of the activity are listed in detail and the vocabulary needed to talk about the graph is provided. There is also a list of materials that would be required by a class to complete the activity. The procedure to follow is described. The

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follow-up questions that are included with each activity model for the teacher how to develop questions that simply identify facts, questions that require interpretation of the material on the graph, and questions that require students to extrapolate information based on the graph, or to explain something about the graph. The questions that a teacher could use to develop the ideas are grouped into three types. The level of question is identified as reading the data [RD], reading between the data [RBW], and reading beyond the data [RBY]. The suggested questions are age appropriate and have been designed to help students expand their thinking about a specific graphic display. Suggested ways in which technology could be incorporated into the activity are included with many of the activities. Finally, the activity is concluded with a section called writing and reading which suggests ways to summarize the activity using writing and/or reading.

The third and final section of the book contains the Appendices. One appendix is an extensive list of graphing topics with a suggested grade level. Another appendix has Blackline Masters for different grid graph paper. Appendix 1 includes seven graphs along with multiple choice questions that further model the different levels of questions. There are a variety of different sample data collection sheets, activities that compare the impact of using different types of graphs to demonstrate the same information, and several "Here's the Graph, What's the Story?" The activities in the book were field-tested with students in elementary and middle schools prior to their inclusion in the final resource. Even though the book was written and field-tested in the United States, the examples and the strategies apply to the Ontario Mathematics grades 1-8 Curriculum.

Many features make this book a valuable resource to have. The title of the book accurately reflects the focus of the book. The continuum is developed from making graphs by arranging objects on a line to creating graphs using graphing software. The interpretation of graphs is developed from simply asking what is this graph about to how would you use this information. Graphing and Data Management are used across the curriculum. This book can help any teacher, to develop in their students, the skills required to construct a graph, then to build skills in interpreting the information found in a graph, and finally to help develop higher order thinking skills when interpreting graphing displays. This book is available by contacting Frances Schatz, OAME's NCTM representative, at frances.schatz@sympatico.ca. ▲

▲ Photo Math – A New Way of Picturing Math

RON LANCASTER
35 HADDON AVE. N., HAMILTON, ON L8S 4A2



Ron Lancaster is a middle and high school mathematics teacher, currently working throughout North America and Asia as an Independent Mathematics Consultant.

"A picture is worth a thousand words" is an expression that is often used to convey the importance of using images to make a point. The purpose of this column is to go beyond this notion and to promote the idea that, "A picture is worth a thousand numbers." Readers can expect photos with math in every *Photo Math* column, and the emphasis will be on seeing and doing mathematics everywhere. Teachers may want to assign these questions for their students as part of an overall effort to make connections between the mathematics curriculum and the world around us. Establishing these connections is at the heart of the new Ontario mathematics curriculum as well as the NCTM document, *Principles and Standards for School Mathematics.* It is hoped that these questions will inspire students to be more creative and playful, and that in the end, students will develop an ability to see the world from a different perspective.

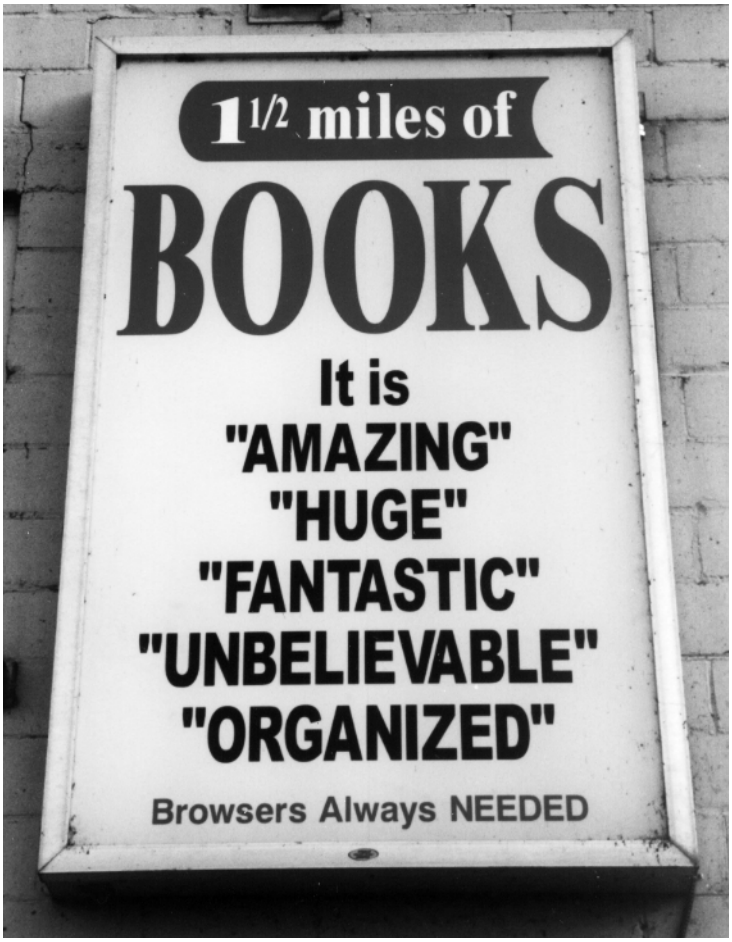
Teachers and students are encouraged to pose mathematical questions related to their own encounters and submit these problems, along with photographs, to me for possible publication in future columns. I do not have a cable modem, and in order to avoid long periods of downloading items, submissions to this column should be sent via Canada Post to the address given above.

Introductory Comments

I have had the pleasure of working with mathematics teachers from North Bay and the surrounding area on a number of occasions. The many teachers that I have worked with are truly exemplary. Their passion for working with students, for using technology, and for learning new ideas are remarkable. Teachers in this area are fortunate to have numerous innovative and hard-working leaders, including Ross Isenegger, Jim O'Connor, and Dwayne Myers.

All of these photos were taken in the downtown area of North Bay in October, 2001.

Photograph #1



(a) Estimate the average width of a book by using a random sample of books. Use your answer and the name of the book store ($1\frac{1}{2}$ miles of books) to estimate the total number of books that one might find in this store.

(b) From a mathematical perspective, the name of the bookstore appears to be $1^{\frac{1}{2}}$ miles of books. Under this interpretation, the store would have one mile of books, an amount that is less that the actual one and a half miles. By solving the equation given below, see if it is possible to find a length for the total number of books that would remain the same under either interpretation.

$$a + \frac{1}{2} = a^{\frac{1}{2}}$$

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Photograph #2



(a) What type of research do you think that Butler and Cadger did before making the offer to buy any and all houses that do not get sold in 120 days? What branch of mathematics might they have used to decide if this offer was a good idea?

(b) If a house did not sell within 120 days, how much should Butler and Cadger pay for the house? Would it be more, less, or the same as the listed price?

(c) List some pros and cons to the offer being made by Butler and Cadger. Do you think that this type of marketing idea should be adopted by every real estate agent?

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Photograph #3



(a) Find the slope of the upgrade by measuring its rise and run. Assume that the hill has been drawn accurately.

(b) Suppose that instead of measuring the rise and the run in the diagram, you measured the angle of inclination of the upgrade with respect to the horizon. How could you use this angle to find the slope of the upgrade?

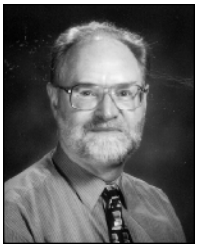
(c) Do you think that an effort has been made to accurately draw the diagram of the hill? Explain.

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McGraw Hill
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▲ Technology Corner: Reinforcing Geometry Concepts Using *The Geometer's Sketchpad*

FRED FERNEYHOUGH
E-MAIL: dybydx@rogers.com

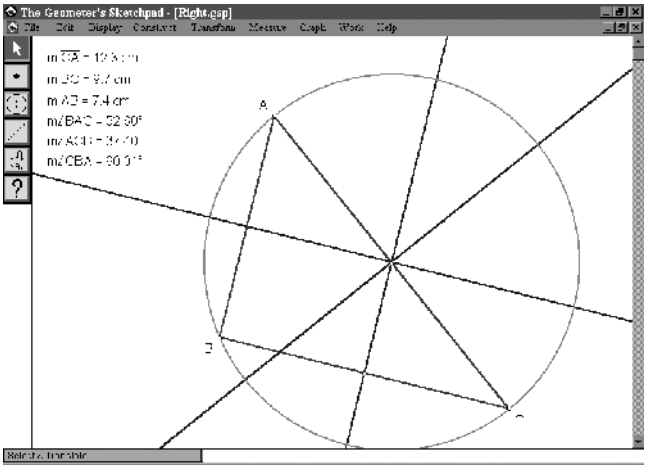


Fred Ferneyhough is Head of Mathematics at Central Peel SS in Brampton and is technology consultant for the McGraw-Hill Ryerson texts in Ontario. He is an avid user of, and advocate for, the use of technology in the mathematics classroom.

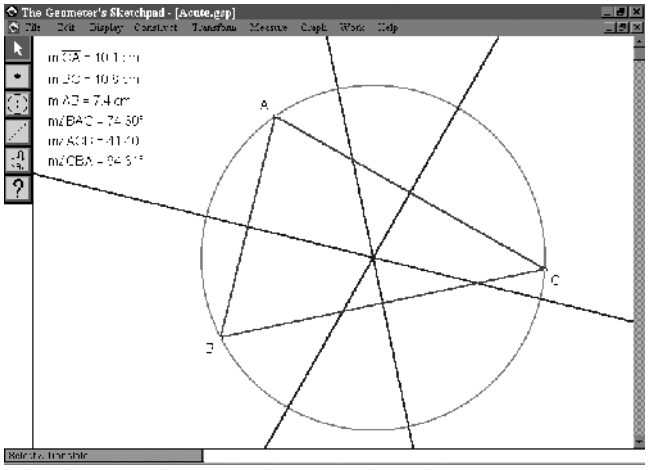
You are teaching basic geometry concepts and terminology. You want your students to learn how to label triangles according to their side lengths or their angle measures. Let's face it–memorizing terms such as "acute", "obtuse", and "scalene" just do not excite students. What to do? Here's a way I stumbled upon while teaching with *The Geometer's Sketchpad* in grade 9.

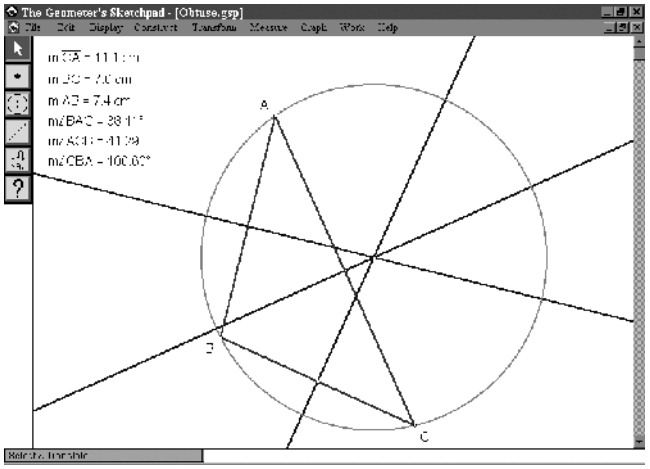
Most of us have probably constructed the diagram below: Start with a triangle ABC. Measure the lengths of the sides and the angles. Construct the midpoints and the perpendicular bisectors will intersect at a common point, called the circumcentre. For whatever reason, a lot of students, and quite a few teachers love to take the mouse and drag one vertex around the screen. So, what happens if you drag a vertex and attempt to keep the circumcentre inside the triangle? Watch the measurements for the sides and angles. Most students will discover that the triangle is acute and some may offer that it is also scalene. Of course, the rare student may argue about isosceles triangles and equilateral triangles, but we can fend him/her off for a few minutes with the promise of revisiting that idea later.

Is it possible to drag the vertices of the triangle so that the circumcentre is on one of the sides of the triangle? Does the triangle have any particular properties?



After a couple of moments of exploration, the students may obtain a result such as the one above. "But it must be just a fluke that your triangle is right-angled," you say to your class. But when every student in the class has a right-angled triangle, it must be more than a coincidence. Without even realizing it, students have already started using two geometric terms that you want them to know.

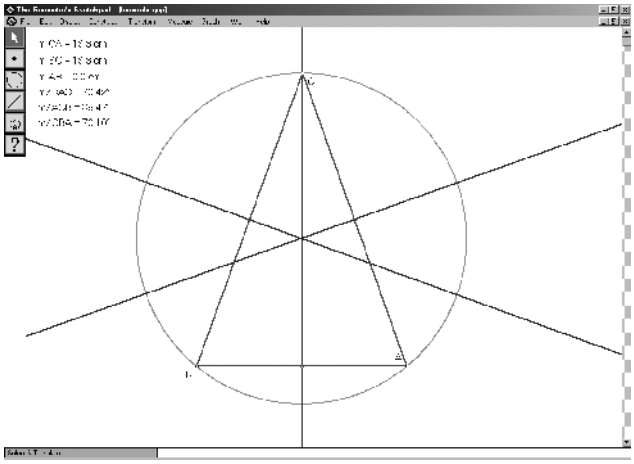




So, what kind of triangle should I get if I want the circumcentre to be outside of the original triangle?

It does not take long for a number of students to tell you that the triangle must be obtuse and that they can draw any obtuse triangle and it still works. Dare we suggest that they might be able to prove these ideas when they know some trigonometry?

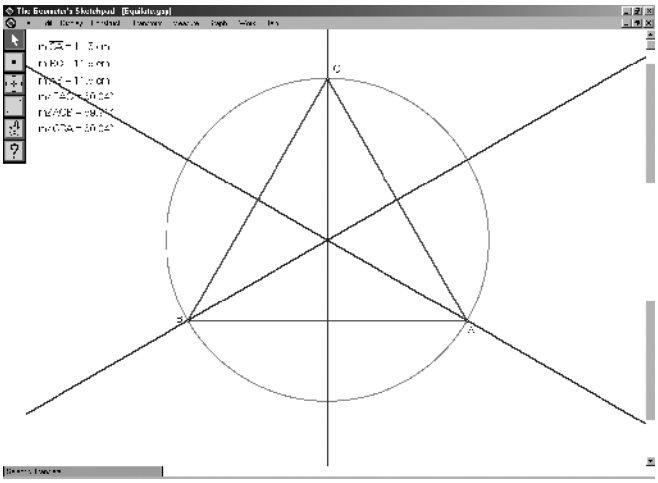
Okay, so this works well with triangles that are labelled according to their angles, but what do we do about the students who wanted to talk about scalene triangles in the first example? Do all scalene triangles have the circumcentre in the interior of the triangle? Most students will be able to tell you "no" quite quickly. In all three diagrams the triangles were scalene. Good, now are there any properties that I can get from an isosceles triangle? We can actually look at two different ideas here. First, can I move one of the vertices, say C, so that the perpendicular bisector from the opposite side AB passes through the vertex C? If so, what kind of triangle is produced? Will this always work? If I try this with point A or B, will I still come up with an isosceles triangle?



A slightly different approach is to have the students drag one of the vertices so that the triangle becomes isosceles. It may take a while to get the sides lined up so that the students can produce an isosceles triangle and they discover that the perpendicular bisector of one side passes through the opposite vertex. Of course, it may take them a while to phrase the result that way, but you can help them along. As soon as they get it done, you can announce that you want that perpendicular bisector that passes through the vertex to be PERFECTLY vertical. That should keep them occupied for a few more minutes and you may even find that some students discover that the one side must be horizontal and then you can move the vertex to the perpendicular line. As soon as one student discovers this, he/she will announce it to the rest of the class. You must love this kind of interaction in the classroom.

With either approach, there are questions that can be posed and tested by students about the isosceles triangle and the perpendicular bisector of one side. Is the vertex angle bisected? Always? Are the two triangles created by the perpendicular bisector through side AB and point C congruent? Are there other congruent figures in the diagram?

So, tell me what the diagram will look like if I have an equilateral triangle?



In this diagram, I had started with a scalene triangle and changed it into an equilateral triangle. As a result, my angles are not quite equal. I did the same thing in the previous exercise. Rather than changing a scalene triangle into an isosceles or equilateral triangle, how do I go about constructing an isosceles or equilateral triangle from the beginning? What angles in the diagram are equal? What line segments are equal? Which figures are congruent?

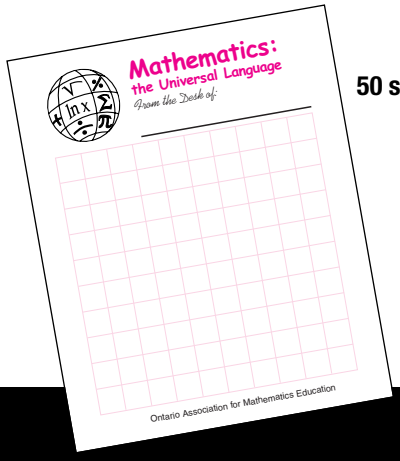
With *The Geometer's Sketchpad*, I can have my students investigate relationships quickly. However, an advantage that I had never really considered before is the idea that their geometry vocabulary has strengthened since I have them communicate their findings to me in either oral or written form. Having to come to grips with terminology in their work allows them to grow in the task that we want and allows them to internalize the terminology of geometric figures. It is worth a try. The worst that could happen is that they are still bored – but I doubt that they will be. ▲

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▲ NOMINATIONS FOR OAME/AOEM BOARD OF DIRECTORS 2003-2004

Each year, elections are held for a President-Elect, a Vice President (3 year term), and 6 to 9 Directors (3 year term) of OAME/AOEM. Nominations for these positions are to be submitted by 4:00 p.m., January 24, 2003, to:

Shirley Dalrymple, Past President

Include the nominee's qualifications with the Nominations Form. A nominee must be a member of OAME. By March 2003, the Nomination Committee will publish a slate of candidates, including qualifications, for consideration by the membership. Voting will be by mail, and is open to all OAME/AOEM members. The election results will be released at the Annual General Meeting of the OAME/AOEM in Oshawa, May 2003.

NOMINATION FORM

I nominate: _____

For the position(s) of: ☐ President-Elect ☐ Vice-President ☐ Director

Nominee's Address: _____

_____

Telephone: H ( ) _____ W ( )_____

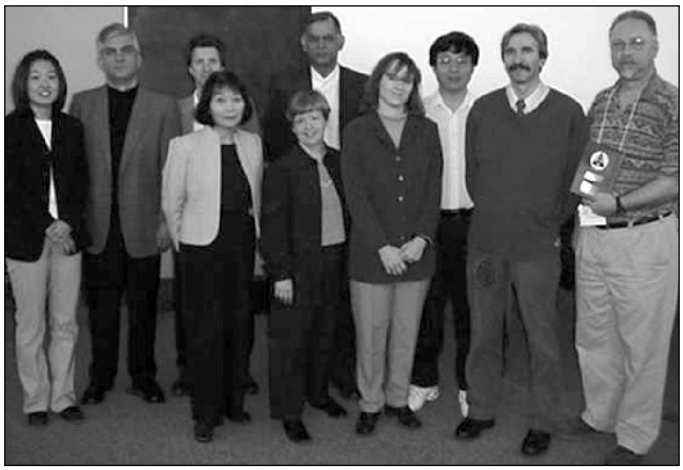
Nominator's Name : _____

Nominator's Address: _____

Telephone: H ( ) _____ W ( )_____

▲ 2002 OAME Award Recipients

Kenneth D. Fryer Award - EASTERN HIGH SCHOOL OF COMMERCE MATHEMATICS DEPARTMENT



Left to Right: Sonia Kim, John Wegrynowski, Bryce Bates, Nobuko Khan, Cheryl Powell, Gaz Farouk, Alison Large, Kelvin Soh, Greg Szczachor, Wayne Erdman (Dept Head). (Absent: Warren Anderson, Ed Ho, Ibor Briones)

The Eastern High School of Commerce Mathematics Department was awarded the Kenneth D. Fryer Award for fostering collegiality, teamwork, excellent teaching, contributing to the overall development of students, and demonstrating leadership in the mathematics education community.

Eastern High School of Commerce is an inner-city school in the heart of Toronto serving a very diverse student body, many of whom are special needs students. The mathematics department has consistently used a variety of teaching techniques to motivate the students to value mathematics and understand its importance in furthering their education. Therefore, the vast majority of the students continue with their mathematics studies until graduation.

Computer technology has been an integral part of the delivery of the mathematics program at Eastern Commerce for over 20 years. The use of graphing calculators in mathematics classrooms began over 6 years ago. The department takes a collegial approach to curriculum development and leadership, sharing ideas on teaching and assessment both within the department and with the mathematics education community at large.

The members of this department also contribute to the school and the local community in a variety of ways. Each member is a staff advisor of a school club or coaches a team on a regular basis. They also actively participate in a wide array of school committees.

Mona MacGregor Award - VINCE DELISI



Vince Delisi is well known for his outstanding work during his long teaching career in Ontario. He is highly regarded for using all forms of technology in the classroom. His students wrote in mathematics class long before communication became an important component of the new trends in teaching mathematics.

Through his work with Texas Instruments, he has influenced the lives of teachers throughout Ontario. It has been wonderful that the T^3 program was extended to Canada and allowed to flourish with funding from head office. Vince was a key player in ensuring that the T^3 got off the ground in Canada. His passion and strong lobbying efforts have made all the difference in making the program a real success story.

The Mona MacGregor Award recognizes Vince's major contributions to teachers and to education in Ontario.



Morley MacGregor Award - PAT BARLTROP

At the recent Ontario Association for Mathematics Education conference held in Barrie, Pat was awarded the Morley MacGregor Award for excellence in elementary mathematics education.

Pat is an experienced teacher who began her career in 1969 at J. S. Woodsworth Senior Public School in Scarborough. She has taught a variety of grade levels in five different schools and has assumed the additional responsibilities of curriculum chairperson for many years. She is presently teaching a grade 1-2 class at Alexmuir Junior Public School.

Pat's classroom is a learning environment unlike any other. Pat knows that young children are great thinkers, so she creates numerous opportunities to think. With abundance of the newest materials, her classroom exemplifies mathematics research and best practices. Her program is child-centred, hands-on, exciting, and meaningful. Still, the most revealing evidence of Pat's gifted teaching is the students themselves. Year after year, the high level of independence, confidence, and overall enthusiasm of her grades one and two children genuinely mesmerize those who visit. Work completed by these students often defies the expectations for the grade level. Even where a child is struggling with beginning concepts, the growth is consistently incredible. It is no wonder that Pat and her students were videotaped by their Board to support a system-wide program promoting quality assessment and instruction.

Henry Brooks Adams once wrote: "A teacher affects eternity; he can never tell where his influence stops." From students to fellow teachers, the positive influence of Pat's incredible teaching is immeasurable.

Don Attridge Award - GORD COOKE



Gord Cooke is a mathematics teacher and department head from Thousand Islands Secondary School in Brockville. He also acts as mathematics program leader for the Upper Canada District School Board.

He has worked with the Education Quality and Accountability Office for the Grade 9 Assessment of Mathematics. He has helped on developing, editing and revising, creating scoring tools, and operating as a Group Leader at a marking site.

Gord is a tireless worker for students in mathematics courses. Since his exposure to technology in the early 1990's, he has been using graphing calculators and dynamic geometry software in all his courses from grade 9 applied to OAC Calculus.

Gord is one of the developers and teachers of the Mathematics component of an integrated, thematic Math/Science/Tech/Computer program in grade 9 at Thousand Islands Secondary School. He has been President and Chapter representative to OAME for Q.S.L.M.A. and served on the Program Committee for the 1994 Annual OAME conference. He now serves as a Director and has worked on the Futures, Specialization Years, and Grades 11-12 committees.

OAME/AOEM Life Membership Award - RALPH CONNELLY



Ralph began on OAME Council in 1978, and served on the Council (now the Board of Directors) continuously from 1978-1989, and again from 1992-2000. Ralph is the only member of OAME who has served twice as President-Elect/ President/Past-President once, from 1986-1989, and again from 1997-2000. He was also editor of the *Ontario Mathematics Gazette* twice, once from 1983-1986, and then again in 1988, when the editor at that time passed away suddenly. Ralph took on the role as editor in 1988 when he was also Past-President!

Ralph was the OAME Project Coordinator for the *Linking Assessment and Instruction in Mathematics: Primary Years* document, which has been exceptionally well-received by teachers across the province. Throughout this project, Ralph demonstrated his collaborative work style and his trademark sense of humour.

Ralph has presented workshops at almost every OAME Annual conference from 1978-present. From 1994-1996, he served as the Canadian Director for the National Council of Supervisors of Mathematics. ▲

▲ Assessment Corner: Assessing Learning Skills

CHRIS SUURTAMM



Chris Suurtamm is Assistant Professor of Mathematics Education at the University of Ottawa. She is an experienced mathematics teacher who is committed to helping teachers with the implementation of the new curriculum and assessment practices.

During the first year of implementing the new grade 9 curriculum, I, as well as many others, was dutifully grappling with instructing and assessing both the *content* and *intent* of the new curriculum. In the area of assessment, I organized my marks into the categories of the Achievement Chart to ensure that I was balancing the continuum of learning. I also was assessing students' learning skills using checklists, observation, and student self-assessment. At times, it felt quite overwhelming. After several weeks of "tracking" learning skills, I suddenly exclaimed to myself, "Whose learning skills are these anyway?!" I felt as though I was being attentive to student work habits, teamwork, organization, independence, and initiative but that the students were "left out of the picture". In many cases, the students were not necessarily aware of their own learning skills, were not working on developing these skills, and did not make the connection between their learning skills and their achievement.

I wanted to develop a way to encourage student ownership of their learning skills. With this in mind, I designed a "learning skills portfolio". When most people hear the word "portfolio", their reaction is often, "How will I have time for portfolios?!" This portfolio actually tends to take care of itself because assessment and "tracking" of learning skills become a collaboration of teacher and student.

Here's how the portfolio worked:

Each student received a folder with a "tracking sheet" stapled to the inside. The tracking sheet was divided into 5 areas to represent the 5 learning skills at the secondary level. Each area had several spaces for students to list the activity and a rating of the specific learning skill. For instance, one area of the tracking sheet looked like this:

Learning Skill	Description of Activity	Date	N	S	G	E
Work Habits						

This would be used to summarize their peer and self-assessments. The body of the portfolio included self-assessment sheets for the various learning skills. For instance, I began the portfolios after I had given and marked a test at the end of the unit. I distributed the marked test and we discussed it, shared some solutions, and answered questions. I then distributed a sheet that asked students to reflect on their Work Habits during this unit. I asked several questions such as:

- Comment on your work habits during this unit.
- How are your work habits reflected in your mark?
- What would you do differently next time?

And I asked students to assess themselves:

Work Habits During this Unit	Rarely	Sometimes	Usually	Always
Used class time in a productive way				
Completed the tasks assigned				
Followed through after classtime				

Students then summarized this rating and filled it in their tracking sheet under the "work habits" area. The above self-assessment sheet also included the student's name, date, and title of activity and units, which then went into the student's learning skills portfolio.

Many other such self-assessment sheets were used. There were sheets on teamwork to be completed after a group activity, a peer notebook checklist to aid in assessing organization, a sheet that asks students to describe a time when they showed initiative in the course, and offers suggestions as to how to show initiative, as well as several others. In time, students did not necessarily need a "sheet" to self-reflect. For instance, some key questions could be written on the board for students to respond to, or students would decide that they had done something worthy of submission into their Learning Skills Portfolio and include

it as well as a reflection to describe what it showed.

When it came time for me to enter an evaluation of learning skills on a report card, I could use the tracking sheets as my guide. In this way, students knew what their rating in a learning skill meant and they could see their own development of good learning skills. It also gave me more confidence and increased accountability in evaluating learning skills because the student had collaborated in the assessment and evaluation process.

A Learning Skills Portfolio can be used at many different levels so that learning skills can be developed as students progress through the grades. A Learning Skills Portfolio is useful in the junior and intermediate grades as well as at the senior level. Of course, the reflection sheets should take into account the maturity of the students. For instance, for a grade 9 student, coming in to see the teacher to find out what they missed due to an absence might reflect strong initiative. However, for a grade 12 student, strong initiative would be demonstrated in other ways. As students progress, they should be able to clearly set goals for themselves and work to achieve them.

A Learning Skills Portfolio helps students "learn how to learn" which is a valuable capacity and is closely tied to skills that students will need in future schooling, workplace, and family environments. For instance, the Conference Board of Canada refers to the following Employability Skills:

1) Fundamental Skills: communicate, manage information, use numbers, think, and solve problems
2) Personal Management Skills: positive attitudes and behaviours, be responsible, be adaptable, learn continuously
3) Teamwork Skills: work with others, participate in projects and tasks

Some of these skills relate to curriculum achievement but many are directly linked to Learning Skills.

If carrying out a Learning Skills Portfolio seems like a large undertaking then perhaps begin by using some self-assessment of learning skills with your students. A goal of education is to help students take responsibility for their own learning. There is no better place to start to develop this responsibility than to give ownership of learning skills back to their owner – the student, through reflection, self-assessment, and strategies that encourage improvement. ▲

▲ Hey, It's Elementary...

LYNDA COLGAN



Lynda Colgan has been at the Faculty of Education at Queen's for four years, teaching in the B.Ed., M.Ed., and Ph.D. programs. Her primary focus is the classroom and her research is aimed at improving the mathematics learning experience of the child by supporting teachers and parents.

Elementary mathematics education is a complex, exciting, and esteemed field of study. The art and science of elementary school mathematics teaching and learning is no longer poor cousin to its secondary and post-secondary counterparts. In fact, the high-stakes issues that impact the Kindergarten to Grade 8 mathematics classroom are arguably among the most formidable and confounding of those undertaken by educational researchers.

These compelling reasons made it difficult to resist editor Louis Lim's offer to include a regular elementary mathematics column in the *Ontario Mathematics Gazette*. I am appreciative of the wonderful opportunity to meet with elementary mathematics educators across Ontario (and beyond) through the pages of this journal, and I look forward to lively debate through letters to the editor, e-mail discussions, and counter-point articles. I welcome your suggestions about future topics and I invite your direction in shaping this regular feature so that the unique concerns and voices of elementary educators can be respectively (and respectfully) illuminated and heard.

It's a Matter of Balance

In June, I spent some holiday time in Nova Scotia. I travelled the Lighthouse and Evangeline Trails to places like Lunenburg, Mahone Bay, and Digby. Once at Digby, I bowed to tourist pressure and decided to visit Long Island and its famous Balancing Rock (see figure 1). Geologists tell us that this enormously heavy volcanic basalt column dates back to the age when the dinosaurs were in their heyday. As you can see from the



Figure 1. Balancing Rock near Digby, Nova Scotia. (Free Internet postcard from Mirrorlock Photography.*)*

photograph, the Balancing Rock is perched on top of another basalt column, defying both imagination and gravity. A passing glance at this huge boulder might lead the viewer to conclude that the rock's balance is precarious. Hundreds of years have proved, however, that it is this rock's perfect balance that has given it indomitable strength.

The Balancing Rock conveys a message that we as educators must heed – there is might in balance. I believe that these words, now more than ever, have a special significance in terms of elementary mathematics education.

Drill and practice. No drill and practice. Calculators. No calculators. Worksheets. No worksheets. Teacher-centred classrooms. Student-centred classrooms. Discovery learning. Directed teaching. There have been many experiments and many pages written about how best to teach mathematics to the young child. The fact that most of the published recommendations have been contradictory and counter-intuitive has caused the pendulum of curriculum reform to swing wildly over the last half-century, from one extreme, superficial and short-lived change to the next.

But as we begin the 2002-2003 school year, all of the voices that deserve to be heard with respect to elementary mathematics education seem to be in bold, loud unison. From curriculum writers to professionals developers, researchers to classroom teachers, and parents to students, the call is loud and clear: *balance*.

The evidentiary pendulum too seems to have found its equilibrium, its *balance*. It has finally been acknowledged that polar positions (e.g., from one extreme that a child learns only by inventing mathematics on her own, to the other, that she internalizes what a teacher or book says) do nothing to advance classroom instruction or improve student understanding.

In terms of teaching mathematics, *balance* means that instructional time must be equally devoted both to conceptual knowledge and procedural skills. Since research shows that different teaching techniques are needed for children to acquire these different skill sets, *balance* suggests that teaching should not rely exclusively on one form of instruction or another. *Balance* means that children must have opportunities to work in social environments to discover and construct their own understanding and individual time to practice basic facts and rules so that computations, processes, and strategies are reinforced, becoming more efficient and reliable and better understood. *Balance* means that children have equal opportunities to work with physical materials and abstract ideas. *Balance* means that children have opportunities to experience all five strands of the mathematics curriculum in both integrated and dedicated ways. *Balance* means that assessment and evaluation measure and judge both computational skills and higher-order process skills and everything in-between.

This common sense approach connects with teachers' personal experiences and professional intuitions and most will find comfort in the endorsement for balancing the major "big ideas" of mathematics learning such as problem solving, communicating, connecting, and reasoning, along with standards of mastery for learning specific facts, definitions, and procedures.

However, this new spirit of *balance* does not translate into stillness or complacency. In fact, implementing *balance* fully and effectively may be the greatest challenge we have yet faced as teachers and mathematics educators.

Certainly, few teachers experienced a balanced pedagogical environment themselves as learners of mathematics. For most teachers, school mathematics was a tedious sequence of memorizing and forgetting facts and procedures that made little personal sense. A testament to this is the oft-quoted mantra, "Ours is not to question why, just invert and multiply."

Although our provincial curriculum document claims a

balance of basic skills, conceptual understanding, and problem solving as its aim, as illustrated by its assessment rubric, the heart of the document is devoted to a list of topics on a grade-by-grade basis. This checklist approach is central to the erroneous belief that "If mathematics is 'covered', students will learn it."

Moreover, there are no current textbooks that have successfully implemented a balanced approach in spite of there being numerous practice pages in combination with real-world-based investigations and problems.

If a *balanced* curriculum and a *balanced* approach to instruction, assessment and evaluation is to be a priority (and both research and the collective experience of thousands of teachers indicate that it must be) then these three issues alone raise many important questions about teacher professional development, pre-service teacher education, curriculum implementation, and textbook selection. It is certain that these ancillary topics will be among those addressed in this year's future columns, but for now I turn to a more immediate concern.

Most recent professional development efforts have focussed on a problems-based approach to mathematics teaching and learning and assessment using high quality, carefully constructed instruments and rubrics. That there is a wide community of teachers who share a common understanding of terms like "rich learning task" is a tribute to the hard work of organizations like the Ontario Association for Mathematics Education and the Ontario Mathematics Coordinators Association. Individual members within these organizations and within the curriculum departments of Boards of Education across this province have worked diligently to introduce new ways of doing and thinking about mathematics to thousands of interested educators. There have been enormous efforts to create shared banks of exemplary problems and illuminative samples of student work. And these systematic efforts to make steady and continuing improvements to students' mathematics learning experiences must be applauded and appreciated.

However, we must now turn our attention to another facet of learning with understanding by devoting similar time and energy to the notion of *practice* so that our shared definition and communal implementation of *balance* continues to move the field of elementary mathematics education forward.

The traditional understanding of practice was to provide students with repetitive rote learning opportunities in sufficient quantity that the student would be able to execute the procedure automatically without conscious thought. A perfect illustration of this definition of practice would be timed multiplication tests. Other examples include textbook and worksheet exercises that provide students with frequent, repeated opportunities to practice a skill until he can perform them independently, quickly, and effortlessly.

There are many problems with this image of mindless practice. Such exercises make it highly probable that all students are able to produce correct answers – as long as they remember the rule; however, if the student forgets the procedure, she has no conceptual basis for reconstructing it. Worse yet, practice can result in the student automatizing an incorrect procedure, which is enormously difficult to correct.

Fractional parts and operations with fractions are a perfect example. Children do not appear to have an intuitive understanding of fractions as they do with counting and simple arithmetic, and yet it is common for teachers to rush to the rules because they are simple to teach and a perfect focus for rote instruction and practice. Unfortunately, these "simple" rules also become the source of frequent misunderstandings and confusions. It is common for children to ask, "Do I need a common denominator to multiply fractions?" or "Do you invert the second number or the first when dividing fractions?" In fact, the design of multiple choice questions for fraction computations has been made almost trivial because of regularity with which students make predictable errors in using the standard algorithms.

However, since the rules do not help students to think about the meanings of the operations and why they work, a better alternative to worksheets filled with hundreds of addition or multiplication questions would be practice pages that reinforce concepts and illuminate strategies. For example, students could work with (i) region or area models (e.g., circular pie pieces, pattern blocks, drawings on grid paper, paper folding); (ii) length or measurement models (e.g., Cuisenaire Rods, folded paper fraction strips, number lines); or (iii) set models (2-colour counters or X's and O's) to reinforce the concept that the top number of a fraction *counts* and the bottom number tells you *what is being counted*. Sets of similar exercises on photocopied pages (such as the two shown in figure 2, taken from John Van de Walle's *Elementary and Middle School Mathematics: Teaching Developmentally, 4th Edition)* can still be given for individual "drill" or homework; however, the dramatically different content and approach would serve to reinforce conceptual development, not hollow memorization.

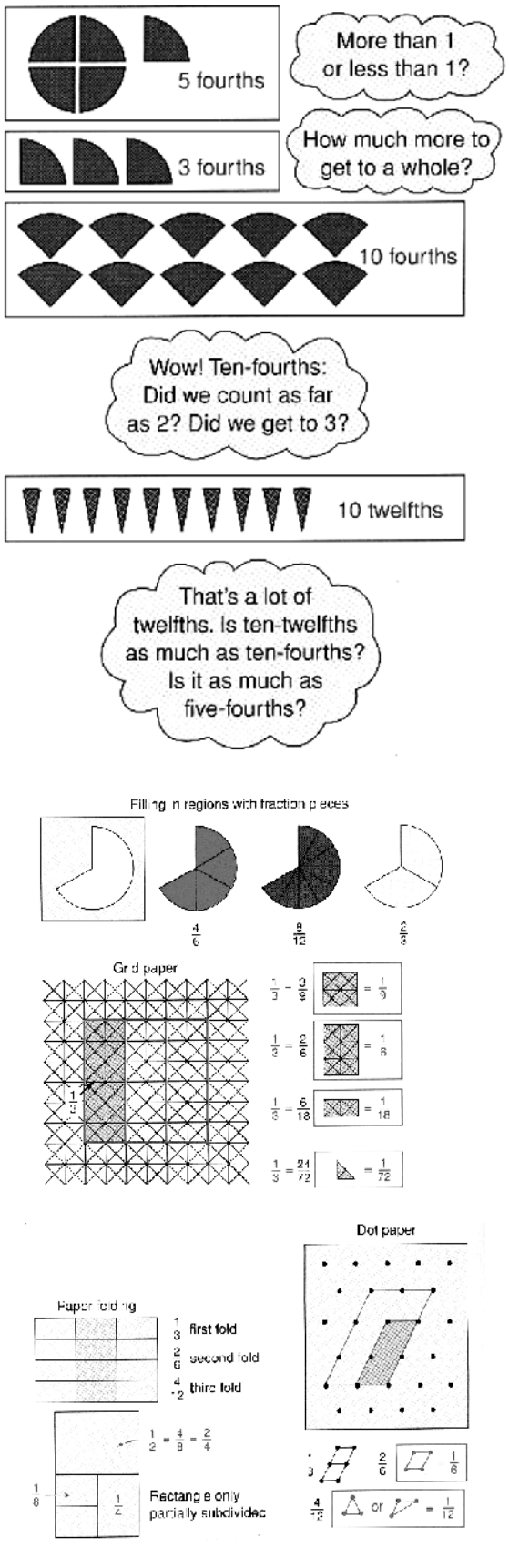


Figure 2. Samples of worksheet with conceptual focus.

Research tells us that practice of this type leads to a flexible and reflective "number sense" with fractions that should enable students to compare fractions by using mental computations/models without having to find a common denominator or cross-multiplying. By practicing with these models, students develop fluency in thinking about the relative size of various fractions and have opportunities to apply concepts such as equivalence to tasks such as writing fractions in simplest terms. Both research and common sense say that students similarly need opportunities to practice modelling the meaning of the basic operations using everyday problems and concepts (such as sharing cookies, eating pizza, distributing time to chores, or mixing lemonade powder). By having opportunities to connect models to whole-number computation before being introduced to algorithms like the common-denominator approach when the standard "rules" are presented, they have context and purpose.

This kind of conceptually-based practice is intended to increase a student's comfort level (an amalgam of confidence and competence) because it is built on understanding. When this student is confronted by a division of fractions question on a test, her response is not immediately to perform an algorithm in a monkey-see-monkey-do-like fashion, but to think, estimate, and reflect on her answer using the growing repertoire of strategies she has accrued over time.

Cognitive scientists tell us that this type of practice works because it is based on the notion that when learners have multiple first-hand experiences and mental representations that are connected to internalized pieces of knowledge, they are more likely both to understand a concept deeply and access it during a novel problem-solving situation. These same scientists argue that the purpose of practice is to advance learning with understanding, a more powerful and flexible ability than simple memorization since alternative mental representations and organization appears to improve retention and accessibility, both of which lead to more "correct solutions".

Assuming this definition, the-opposite-to-open-problem-solving end of balance in mathematics means that a mathematical idea is worked on over time until children have achieved efficiency, accuracy, and flexibility. If it is, that understanding should last a few hundred years – at least if you believe, as I do, that the Rock at Digby is a concretization of the power of balance and its staying-power. ▲

▲ The New Ontario Mathematics Curriculum Induced Calculus Course at the University of Guelph



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As with, I hope, every other Ontario University and Community College, the University of Guelph is modifying the curricula of its first year courses so that they mesh well with the new Ontario Secondary School Curriculum. My colleagues in other departments inform me that, for the most part, their high school content has survived relatively intact, save for changes in order or emphasis. For example, two years of physics is still two years of physics.[1]

We in mathematics face a serious challenge. Substantial omissions in the new curriculum from the outgoing courses as well as changes in emphasis necessitated major revision and restructuring of our honours first year calculus stream. We have three streams of calculus: *Elements of Calculus*, *Introductory Calculus*, and *Calculus*. The first emphasizes technique and intuition, and focusses on applications from the Biological Sciences. The second covers the content of the outgoing OAC Calculus, but has more depth and many extensions. The last, *Calculus*, is designed for mathematics and statistics majors as well as students in disciplines such as physics and chemistry. In this course, we concentrate on method (how to do the problems), motivation (look at the picture to see what's going on), and proof (proof!).

Elements of Calculus and *Introductory Calculus* have survived relatively intact. How are the omissions handled? The sin(A + B) expansion, for example, will be motivated by example and the derivative of sin(x) = cos(x) by judicious use of slopes of tangents. However, the Calculus course in semesters one and two has been redesigned to fill the gaps and yet retain its essential content. The intent is twofold. First, properly recognize and address the preparation level of the incoming students. Second, deliver into semester three students equal in preparation, both in terms of content and maturity, to their predecessors!

What Had To Be Added In?

1) The trigonometric functions are covered in grade 11 to the extent that students can graph $y = a \sin(bx + c) + d$ and $y = a \cos(bx + c) + d$ as well as $y = \tan(x)$. There is no trigonometry in grade 12. That means that we needed to include the development of the reciprocal trigonometric functions, as well as the compound angle formulas and essential trigonometric limits in order to cover the derivatives of the trigonometric functions.
2) Neither Riemann sums nor integration appear in the high school calculus course. Therefore, we needed to spend more time on Riemann sums, basic anti-derivatives, the substitution rule (extensive examples deferred to the second semester), and applications to area.

Apart from these two major considerations, there are many algebraic skills that we will teach and reinforce by careful choice of examples. For example, while students will know how to factor $a^2 - b^2$, it may be an extension for them to use difference of squares and rationalization to find the derivative of $y = x^{\frac{1}{2}}$. Factoring $a^n \pm b^n$, while never easy for many first year students, will be even more of a problem.

Realistically, we all know that many skills taught in the existing outgoing high school curriculum were not well retained by many students entering university. (The same can be said for some students from grade x entering grade x + 1.) Algebraic manipulation has always been a problem. I suspect that this will continue to cause problems, perhaps more. The plan is to note with care, as we teach the first year calculus courses in 2003 and

[1]However, the physics folks have a problem. They always use integration for applications such as work and fluid flow near the beginning of the first semester. They tell their students, "We know you won't see this in your math class till much later in the semester, but you remember from high school..." Now, they are in a fix!

beyond, what skills are lacking. Having done so, we can effectively teach these skills by constructing examples that illustrate and reinforce them in the course of developing the day's topic.

Apart from content, there is concern about the mathematical and emotional maturity of the students. With the former, can students handle certain levels of abstraction with one less year of mathematical experience? As to emotional maturity, will the students be ready for the freedom and the associated responsibility that comes with university? My answer is to both of these worries: it's too early to say. But...

Regarding emotional maturity, every grade 13 class I taught in my years at Parkside High School in Dundas (yes, I predate OAC!) was as a whole as mature as my first year classes at the University of Guelph. Remember, Ontario is the exception across most of this continent. Most university bound students head to campus after grade 12.

As to mathematical maturity, *at least in the honours calculus stream*, we are dealing predominantly with the mathematically successful so mathematical experience, I believe, will be only marginally more of a problem than it has been in the past. In fact, the problems in my first year classes with *understanding* the material have been minimal! The difficulties are almost always rooted in the lack of underlying skills and relevant facts in the students' problem solving inventory. This may be more of a problem in the other two streams. However, for all concerned...

We will create on-line special resources. Here is an example:

> *"For next class, you will need to know the trigonometric ratios for* $\frac{\pi}{4}, \frac{\pi}{3}$, and $\frac{\pi}{6}$. *If you need to review these, complete unit xx on the Calculus preparation site BEFORE next class."*

The unit will take a student between 10 and 20 minutes to complete. It will develop the essential ideas – *and this is KEY* – without extension. The idea is to review and reinforce the core topic so that the students can participate actively in the next class, but not overwhelm them with detail.

By the way, the Grand Valley Mathematics Association (GVMA) is sponsoring the publication of these units, to be called, *A Survival Guide for Ontario First Year Calculus Students*. The on-line units may also be made available on the GVMA website as they are created. We shall see.

Here are topics that are either new to our first semester curriculum, marked by *, or whose coverage has been allocated more time:

- compound angle formulas for trigonometric functions*
- reciprocal trigonometric functions*
- $\lim_{h\to 0}\frac{\sin(h)}{h} = 1$*
- Derivation of the trigonometric derivatives (I always shiver with discomfort when I use the expression "derivation of a derivative"!)*
- Riemann sums
- Definition of the definite integral
- Applications to area problems
- The Fundamental Theorem of Calculus
- Anti-derivatives, including a brief introduction to the substitution rule

Here is how we pared the first semester sequence to accommodate these additions:

- Reduced time for related rates
- Reduced time for applications of the differential
- Omitted applications of the exponential and logarithm functions to growth and decay problems
- Deferred extensive practice on integration by substitution to the second semester

In the *Calculus II* course, we have added work on the substitution rule. We have omitted from polar coordinates alternate equations, intersection and area problems. We have cut back the introduction to calculus of more than one variable to brief discussions of domain, range, and partial derivatives. There are other topics listed as optional which will be included if time permits.

Now, to end, I present for your consideration our proposed sequence for *(Honours) Calculus*, semesters I and II. This is meant to be a work in progress. We will certainly have improvements to implement for September, 2004. In the meantime, I invite your constructive criticisms. I will also write a progress report for the June, 2004 *Gazette*, the new editor and reviewers of this journal permitting.

MATH 1200 OUTLINE, FALL 2003

TOPIC / # LECTURES	DETAILS
Trigonometry / 2	• Graphs of the six trigonometric functions • Compound angle formulas
Exponents and Logarithms / 2	• Definition, domain, range, and graphs of $y = a^x$, $y = \log_a(x)$ • $y = e^x$, $y = \ln(x)$ • Change of base formula • Properties of Exponents and Logarithms
Intuitive Limits / 2	• Straightforward evaluation • "0/0" • Limits at infinity • Limits as x approaches infinity • Discussion of vertical and horizontal asymptotes
Formal Definition of a Limit / 4	• Formal definition of a limit • $\in / \delta$ proofs, linear case $\left(\text{eg., } \lim_{x\to 3}(3x-7)=2\right)$ • Limits with constraints $\left(\text{eg., } \lim_{x\to 3}(x^2)=9\right)$ • The Squeeze Theorem • Special examples such as $\lim_{x\to 0}\left(x\sin\left(\frac{1}{x}\right)\right)=0$ and $\lim_{\theta\to 0}\frac{\sin(\theta)}{\theta}=1$ • Limit theorems (This section will incorporate inequality and absolute value questions formerly covered in the first lectures.) • Formal definition and examples of limits involving infinity
Continuity / 2	• Definition of continuity at a point, on open and closed intervals • Continuity theorems including careful discussion of composition; i.e., when does $\lim_{x\to a} f(g(x)) = f(\lim_{x\to a} g(x))$? • The Extreme Value Theorem • The Intermediate Value Theorem
Differentiation / 2	• Average rate of change • The difference quotient; instantaneous rate of change • Formal definition of the derivative • The definition of the tangent line to a curve as the limit of secants • Finding tangent and normal lines
Derivative Formulas / 3	• The derivative of $y = x^n$ (Prove the formula for natural numbers, and extend by example to real numbers $n \neq -1$) • Derivatives of simple polynomials • Sum, Difference, Product, Quotient, and Chain Rules
More Differentiation / 1	• Implicit Differentiation • Higher order derivatives
Applications of the Derivative Formulas / 1	• Distance/velocity/acceleration • Related rates *(Optional)*
The Differential / 1	• Definition and geometric interpretation of the differential • Approximating functions using the differential
More Applications / 3	• Fermat's Theorem • Rolle's Theorem • The Mean Value Theorem • Applications to optimization problems • The second derivative test
Graphing / 2	• Graphing WITHOUT calculus • Detailed graphing with calculus
Calculus and Trigonometry / 1	• Derivatives of trigonometric functions
Exponential and Logarithmic functions / 2	• Derivatives of logs and exponential functions, emphasizing bases e and 10 • Logarithmic differentiation
Indefinite Integral / 1	• Straightforward examples of the indefinite integral $\left(\text{eg., } \int \sin(3x+1)dx, \int \frac{x}{x+5}dx, \int e^{5x}dx\right)$
Definite Integral / 2	• The Riemann Integral • Riemann sums applied to simple area problems, e.g., the area bounded by $y = x^2$, $y = 0$, $x = 0$, $x = 2$
The Fundamental Theorem of Calculus / 1	• Proof of the Fundamental Theorem of Calculus • Application to definite integrals, area problems (both using dy and dx) • Derivative of an integral
The Substitution Rule for Integration / 2	• The substitution rule $\left(\int f'(u)\frac{du}{dx}dx = f(u)+C\right)$
Total: 34	

PROPOSED OUTLINE FOR MATH 1210, WINTER 2004

TOPIC / # LECTURES	DETAILS
Inverse Functions / 1	• One-to-one functions • Finding inverses algebraically • Finding inverses by reflecting in $y = x$ • Finding inverses by "flipping and rotating" • The reciprocal relationship between the derivative of a function and its inverse
The Inverse Trig Functions / 4	• Restricted domains • Defining the six inverse trigonometric functions • Derivatives • Integrals yielding inverse trigonometric functions
Hyperbolic Functions / 2	•Definition in terms of exponential functions • Relationship to the hyperbola $x^2 - y^2 = 1$ • The "circular" functions versus the "hyperbolic functions" • Formulas involving hyperbolic functions (including Left Side/Right Side proofs) • Derivatives and integrals of hyperbolic functions
Inverse Hyperbolic Functions / 2	• Definitions • Deriving "ln" formulas for inverse hyperbolic functions • Derivatives • Using the derivatives as an alternate method of deriving the ln formulas for the inverse hyperbolic functions • Integrals yielding inverse hyperbolic functions
L'Hôpital's Rule / 3	• Indeterminate forms $\left(\frac{0}{0}, \frac{\infty}{\infty}, 0^1, 1^\infty, \infty-\infty, \text{etc.}\right)$ • Proofs of Cauchy's Mean Value Theorem and L'Hôpital's Rule
Techniques of Integration I / 1	• Basic formulas, substitution $\left(\text{eg., } \int \frac{xdx}{\sqrt{5x+2}}\right)$ • "Chain Rule in Reverse": $\int f'(u)\frac{du}{dx}dx = f(u)+C$
Techniques of Integration II / 2	• Integration by parts, including application to examples such as $\int e^x \sin(x)dx, \int x^n e^x dx, \int \sec^3(x)dx$

TOPIC / # LECTURES	DETAILS
Techniques of Integration III / 1	• Products of trigonometric functions
Techniques of Integration IV / 2	• Integration by trigonometric substitution
Techniques of Integration V / 2	• Integration of Rational Functions by Partial Fractions • Linear factors • Irreducible quadratics
Techniques of Integration VI / 1	• Improper Integrals
Applications of Integration / 4	• Arc length • Volume of a solid with known cross sections • Volumes of solid of revolution (disc, washers, and shells) • Area of a surface of revolution *(Optional)*
Parametric Equations / 3	• Definition, domain and range • $\frac{dy}{dx}, \frac{d^ny}{dx^n}$ • The cycloid: definition, graph, area and length *(Optional)* • Graphing parametric equations
Polar Coordinates / 2	• Definition as a special case of parametric equations ($x = r(\theta)\cos(\theta)$, $y = r(\theta)\sin(\theta)$) • Relation to rectangular coordinates • $\frac{dy}{dx}$ and interpretation of $\frac{dy}{dx}$ at the pole • Basic polar graphs (circles, three and four leaf roses, cardioids, lemniscates)
Taylor Series Polynomials / 3	• Taylor and MacLaurin Series for functions such as $y = \sin(x)$, $y = e^x$, $y = \tan(x)$ • Taylor polynomials with remainder *(Optional)* • Taylor's Inequality *(Optional)* $\lvert R_n(x)\rvert \le \frac{M}{(n+1)!}\lvert x-a\rvert^{n+1}$
Functions of Several Variables / 3	• Examples, domain, range • Partial derivatives • Double integrals *(Optional)*
Total: 36	

▲

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▲ OAME/NCTM September 2002 Report



FRANCES SCHATZ

NCTM Products and Publications

During the last four years as your NCTM representative, I have ensured that the OAME-NCTM book display at Ontario conferences, workshops, and meetings has included at least one copy of the popular publications and favourite products. On June 1, 2002, major changes were announced about the consignment/purchase of NCTM materials by affiliates. Since sales at the Barrie conference totalled $1800 CAD (about $250 went towards OAME affiliation fee), and Ontario mathematics teachers do obtain NCTM materials through their Ontario representative, the OAME board voted at the June meeting to continue having NCTM materials available in Ontario. These materials used to be on consignment with NCTM; OAME now owns all books/products we have available.

I can provide a list of products/publications on hand with the Canadian price (at time of purchase). That price includes the 12.5% NCTM charges Canadian affiliates for GST and handling. I will have to add a percentage to the price for shipping costs; however, the 20% NCTM member discount will also be available. If you would like to receive a copy of the list, please write or e-mail me at the address given above and I will reply with a copy. This will be a great opportunity for teachers, schools, or boards to add these treasures to their collections. If I do not have an item you desire, a deposit and a few weeks' wait will get the materials to you.

Affiliation Dues: What Does NCTM Do for OAME?

OAME pays $200 US partner affiliation fees annually.

- OAME benefits from the opportunity to apply for grants. Recently, a project received $1500 US to help with the publication costs of a *Linking*

Assessment and Instruction in Mathematics document.
- NCTM advertises our conferences and our subject association on their web site, www.nctm.org.
- NCTM provides access to information about other affiliates and their journal editors.
- If a new NCTM member identifies the affiliate such as OAME, then the affiliate receives a $5 US rebate per new member.

NCTM Annual Meeting Report to OAME

The 53rd Delegate Assembly was held at the NCTM Annual Conference in Las Vegas, Nevada, in April. Canadian affiliates met on the Sunday afternoon to discuss resolutions that were coming up at the Delegate Assembly on Monday morning and to meet and talk with representatives from NCTM. Joanne Graham and Irene McEvoy, both OAME board members, joined me at the meetings.

Affiliate resolutions are recommendations on Council practices or policies related to mathematics education, membership, or organizational procedures. The Council greatly values the input from its affiliates and the teachers that they represent.

The following resolutions were submitted and either passed by the Delegate Assembly or referred directly to a committee for action:

- Resolution O.R.02.01 (substitute and passed)
  Be it resolved that the Board of Directors instruct the Conference Services Committee that the per person cost of registration for the Annual Meeting be increased X number of dollars so that one speaker per session will have the registration fee waived. (unanimous)
- Resolution O.NR.02.01 (submitted by the Manitoba Association of Mathematics Teachers and supported by all Canadian affiliates present during the Canadian caucus meeeting and passed)
  Be it resolved that the Board of Directors improve the delivery of all NCTM mailings to help ensure the timely delivery of items such as conference packets and journals. (unanimous)
- Resolution O.NR.02.03 (submitted and passed)
  Be it resolved that the opening day for making sleeping room reservations for the Annual Meeting occur approximately three weeks after the planned mailing date of the conference brochure. (75 for, 29 against)

At this year's conference, NCTM premiered a new logo for the 21st century. The new logo combines a stylized human character – symbolizing diversity and equity – with suggestions of the mathematical symbols of infinity, a multiplication sign, and a Möbius strip.

Student Math Notes

These are currently on-line and I have copies available if you are unable to download them. Starting in September, the *Student Math Notes* will return to the NCTM's *News Bulletin* as an insert.

MET Awards, Grants, and Scholarships

MET is now accepting applications for the NCTM Life-Time Achievement Awards. For more information, go to www.nctm.org/about/MET and click on the grant or award name to see the guidelines. Most of these are available to Canadians. Mary Bourassa and Louis Lim are two NCTM members who have benefited from the FLAMeS award to attend an annual NCTM conference.

Changes to NCTM Membership: June 1, 2002

- Multi-year Membership Plan
  Individuals electing to join or renewing their membership for multiple years will now enjoy a discount on the regular cost of membership. (One journal plus postage with 25% cap on the US exchange for Canadian members is now $107.50 CAD). Members who pay for two years will receive a 10% discount and members who pay for three years will receive a 15% discount. Student and retirees are not allowed multi-year discounts.
- Retiree Membership
  There is no change re membership for persons already paying this membership. All new applicants for this membership category must have been members of NCTM for at least 15 years and be at least 62 years of age. If a retiree wishes to receive a journal, individual membership is the way to go, not retiree. Retiree membership gives access to e-resources, subscription to the *News Bulletin*, and member discount on books and products plus reduced rates to regional and annual conferences (but no journal).

For more information about NCTM membership, please visit www.nctm.org/membership/3-benefits.htm. Remember that the cap on exchange rate is 25% regarding membership. Pay using a Canadian funds cheque (US dollars times 1.25).

Frances Schatz, NCTM Representative to OAME ▲

▲ Directors' Dialogue



MARILYN HURRELL, NWOAME
THUNDER BAY, ON

This edition of *Directors' Dialogue* highlights the June 21 and 22, 2002 OAME Board of Directors' meeting at the Four Points Hotel in Mississauga. Under the leadership of OAME President Marg Warren and Executive Directors Dave and Sue Hessey, the meeting format has changed to maximize productivity. Each board member now participates in a Working Committee (K–6, 7–8, 9–10, 11C, 11U/C) as well as a Standing Committee (Publication, Futures, Promotions, Equity, Constitution, Chapter Reps). This *Directors' Dialogue* is reported in four parts: (i) Working Committees; (ii) Standing Committees; (iii) Written Reports, and (iv) Chapter Reports.

I. WORKING COMMITTEES

OAME Vision Committee Meeting

The OAME Vision Committee is made up of the President, Past President, President-Elect, three Vice Presidents, and the Executive Directors. Its purpose is to identify and oversee the implementation of OAME's vision. All Executive members will oversee one or more of the Project work groups to create a collective product consisting of modules to communicate that vision to mathematics educators in Ontario: classroom-ready activities with student and teacher pages with exemplars; a professional development package with resources, and a video of a child starting in a primary math class showing the continuum and common messages of mathematics, and what a math class looks, feels, and sounds, passing through various divisions up to grade 12. This modular project is a two-year plan.

OAME Forum Discussion

The OAME Forum Meeting was introduced at the October, 2001 Board Meeting. Discussions take place both Friday evening and Saturday morning. The theme of this Forum Meeting was, "What is OAME's Vision for Mathematics Education?" Discussions took place in the working committees answering, "What does effective teaching and learning look and sound like in the classroom?," "What do teachers need to learn and experience to understand and implement effective mathematics teaching?," "What resources do teachers need to be effective math teachers?," and "What components should there be in a classroom-ready task?" Each committee then shared its list with the board, and many common themes emerged.

Project Committee Reports

For the upcoming October 4, 2002 board meeting, the following tasks will be brought:

- **JK–6:** Each member will bring two tasks that exemplify problem solving that allow for multiple solutions, are accessible to all, use manipulatives, and are expectations-based.
- **7–8:** (i) sum of the angles of a triangle using paper folding and the *Geometer's Sketchpad*; (ii) a carousel of patterning tasks leading to a general term
- **9–10:** Not available.
- **11C:** rewrite tasks for (i) making decisions about buying/leasing a car (Summative Assessment); (ii) finance project: Designing a budget (Learning Task)
- **11U/C:** rewrite tasks for (i) Hula Hoop Walk to discover periodic properties; (ii) tools for operating and communicating using functions

II. STANDING COMMITTEES

- **Futures:** Heather Boychuk reported that the committee will approach and confirm chapters for OAME'2006 and OMO'2004, with discussion on structural changes for future conferences.
- **Promotions:** Good Cooke submitted a budget request to support promotions projects related to the video project and for purchasing replacement items as stock is reduced.
- **Publication:** Shirley Dalrymple asked for suggestions of ongoing support for the *Gazette*, *Abacus*, and the OAME web site. Louis Lim reported that he has added 11 new reviewers to the growing list (contact Louis if you are interested in this task). Louis formally resigned as *Gazette* Editor, effective June, 2003. Frances Schatz gave notice that she will resign as *Abacus* Editor, effective June, 2004. Contact the Executive Directors if you/ you know of someone who might take on these important positions.
- **Equity:** The speaker for the Breakfast equity is being planned for OAME'2003 in Durham.

- **Constitution:** Dave Hessey reported that the committee will clarify what happens when an executive or board member retires before the end of his/her term; procedures for conducting elections when nominations are not found for all positions; consider the issue of proportional membership by region, panel, etc., and clarify rules around staggering terms for Vice-Presidents.
- **Awards:** Stewart Craven reported that the Don Attridge award has been renamed "Award for Exceptional and Creative Teaching in Secondary Mathematics"; the Mona McGregor Award is renamed "Award for Outstanding Contribution to OAME/AOEM and Mathematics Education in Ontario", and the Morley McGregor Award has been renamed, "Award for Exceptional and Creative Teaching in Elementary Mathematics".

III. WRITTEN REPORTS

- **President's Report:** Marg Warren presented a Board Mission visual, "Renovating: Getting Us All on the Same Page". She looks forward in continuing the vision begun last year of restructuring board meetings and addressing the needs of mathematics educators in Ontario.
- **Fields Institute:** Shirley Dalrymple reminded us that the Fields Institute, in its 10th year, is a world-class centre for mathematics research, and OAME is fortunate to have representation. This summer, the Fields Institute will support the *Fathom* Summer Institutes throughout the province as well as having a task force address on-line learning in mathematics.
- **Ministry of Education and Training:** Shirley Dalrymple reported that the Ministry of Education and Training provided financial support and guidance for grade 12 implementation (see the OAME web site at www.oame.on.ca). OTF Summer Institutes were cancelled. Elementary curriculum units for grades 1-8 mathematics have been sent to schools, through a CD consisting of 81 units for single and combined grades in four subject areas. Grade 11 exemplars will be scored in July and grade 12 exemplars will be created in August.
- **Executive Directors' Report:** Dave and Sue Hessey reported that the OAME Membership is up 206 to 1266 as of June 11. There are new chapter reps for ISOMA, CHAMP, SWOAME, and COMA. Memo pads promoting OAME are now available. Good use was made of the digital camera at the OAME'2002 provincial conference in Barrie. Discussion with Union Gas of a possible substantial grant ($30 000 - $50 000 per year for two years) to support mathematics education in Ontario is currently being discussed.
- NCTM: Frances Schatz will continue to purchase and display NCTM materials at conferences and meetings. Purchasing from Frances, our NCTM representative, will bring some revenue to OAME. Frances formally resigned from her NCTM representative position, effective June, 2004.

IV. CHAPTER REPORTS

CHAMP: Rep Lindy Smith. Membership stands at 157 plus 67 school memberships. Plans for 2002/2003 include a fall conference on October 24; November CHAMP Contests; Spring 2003 Event, and Ontario Mathematics Olympics (OMO) Preparation.

COMA: Rep Peter Lenczewski. COMA sent two teams to the OMO, selected from 58 teams in their chapter Olympics. Two forums were held in the spring focussing on the double cohort year as well as implementating the new Data Management and Advanced Functions and Introductory Calculus courses.

GOLDEN: Rep Ed Haines. Golden (Niagara Peninsula) plans to hold a mini-conference in the fall. The chapter is building a database of e-mail addresses to keep members informed of its activities and to post news from OAME.

GVMA: Rep Paul Fennell. Their fall conference is scheduled for November 7, 2002. The GVMA chapter will host the OAME Annual Conference in 2004, with co-chairs Dean Murray and Paul Fennell.

ISOMA: Rep Brian Raaflaub. A fall conference is tentatively planned at Appleby College for Wednesday, November 6. ISOMA held an OMO preparation competition with the University of Toronto Schools team proceeding to the OMO. ISOMA is overhauling its e-mail communication system to keep its members informed on new issues in mathematics education.

MAC²: Rep Jon Rae. The focus this year was organizing the OAME'2002 provincial conference. The chapter plans to focus on preparing and sending teams to the OMO'2003, hosted by the WOMA chapter.

NOMA: Rep Pauline Therrien. Two mini-workshops held in the spring focused on "Balancing Instruction in

Problem Solving, Skill Development, and Communication" and "Exploring the Differences: Grade 12 vs. OAC Courses". A fall conference is planned in Sudbury for October 18 and 19 with an expected 200 delegates. NOMA plans to send a team to OMO in 2003.

NWOAME: Rep Rona Doyle. Their OMO preparation was held on April 27 at Confederation College with 160 students from the region. One team was sent to the OMO at York University. Lakehead University is launching its own contests next spring and has sought the help of NWOAME.

PINE RIDGE: Rep Jacqueline Hill. Jacqueline Hill and Charles Wyzkowski are co-chairing the OAME'2003 provincial conference at Durham College May 8–10. A successful dinner lude math conference was held in April with 75 participants attending. PRMA plans a membership drive for the upcoming year.

QSLMA: Rep Robert Sherk. A successful spring mini-conference was held on April 25 with 60 people attending. A fall conference is planned. QSLMA has developed an extensive e-mail list to keep its members updated.

SAME: No report.

SWOAME: Rep David Petro. Teams were not sent to the OMO competitions due to withdrawal of extra-curricular activities. SWOAME members met with reps of post secondary institutions to discuss the implications of the double cohort year. Dr. Pat Rogers, dean of the faculty of education at the University of Windsor, addressed the group. SWOAME plans to hold a mini-conference in the fall, undertake a drive to increase membership, fund a bursary for an outstanding mathematics student, and sponsor one SWOAME member to the Leadership conference in February, 2003.

TEAMS: Rep Pat Margerm. TEAMS hosted the OMO'2002 event under the leadership of Stewart Craven and Anthony Azzopardi. Twenty teams competed in paper-and-pencil tasks, *Geometer's Sketchpad* and *Calculator-Based Ranger* challenges, and a manipulative challenge based on viewing multi-link cube structures in perspective. TEAMS will hold a mini-conference and send teams to next year's OMO, while also preparing to host the OAME'2005 provincial conference.

WOMA: Rep John Ferguson. WOMA held a successful "Survivor 2002" conference in April. Enrichment, under the leadership of Tom Griffiths, continues to flourish. One of his students will attend the International Math Olympics in Glasgow, Scotland. WOMA will host the OMO'2003, chaired by Tom and Marlene Griffiths. George Gadanidis from the University of Western Ontario is having his students gather exceptional teaching ideas while on practicum. These will be shared on the WOMA web site.

Y^{4}MA: Rep Rosey Mastrofrancesco. Two teams were sent to the OMO'2002. A name is selected each month from the pool of new members, and that person receives a small prize. The chapter is also trying to expand its membership. A fall conference will be held at Earl Haig Secondary School on October 17, 2002 with the theme, "Mathematics for Everyone".

CLOSING REMARKS

It is an exciting time to be/become involved with OAME at the chapter level and at the provincial level. The New Vision concept will inject new ideas and support the teaching of mathematics. Bring a friend to the next mini-conference in your area!

Marilyn Hurrell ▲

Call for Gazette Editor

The Ontario Mathematics Gazette is taking applications for a two-year term as editor commencing with the September 2003 issue.

If you are interested, or would like to recommend a colleague for this position, please contact: Executive Directors, Dave and Sue Hessey