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▲ Editor's Message



MARILYN HURRELL, EDITOR

March 2004 brings two ideas to mind. First, March is the month that contains "Pi Day" and second, 2004 is a leap year. Both ideas are food for some interesting mathematics in the classroom. I went on line and found information. If you just search for "PI" there are about 16 000 pages of information, but if you search for "Pi Day" some really neat web sites appear, complete with Science and Math Lesson Plans and Worksheets. I found some poems written about Pi and a Pi Day scavenger hunt. Did you know that Einstein was born on March 14 1879? And of course, a Pi Activity Day has to end with a piece if pie. Leap Year can lead to a discussion of how a "year" was defined and how various calendars were developed. In the February 2004 issue of the NCTM *Mathematics Teacher*, (p. 87) a method is developed for including Leap Year in the traditional Birthday Problem A Leap Year is divisible by 4 but why was 2000 a Leap Year and 1900 was not?

Perhaps you will read this Editorial after March 14 2004, but tuck these ideas away for use next year, or in four more years.

We welcome **Louis Lim** back to the pages of the *Gazette* as author of an article *"Implementing Journal Writing in Grade 9 Applied Mathematics"*. Use this idea in your classroom now or put it in a safe spot for use next September. **Chris Suurtamm**, whose column *Assessment Corner* appears in every second issue, writes on a similar topic and describes several different types of assessment portfolios;.clearly these are ideas worth trying. **Joel Yahn** of Statistics Canada begins a new column in this issue. This column will feature ideas on how to use StatCan materials in your classroom. This first column focuses on the Grade 12 MDM4U course. Ron Lancaster welcomes a guest photographer to his Photo Math column, none other than former OAME President **Peter Saarimaki**. Lynda Colgan's column, *"Our Most Important Garden"* and the article *"Activities With a Daily Estimation Jar"* both focus on Kindergarten.

Are you a budding author? Or have a great classroom lesson you want to share or just a "good idea" that you are not sure how to get down on paper? Do you need to find out how to submit articles for possible publication in the *Ontario Mathematics Gazette*? I will be at the OAME Annual Conference at Waterloo April 28 - May 1 2004 and hope to meet with readers of the *OMG*. Look for me close to the OAME booth.

Marilyn Hurrell

▲ Upcoming Events

For further information please contact the Chapter Representative for OAME Chapter Conferences, and Frances Schatz, OAME's NCTM representative for NCTM conferences.

See the last page in this *Gazette* for contact information.

OAME Chapter Conferences and Events

March 25 2004	Lindsay ON	PRMA Mini Conference
April 1 2004	Fanshawe College	WOMA: "Foolproof"
April 4 2004	Albert Campbell CI	SAME: "Spring into Spring"
Early April 2004	Brock University	GOLDEN Spring Conference
Early April 2004	Ottawa	COMA Forums
April 2004	St Andrew's College	ISOMA Middleschool Math Olympiad
April 22	St Peter's High School Barrie ON	MAC^2 Spring Mini Conference
June 18 and 19 2004	Durham College	OMO 2004 Hosted by PRMA

OAME Annual Conference:

April 28 - May 1 2004	University of Waterloo	31st OAME Annual Conference Hosted by GVMA

NCTM Conferences

April 21 - 24 2004	Philadelphia, Pennsylvania	82nd Annual Conference
May 28 - 29 2004	Ottawa	NCTM Leadership Conference
April 6 - 9 2005	Anaheim, California	83rd Annual Conference

▲ President's Message ~ Seeing the World Through Our Students' Eyes



STEWART CRAVEN

As a teacher, I always felt that I had a good understanding about who my students were, at least in terms of what they liked doing. I also thought that I knew the kinds of things that would motivate my students to want to do mathematics. To this end, I created assignments that were based on subjects that I was sure would capture their imagination — subjects such as sports, forensics, food, hiking, JFK, and photography. While many students did find these topics intriguing, there is little doubt that I had failed to engage a large proportion of my students, perhaps even the majority of them, because I really couldn't see the world through their eyes.

This inability to see the world as students do resurfaced while I was enrolled in the course "Retooling the Learning Game: Educational Gaming and Play," at York University. Through this course, I began to get a sense of the scope of gaming culture among young people, particularly boys –– although it was recently broadcast that an estimated 39% of gamers are girls. I knew that gaming was popular, but I had no idea just how popular it was. (Far more money is currently spent in North America on video/computer gaming than on going to the cinema, for example.) I'm sure that many of my misconceptions about gaming have come from my own distaste for much of today's "popular culture." Yet, our students are the key target audience for the music, the movies, the television, and the games that form our popular culture. What does any of this have to do with teaching mathematics?

There are two critical areas to consider. The first is about the nature of the contexts in which we situate mathematical concepts and around which we build mathematical problems and investigations. The second is about our understanding of the environments in which students are most likely to learn.

Motivation is a critical issue in most mathematics

classes. As teachers, we try to set contexts for mathematics that will interest our students. By activating their interest, our students will engage in, and hence learn, what it is we are trying to teach. But context setting becomes more difficult as students progress through the grades, largely because students start to realize that the contexts presented to them are usually trivial or unrealistic and rarely represent situations that are intrinsically interesting or motivating. To solve this problem, I believe we must collaborate far more closely with our students so that we can find out what "turns them on" when we create problems or investigations for them to do. Better yet, we must find effective ways to create environments in which students can create their *own* stories and assignments and can pose and solve their *own* mathematics problems.

Secondly, we need to ask ourselves why young people become so easily engaged in computer/video games and how they accomplish the significant amounts of learning, in terms of both content and process that these games require. We cannot underestimate the impact that modern technologies are having on how all people relate to and learn about the world we live in. Although research in this area is in its infancy, we as teachers must pay attention to what is being discovered. If we do not, it is entirely possible that many of our students will see mathematics as irrelevant to who they are and what they will become.

Postscript

My term as president is quickly drawing to a close. It surprises me that in a relatively short period of time — less than a year — so many new and fascinating ideas have caught my attention. Many of these ideas have surfaced because I have been privileged to work with innovative mathematics teachers from across Ontario and Canada through my association with organizations like OAME and TEAMS. I have also been able to enjoy rich discussions about mathematics education with mathematics professors (CMESG and the Fields Institute), faculty of education professors (CMESG), college professors (OCMA), coordinators and consultants (OMCA), Ministry and EQAO officials, and my colleagues in the Toronto District School Board. It has been a year that has produced the Vision initiative, a new Gazette, a successful Leadership conference, and the genesis of a pan-Canadian association for mathematics teachers. I would like to thank everyone associated with OAME, but in particular, OAME executive and Sue and Dave Hessey for the tremendous support that they have extended to me this year. Finally, I would like to wish Gord Cooke the very best of success as he takes over as president of OAME. ▲



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▲ Letters to the Editor:

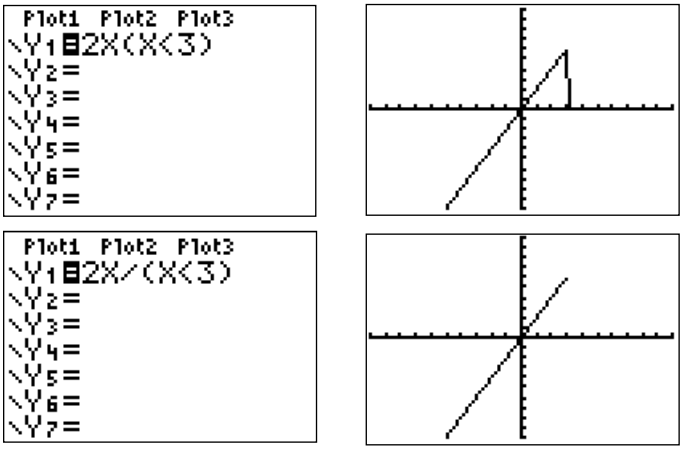
Dear Editor

I thought I would drop a note to say how much I enjoyed this recent issue. I also would like to commend all those who contribute on a regular basis! They may not realize how much of a positive impact their articles are having issue after issue.

In particular I enjoyed Fred Ferneyhough's recent column on saving graphs using the Graph Data Base feature. A great idea and time saver for teachers even if all they want to do is pull up a certain set of graphs to show the class.

I want to add one comment about piecewise functions. To avoid the annoying connecting line when the domain is false I have used division rather than multiplication. For example, on the calculator, rather than entering y=2x(x<3) which gives you y=0 when x<3 is false I enter y=2x/(x<3). This makes y undefined when x is greater than 3 and you do not have that connecting line down to 0. This is particularly helpful when illustrating discontinuous functions.

Screen shots below illustrate the differences.



Thanks for all your work!

Kevin Spry

▲

Dear Editor

I thought the *OMG* readership would be interested in how the new versus old math curriculum students fared in first year university calculus courses. Here is the University of Guelph experience.

In the September, 2002 *Gazette*, you will find my article, "The New Ontario Mathematics Curriculum Induced Calculus Course at the University of Guelph".

I put theory into practice this past fall. I taught the revised course to both cohorts. My students worked hard and effectively, and the sky did not fall. I had 850 students and the final average was 76.5%, with a failure rate of under 4%. Good for them. And thanks for preparing them so well!

I hope in a future *Gazette* to provide a comparison bar graph showing the new curriculum distribution of grades versus the old. Anecdotally, I can tell you that the differences do not seem significant. Why were these students successful? Their course filled in where necessary content (primarily trigonometry and integral calculus), examples for new topics were designed to have, built in, review of one or more high school topics (like completing the square), and we obsessed on "How to Get an 'A' in Math". (See the *OMG*, December, 2003.)

Jack Weiner
Associate Professor
Department of Mathematics and Statistics
University of Guelph

▲

▲ Discussing Mathematics and ENO

MARY STOREY

Mary Storey has taught for 35 years with the York Region District School Board. She has been a workshop and conference presenter, and is the recipient of a Descartes medal from the University of Waterloo and the Mona MacGregor Award from OAME. Presently, Mary is semi-retired and teaching on-line courses for teachers.

The Education Network of Ontario (ENO) now has 123 000 members. That means you can potentially discuss the teaching of mathematics with all of these teachers throughout the province.

Some recent discussions have included the following statements:

"In my element now, tutoring a grade 12 student in calculus. Why, oh why do we still do this? Is there no sense at all to spending a reasonable amount of time on more fundamental concepts, and giving calculus back to the universities? All would benefit, I think, in the long run."

*"Suppose that the questions are at a somewhat higher level. Let's say you are given the graph of sin(x) and the graph of exp(x) to stare at for a while. Now, **without using any software**, how simple would it be for you to sketch the graphs of exp(sin(x)) and sin(exp(x)), given the same information about relationships between elements of composite functions? [Assuming no prior familiarity.]"*

"My point is, I think, that as much as the above might cause us some difficulty, the same sort of questions are being asked of those who are just beginning (at an ever younger age), and who would encounter similar difficulties, I'd think. Again, why burden a study of the chain rule with concepts of inverse discrete functions? Both are legitimate studies, it's just the timing I question."

These are just samples of the daily discussions on the ENO web site.

The primary goal of The Educational Network of Ontario/Le Reseau educatif de l'Ontario (ENO/REO) is to enhance the school-based educator professionalism through electronic networking. To that end ENO/REO provides a wide range of telecommunication services for the JK-12/OAC education community in Ontario, including Internet access, member e-mail accounts, student and teacher education projects and a large number of online education conferences/newsgroups.

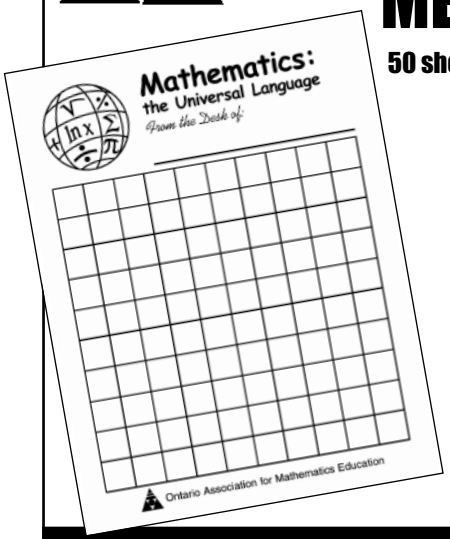
Of interest to all teachers throughout the province are discussions on such topics as standardized testing, report cards, rubrics, exemplars, and course profiles. Within these discussion groups teachers ask questions, pose problems and get solutions, share resources, compare situations with school districts, and notify others of upcoming events and conferences, etc. When you can discuss educational issues with all the teachers of the province, it is a very powerful learning tool.

The logistics of using the Education Network of Ontario are simply to visit their web site www.enoreo.on.ca to apply and get your password. All of the above teacher resources are then available to you.

See you online and participating in the Mathematics discussion forum. ▲

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▲ Technology Corner: Creating Normal Sets of Data

FRED FERNEYHOUGH



Fred Ferneyhough is Head of Mathematics at Harold M. Braithwaite SS in Brampton and is a 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.

In the data management course, a great deal of work is centred around the concept of normal sets of data. In teaching the course last year, I found that students were able to identify a number of applications where data was normally distributed (including their marks). It would be nice if we had the time to allow each student to develop or use their own data on all assessments, but that is not always practical. In order to work with these ideas, I found that the TI-83 Plus has a few features that allow us to create data sets that are normally distributed with any mean and standard deviation we choose.

Before doing anything with random numbers on the TI-83 Plus, it is necessary to seed the random number generator, particularly when you have students all working on generating sets of random numbers. Otherwise, you may find that each person gets the same set of numbers. Start this process by asking a student for part of a phone number. Enter this on the screen, followed by the STO▸ key.

```
MATH NUM CPX PRB
1:rand
2:nPr
3:nCr
4:!
5:randInt(
6:randNorm(
7:randBin(
```

Press the MATH key and move over to the PRB menu. Press ENTER .This will insert the "rand" command on the home screen. Press ENTER again. The random number generator is now seeded.

```
2498→rand
                2498
```

Now, access the same menu, but use the sixth option "randNorm".

```
MATH NUM CPX PRB
1:rand
2:nPr
3:nCr
4:!
5:randInt(
6:randNorm(
7:randBin(
```

I often use the Catalog Help application to remind myself of the syntax of commands. I have the application running in the background so that, each time I need assistance, I simply press the + key while I'm in a menu and I get the syntax that I need. This shows that I can enter values for the mean and standard deviation with as many pieces of data as I want.

```
randNorm(
(μ,σ[,numtrials]
)
                PASTE ESC
```

Press ENTER and the command is pasted into the home screen. In this example, I have chosen a mean of 42, a standard deviation of 15 and I have asked for 125 values. At the same time, I have stored the values in List 1. Using this approach, I now have a set of data that is normally distributed. Hopefully, these are not the final results in my class! Using this process, I can create a set of data values for an assessment and store it in List 1. All that I have to do in class is have my students transfer the data to their calculators and everyone has a common set of data to use.

```
2498→rand
                2498
randNorm(42,15,1
25)→L1
{45.3819463 68.…
```

```
1-Var Stats
 x̄=42.4872
 Σx=5310.9
 Σx²=239849.11
 Sx=10.70266756
 σx=10.65977092
↓n=125
```

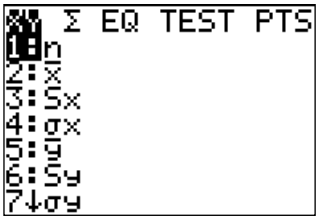
Bell Curving Marks

Students at Statsville Secondary School know that their Data Management teacher will never "bell curve" their marks, but they would like to know how it's done. To demonstrate this idea, I stored the data in L1 and, after distributing the data to the class, I had students determine the mean and standard deviation using the one variable statistics feature.

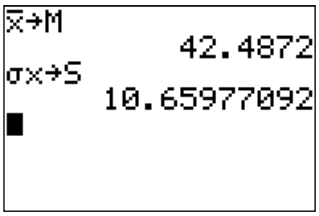
A little known feature of the device is that all values that are calculated are stored in variables that the user can access. Press the VARS key and select option **5: Statistics**.

```
VARS Y-VARS
1:Window…
2:Zoom…
3:GDB…
4:Picture…
5:Statistics…
6:Table…
7:String…
```

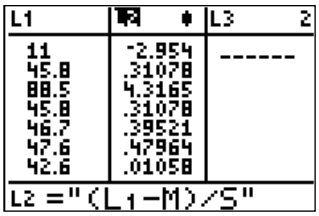
This will open up a new window as shown to the right. The first column contains the results from the calculations of one-variable statistics and some of the two-variable statistics. We need the mean ($\bar{x}$) and standard deviation (σ) found in options 2 and 4 respectively.



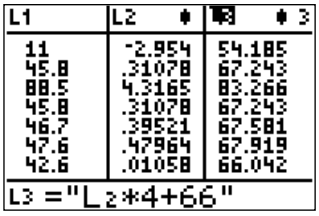
As you press ENTER, the quantity is pasted into the home screen and can be assigned to a variable of your choosing. From this screen it can be seen that the mean has been stored into variable M and the standard deviation into variable S.



The test results were dismal except for Nicki who got an 88.5. In List 2, we will calculate the Z-scores of each student. The formula for a z-score is $z = \frac{x - \mu}{\sigma}$.



Notice Nicki's mark in row 3. Her z-score is 4.3165 indicating that she is close to 4 standard deviations above average. The weakest student in the class has a mark of 11 and a z-score almost 2.5 standard deviations below the mean.



When I did this example with my students, they thought that the marks should be adjusted to show a mean of 66 and a standard deviation of 4. So, in list 3, we adjust the marks by using the formula $z = \frac{x^* - \mu}{\sigma^*}$, where z is the score obtained in the previous calculation, x* is the new mean and μ* is the new standard deviation. Isolating x*, we get $x^* = z\sigma + \mu$. The formula is shown at the bottom of the screen. Notice what happened to Nicki and the student whose mark had been 11. The weak student's mark moved from 11 to 54.2 and he/she now passes the test while Nicki's mark is lowered from 88.5 to 83.3. Somehow, bell curving marks only helps the weaker students! ▲

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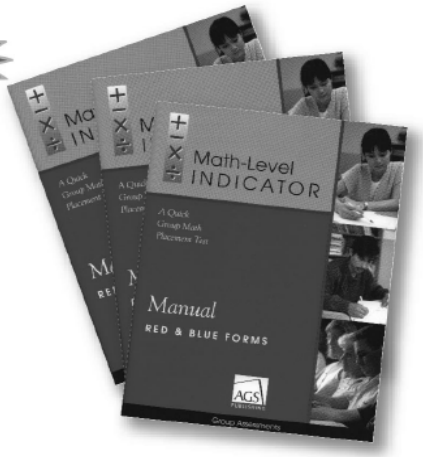
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▲ PHOTO MATH – A NEW WAY OF PICTURING MATH

RON LANCASTER
INDEPENDENT MATHEMATICS CONSULTANT



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 point of this column is to go beyond this notion and promote the idea that in fact "A picture is worth a thousand numbers". Photos with Math is what readers can expect to find in every Photo Math column and the emphasis will be on seeing and doing mathematics everywhere. Teachers may want to assign these questions to their students as part of an overall effort to make connections between the curriculum and the world around us. Establishing these connections is at the heart of the new Ontario curriculum as well as the new 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 to submit these problems along with photographs to the author via e-mail or by regular mail for possible publication in future columns

Introductory Comments

All of the photos for this month's column and the accompanying mathematical questions were created by Peter Saaramaki, a well known and highly regarded mathematics educator from Toronto. Peter is a former Coordinator of Mathematics with the Toronto Board of Education, he was seconded for two years to work at EQAO, he is a former president of OAME and OMCA and he is a writer and editor for GTK Press. Peter has continued to support mathematics education since his retirement through a number of initiatives.

I have known Peter for many years and often run into him at conferences in North America. The last few times we met I was delighted to find that we were both out independently capturing scenes of math with our cameras. Peter has a wonderful eye for finding math. The photos for this month's column were taken in Whistler, British Columbia. I hope you enjoy his work and that it inspires you to take your own pictures and send them to the Editor for publication in this column.

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Photograph 1



What is parallel in this picture? (answer includes, opposite sides of the rectangular frame, three "l"'s in parallel, two sloping sides to the overlapping triangles, how about the curved arms for the lights above - aren't they parallel, even though they aren't straight?)

Photograph 2



How many triangles can you find? How many different sizes?

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Photograph 3&4





Describe each banner shape. What do they have in common?

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▲ Implementing Journal Writing in Grade 9 Applied Mathematics

Louis Lim



Louis Lim is department head of mathematics at Unionville HS and a PhD student at York University. He is currently an editorial panel member of the NCTM's Mathematics Teacher *and was editor of the OAME's* Gazette *from 1999 to 2003. In 2003, Louis was the recipient of the York University Faculty of Education Alumni Association's Excellence in Teaching Award.* *This article is based on a component of the author's Master of Education thesis. He wishes to acknowledge the many contributions of Dr. Lynda Colgan, his MEd thesis supervisor at Queen's University.*

Background

A proverb appearing on the cover of the 2002 – 2003 *Exclusive Educational Products* catalogue sums up the importance of communication: "I Hear – I Forget; I See – I Remember; I Do – I Understand; I Explain – I Own." Communication is one of the four categories of the Achievement Chart and students are assessed in their communication skills in all courses of the Ontario four-year high school curriculum. Descriptors in *Ontario Curriculum Grades 9 and 10: Mathematics* (1999) that foster communication include: "describe," "pose," "interpret," "communicate," and "explain." The National Council of Teachers of Mathematics (NCTM), which supports the reform efforts in Ontario, lists communication as one of their ten standards[1] in *Principles and Standards for School Mathematics* (2000). There is a dual connection between communication and learning mathematics: "They (students) communicate to learn mathematics, and they learn to communicate mathematically" (p. 60).

[1]*A* standard *describes "what mathematics instruction should enable students to know and do – statements of what is valued for school mathematics education" (p. 7).*

Journal writing is one form of communication. The NCTM advocates that writing in mathematics allows students to reflect, clarify, and consolidate their thoughts. The need for writing is exemplified through:

> *It is the expectation that students, over the course of their high school experience, will learn to write about their use of mathematics, effectively incorporating mathematical forms such as calculations, equations, graphs, or tables. This curriculum assumes a classroom environment in which students are called upon to explain their reasoning in writing, or orally to the teacher, to the class, or to other students in a group (*Ontario Curriculum Grades 9 and 10: Mathematics, *1999, p. 4).*

Recent research documents the positive effects of journal writing in mathematics. Jurdak and Zein (1998) determined that students' conceptual understanding, procedural knowledge, and mathematical communication were enhanced in 11 to 13 year olds when journals were written in the final 7 to 10 minutes of each class. The researchers argue that their study "lends support to the theories of writing that propose a dialectic relationship between writing and learning" (p. 416). Ma (1999) found that alternative assessments, such as journals, allowed students to demonstrate their knowledge under less stress and anxiety, which improved their academic achievement, attitudes, and confidence to do mathematics. Kulm (1994) concluded that students' attitudes to mathematics improved through the use of alternative assessments, regardless of their gender or ethnicity.

In fact, the focus is now "assessment *for* learning", rather than "assessment *of* learning". Davies (2000) states that assessment was traditionally used to "rank, sort, and group learners for their roles in the industrial world", but assessment needs to shift to guide instruction and support student learning (p. 77). Suurtamm (2001) reaffirms this when she says that assessment should be integrated with instruction, rather than be viewed as a disruption. Davies argues that descriptive feedback should be increased (and evaluative feedback decreased) so students know what they are doing well and how to improve. Black and William (1998), in their extensive review of 250 research studies, found that formative assessments (which include the use of journals) benefit all students, with the greatest impact on low achieving students.

Format

Although this article concentrates on the

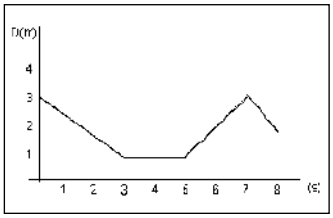
implementation of journal writing in grade 9 applied mathematics, I believe that there is benefit for students to write in any math class. My present focus has been on the grade 9 applied students since I find that they struggle with the mathematics curriculum and believe that writing could assist them in grasping the concepts.

Students were provided with a 32-page, hole-punched workbook during the first class. For students to take journals seriously, I felt I needed to introduce it very early in the course. Journal writing became a routine way to end a class. A question would be written on the chalkboard, and students had approximately 10 minutes to answer, writing in sentence form. Most of the entries required students to write detailed instructions or descriptions for calculating a certain skill or procedure. Their journals were submitted at the end of class and I spent time that evening reading and providing detailed feedback. I ignored grammar and spelling, since I wanted students to transfer what they were thinking to paper, and gain confidence in expressing themselves mathematically (rather than to focus on their use of English).

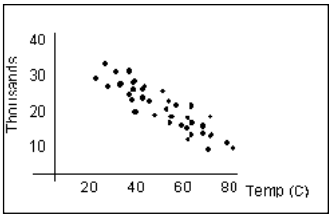
The Entries

Questions were generated using the "Communicating the Ideas" feature of Addison Wesley's *Mathematics 9: Ontario Edition* textbook: "A student is absent. You are talking on the phone. Explain to your friend how …". During the most recent implementation of journals, my school purchased the Pearson *Applied Mathematics 9: Ontario Edition* textbook at mid-term, so additional questions were generated using the highlighted communication questions in the exercise sets. An additional format of questions came from the McGraw-Hill Ryerson grade 10 academic textbook that uses "describe how you would…" The journal entries were:

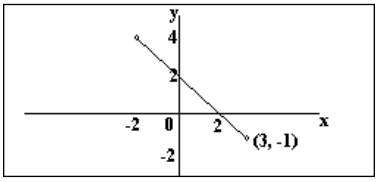
1. "Mathematics and Me". (see figure 1 at end of article)
2. Students play a game ("Fantastic Memory") with a family member. They write about their family member's reaction, along with where the mathematics is in the game. (see figure 2 at end of article)
3. Explain why you add the exponents when you simplify $5^2 \times 5^3$, but multiply the exponents when you simplify $(5^2)^3$.
4. A distance-time graph is obtained by the CBR (Calculator-Based Ranger). Describe how the person moved with respect to the CBR.



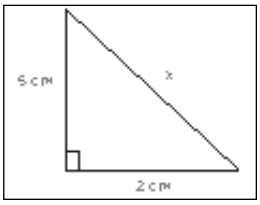
5. An old fashioned bathtub is drawn on the chalkboard.
   (a) Sketch a graph of height of water versus time for: bathtub filling with water; person gets in; bathes; person gets out; and then drains the water.
   (b) Describe each part of the graph.
6. Describe, in detail, the steps you would take to plot the point (2, -5) on the Cartesian Plane.
7. A scatter plot of number of bacteria versus temperature is provided. Describe
   (a) how to draw the line of best fit;
   (b) the correlation and how you know, and
   (c) the relationship between temperature and number of bacteria.



8. Describe how you would determine if the following ordered pairs create a linear or non-linear relationship: (0, 5), (1, 3), (2, 1), (3, -1), (4, -3). Do not plot the points!
9. Your friend missed today's mathematics lesson. Over the telephone, explain how to calculate the slope of a line segment when you are given the coordinates of the endpoints.
10. Explain to your friend who missed today's class how you would graph a line with slope $\frac{3}{2}$ and through the point (4, -1).



11. Describe the steps you would use to find the equation of the line segment:
12. Your friend missed today's lesson. Describe how you would determine if two line segments are parallel, perpendicular, or neither. Use examples.
13. Describe the steps to write in scientific notation: $(3 \times 10^5) \times (6 \times 10^7)$.
14. Describe how you would approximate $\sqrt{125}$ without using a calculator.
15. Describe how you would find the length of the missing side, x:



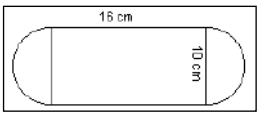
16. Describe how you would simplify the expression: $2x^3 - 4x^2 + 3 - x^2 + 5x^3 - 1$.

17. Describe how you would expand and simplify: $3x(x + 2) + 4x(x^2 – 2x – 3)$.

18. Describe how you would solve: $3x + 5 = x + 9$.

19. Describe how you would solve: $5(x – 1) – 4 = 3x + 1$.

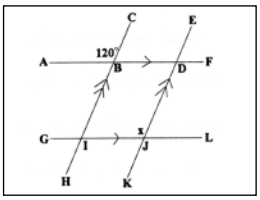
20. Describe how you would find the area of:



21. Describe how the formulae for volume and surface area can be developed for a soup can.

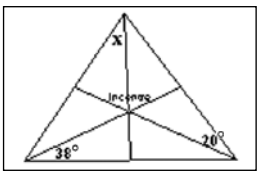
22. Describe how you would calculate the surface area and volume of a cone (given diagram without the slant height).

23. An isosceles triangle is given with sides AB = BC. If you know the measure of ∠A, describe how you would find the measures of ∠B and ∠C. Include a diagram.



24. Describe the steps to find the measure of angle x.

25. Describe the steps to find the measure of angle x.



Assessing the Journal Entries

Students submitted their journals for formative feedback after each submission. No mark was assigned to individual entries. Journals provided me, the teacher, with immediate feedback on students' progress. There were several instances in the course when I had to revisit concepts with the class after reading journal entries since many students had the same misconception. For students, they were provided with feedback and could then approach me for further clarification or extra help. One unanticipated benefit to journal writing was that it allowed me to engage in one-to-one "conversations" with students. I often used that as an opportunity to reiterate good work or to remind students of what constitutes acceptable behaviour.

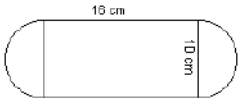
At the beginning of the semester, several students asked how many marks each submission would be worth. I mentioned that their entries would not be graded. Rather, they provided "dry runs" for similar communication-type questions on unit tests. Also, at mid-term and at the end of semester, students would be required to select two journal entries that reflect their best work for inclusion in their student portfolios; hence, it was important that they take journal writing seriously since the portfolio would be evaluated.

Much growth was evident in journal writing since students' communication skills improved throughout the semester. To illustrate, two entries from a student are provided:

Question: "Your friend missed today's mathematics lesson. Over the telephone, explain how to calculate the slope of a line segment when you are given the coordinates of the endpoints."

Student's Response: "If your horizontal line would end at 1 and your vertical ended at 3 then you divide the vertical divided by the horizontal so 3 ÷ 1 and that equals 3 and since you were right it is positive and you want up so that is also positive so the answer is +3." (March 21).

Question: "Describe how you would find the area of:"



Student's response: "First you get the formula A = l x w then you find the length and the width so it would be A = 16 x 10 then you multiply them. So you find out the rectangle then you do the circle. The diameter is 10 so the radius is 5. Then you multiply it by 3.14 out then that = 246.49." (May 18).

My Reflections

A thrust of the new assessment policy in Ontario is for learning to take place during assessment, rather than assessment being an interruption to the learning process. Journals allow students to reflect on and consolidate their learning.

I believe that the implementation of journals was successful since I provided prompt and supportive comments. Students would often walk in the classroom, and without removing their backpacks, approach me for their journals, many reading my comments as they walked towards their seats.

There is no doubt that providing written feedback to each student was time consuming. I would spend about an hour reading and providing comments; fortunately I have taught the grade 9 applied course on several occasions so I was no longer creating new lesson plans every night. A sample of my feedback, from their first journal entry was:

Thanks for sharing your early math memories with me. You're not alone – many students enjoy math, and then develop a dislike for it – and enter high school hating it. I will do my best to make the grade 9 course as painless as I can. But, be sure to ask questions when you don't understand something – I can't read your mind! I like your

positive attitude to learning and look forward to working with you this semester.

Final Remarks

Having implemented journals in my grade 9 applied classes for several years, I am convinced that the benefits far outweigh the amount of time spent providing written comments. Both the teacher and students are provided with immediate feedback. Also, I used the journals as an opportunity to develop and strengthen rapport with students. I observed students' communication skills strengthen as the semester progressed, as well as provide the last 10 minutes of a 75-minute period, which is often wasted, with productive work. Students, too, saw their communication skills improve when they assembled their portfolios and had to reread their collection of entries. Journals provide an alternative method of assessment especially for students who are test-anxious to demonstrate what they know and can do.

In the future, I would like to incorporate journals in all my courses. To make providing feedback doable, in senior level classes, journals could be submitted on a bi-weekly basis with comments provided.

My advice to colleagues interested in implementing journals is not to give up or become frustrated when students complain about the extra work, not being able to write enough, or why they should write in math class since they have not done it in the past. Once my students saw the benefits, they "bought" into it and often asked, "Can we write in our journals?" One student summed up the purpose of journals when he said to the class, "That journal entry (slope) allows us to write what we are thinking so we can understand it."

Recently, there has been a major emphasis in boards of education to promote literacy across the curriculum to help prepare students for success on the literacy test written in grade 10. Writing in mathematics class supports that initiative!

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Journal Entry #1: Mathematics and Me

For your first journal entry, you are going to write your mathematical autobiography. Throughout your entry, please emphasize your personal experiences and feelings – be honest! Your mathematical autobiography will assist me in getting to know you individually and plan the course to best meet your needs.

Your mathematical autobiography should be written in paragraph form and be approximately 1 page in length. Try your best to use correct spelling and grammar, but do not worry about incorrect use of English – the focus is on communicating your personal experiences and feelings as best you can.

Use the questions listed below to help guide your writing. Do NOT simply answer each of the questions – remember, you must write in paragraphs. Feel free to include anything else you want in your entry.

- Does mathematics come easily to you?
- What are your earliest memories of mathematics?
- What is mathematics?
- What topics do you particularly enjoy? Dislike?
- Do you enjoy the study of mathematics? If not, did you ever enjoy mathematics? When did you begin to develop a dislike to the subject?
- What are your most memorable mathematical experiences? (e.g., a concept, or activity)
- Did you have any "bad" years in mathematics?
- Have you ever used graphing calculators or computers in mathematics classes? If so, in what way were they used? How do you feel about these experiences?
- Have you ever used journals in mathematics? What about maintaining a portfolio in mathematics?
- What are your goals for the grade 9 applied mathematics course? How will you go about achieving these goals?
- What are your plans after high school?
- Is there anything you need to tell me to help you succeed?
- What should I do as your mathematics teacher to help you succeed?

Figure 1: Journal Entry #1: Mathematics and Me

Fantastic Memory![2]

#1: 190 998 752 796 516 730 336

#2: 279 651 673 033 695 493 257

#3: 358 314 594 370 774 156 178

#4: 437 077 415 617 853 819 099

#5: 516 730 336 954 932 572 910

#6: 617 853 819 099 875 279 651

#7: 730 336 954 932 572 910 112

#8: 853 819 099 875 279 651 673

#9: 976 392 134 718 976 392 134

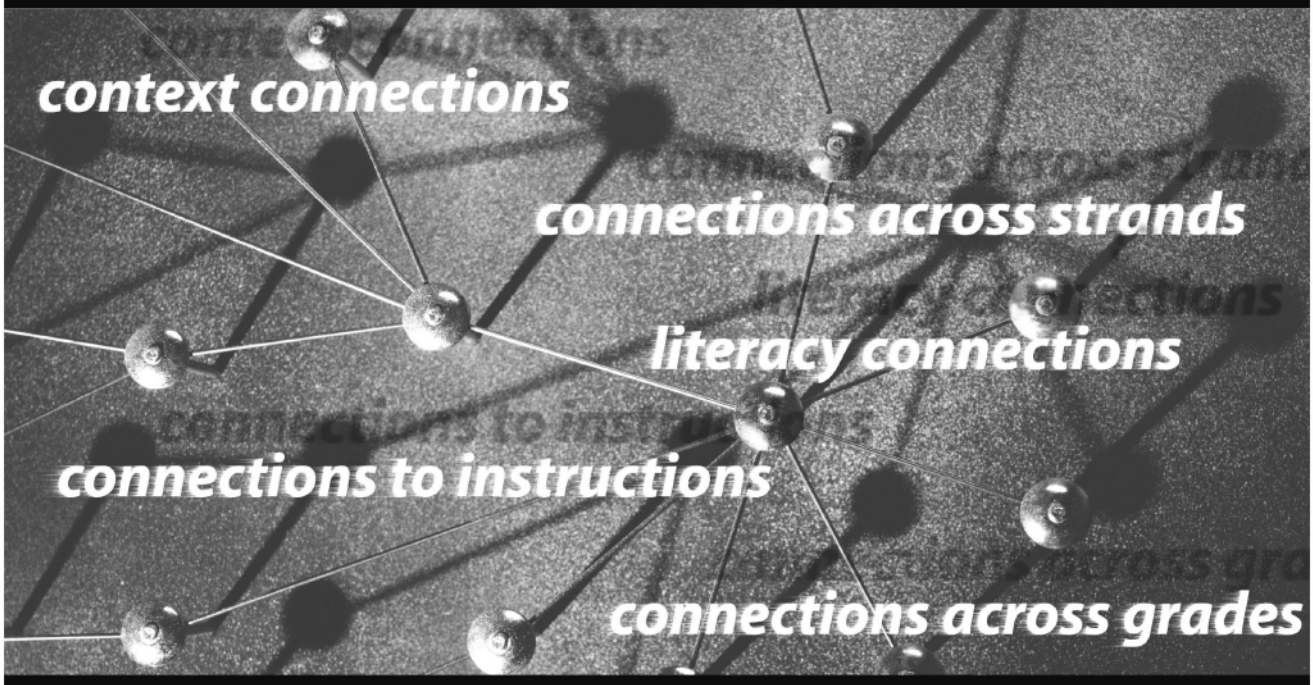
Source:http://www.bonus.com/contour/mathmagic/http@@/www.scri.fsu.edu/~dennisl/CMS/activity/MM-calcw.html

Figure 2: Fantastic Memory![2]

[2] The game does not actually involve memorizing the nine numbers, each with 21 digits. The first digit is the natural numbers ascending. The second digit is the odd numbers descending and then ascending. To find the subsequent digits, add the previous two digits and keep the unit's digit (ignore the tens digit). For instance, in #1, the third digit is the unit's digit of 1 + 9, which is 0, while the fourth digit is the unit's digit of 9 + 0, which is 9.

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▲ Assessment Corner: Using Portfolios in the Mathematics Classroom

CHRIS SUURTAMM



Chris Suurtamm is an 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.

Students in mathematics courses are encouraged to develop their own meaning from mathematics, to build confidence in their ability to do mathematics, to make connections between mathematics and their world and to develop themselves as problem solvers. These actions generally result in students engaging in the process of mathematics, creating a product or result of their work, and evaluating and thinking about what they are doing. Assessing all of these components proves to be a challenge. However, the use of portfolio assessment takes into account the processes of mathematics, the products produced, and the metacognitive aspects of learning. It also encourages students to take responsibility for their progress in mathematics. Ideally, portfolios contain samples of student work that the student has chosen to include as well as student reflections on why they chose the work that they did. Portfolios focus on student growth and help to make students more cognizant of their learning.

By their very nature, portfolios celebrate what students know and can do. Portfolios allow students to demonstrate mathematics learning and understanding beyond merely facts and knowledge and permit the demonstration of learning outcomes that are difficult to assess using traditional assessment techniques. Work in the portfolio can show the ability to think and to communicate mathematically, to make conjectures, gather evidence, look for patterns, model, analyze, build logical arguments, and reach conclusions.

What is a Portfolio?

A portfolio is more than just a folder. It holds evidence of an individual's skills, ideas, interests and accomplishments. It is an organized collection of evidence used by the teacher and student to monitor the growth of the student's knowledge, skills, and attitudes. Portfolios can take many forms: a class treasure chest containing samples of student work that demonstrate the important learning in grade 1; a simple folder of written submissions; or an electronic portfolio, containing photos, *Geometer's Sketchpad* sketches, or videos of investigations.

A portfolio can contain a wide variety of pieces of student work, but what is included should relate to the purpose and type of portfolio. The purpose and criteria by which the portfolio is being judged should be made clear to students at the outset of the use of portfolios. Students will include samples of their work, throughout their learning, that match the type or purpose of the portfolio and satisfy the criteria. Entries in a portfolio might include, but are not limited to:

- Photos or sketches of models constructed by the student
- Mathematics journal writing samples
- Evidence of mathematical investigations
- Solutions to problem solving activities
- Print-outs of explorations with computer software such as *Geometer's Sketchpad*
- Videotapes of working with manipulatives or building models of multi-dimensional figures
- Student reflections on their work

Types of Portfolios

There are many different types and purposes of portfolios and several will be highlighted in the following descriptions. For each type of portfolio, either or both of a working portfolio and showcase portfolio could be used. Students submit work to a working portfolio and later may narrow down those submissions to highlight the samples of their best evidence of their work. This focused portfolio then serves as a showcase portfolio.

Summative Portfolio

A Summative Portfolio allows the student to show that they have mastered the important ideas of mathematics for that course or grade level. The teacher might ask students to select samples of their work in each strand of

mathematics, or related to the "big ideas" of their learning in that particular grade. Students would also include a short reflection describing what the sample of work shows that they know about that strand or concept. By reviewing the portfolio with the student, the teacher and student can see what the student has learned about mathematics and can recognize his or her growth in the important concepts of the course or grade.

Problem Solving Portfolios

A Problem-solving Portfolio might help to develop students' skills and confidence in problem solving. Students choose samples of their work that fit into particular categories related to aspects of problem solving. For instance, the following could be used to guide the selection of samples:

- Perseverance at problem solving
- The use of collaboration in problem solving
- How a model helped to solve a problem
- The incorporation of the use of technology in solving a problem
- How a problem can be solved in a variety of ways

Students include at least one sample from each category as well as a description of how the sample demonstrates that particular aspect of problem solving. Alternately, students may choose to include several samples of their work for each category to show their growth over time in problem solving.

Review Portfolio

A Review Portfolio may be a good starting point for teachers who want to implement portfolios. A review portfolio can help students to focus on summarizing and highlighting important concepts taught in the course. Students might want to submit work to the portfolio at the end of each unit. These submissions could include such things as review notes, review questions created by the student, a copy of the unit's summative assessment accompanied by student comments on their work and corrections. This review portfolio can later serve as a study or review guide when the student prepares for the summative assessment for the entire grade or course. Or, the review portfolio can stand on its own as a summary of what the student has learned in the course.

Learning Skills Portfolio

A Learning Skills Portfolio helps students to "learn how to learn". A learning skills portfolio requires students to submit samples or descriptions of their activity that demonstrate learning skills, such as are outlined on the report card. Thus, they would include evidence of their work habits, organization, teamwork, initiative, and independence. The qualities of each of these areas would need to be clearly articulated and students provided with examples of what types of evidence would display each of these qualities. Students would also complete a reflection sheet for the submissions to prompt them to explain how their samples demonstrate each of the qualities (Suurtamm, 2002).

Portfolios used as Large-scale Assessments

Some jurisdictions, such as the state of Vermont, use portfolios as large-scale assessment projects to promote a broad range of mathematical activity. Vermont uses a number of performance assessments, as part of the portfolio process, to inform educators about student progress (Darling-Hammond, 1997). Math portfolios across the state include "uniform tasks" that all students perform and also other self-selected samples. Teachers convene to assess these portfolios for grade 4 and grade 8 students and work together in scoring sessions to develop their skills in evaluating student work in comparable and reliable ways (much like EQAO scoring helps to create consistency). The portfolios are used throughout the school year so that teachers and students can learn from assessment results and continually improve their work. Assessments are also used to provide longitudinal information about students' work and progress that supports analysis of what is working well and what needs additional attention.

Portfolios as an Aid to Communication

Portfolios are an excellent starting point in establishing sound communication between parent, teacher, and student about a student's work. Several teachers use portfolios in a parent-student-teacher interview as a way to focus on and discuss the student's progress. As students display and discuss the work in their portfolio with teachers and parents they demonstrate ownership for their learning and welcome the opportunity to show what they know and can do.

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Darling-Hammond, L. (1997). *The Right to Learn: A Blueprint for Creating Schools that Work.* San Francisco, CA: Jossey-Bass.

Suurtamm, C. (2002). Assessment Corner: Assessing Learning Skills. *OAME Gazette (41)* 1. 28 – 29. ▲

▲ WEB SITES: GET INTERACTIVE

KEVIN MACGUIRE



Kevin Maguire is an Instructional Leader in Mathematics/Numeracy for the Toronto District School Board. Kevin is also an OAME Director. His particular interests include teaching with technology and elearning.

In this column, web sites of interest to teachers of mathematics will be shared. In this issue, the spotlight is on Data and Chance. In the elementary curriculum, one of the five strands is Data Management and Probability, while in the secondary curriculum, the empirical study of relationships is an important thread throughout. These ideas come together in the new Grade 12 course, Mathematics for Data Management. (MDM4U)

Statistics Canada Web Sites

Joel Yan at Statistics Canada shares the 3 web sites below. If you have not already done so, check out his column, "Using Statcan in your Classroom" in this issue of the Gazette.

Census at school, at www.censusatschool.ca, is a class survey and data analysis project. This is a great online math resource for collecting, analyzing, and comparing data for grades 5 to 12.

The web site of teacher resources for math is at http://www.statcan.ca/english/kits/courses/math.htm. This includes over 40 lessons organized by strand, statistical datasets, and interesting articles.

One of the articles is a complete on-line statistics resources book called *Statistics: Power from Data!* available at http://www.statcan.ca/english/edu/power/toc/contents.htm. This resource is designed for independent learning and includes exercises and links to lesson plans.

Data and Story Library

http://lib.stat.cmu.edu/DASL/

"DASL" houses an impressive collection of data sets and stories about the use of data in classrooms. A well-organized, easily-searched web site. "A good example can make a lesson on a particular statistics method vivid and relevant."

Numeracy in the News

http://inl.news.com.au/mercury/mathguys/introduc.htm (used to be called "Chance and Data in the News")

This site provides resources for students and teachers centred on hot topics in the news. In addition to number, news topics are cross-referenced by data collection and sampling, data representation, chance and basic probability, data reduction, and inference.

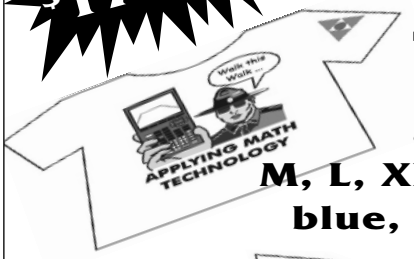
Probability by Surprise

http://www-stat.stanford.edu/%7Esusan/surprise/

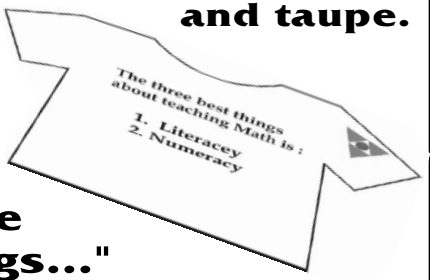
This interactive site lets you "see for yourself" some of the better-known surprises in probability, such as the Birthday Problem. ▲

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▲ Hey, It's Elementary: Our Most Important Garden

LYNDA COLGAN



Play is the highest level of child development . . . It gives . . . joy, freedom, contentment, inner and outer rest, peace with the world . . . The plays of childhood are the germinal leaves of all later life.Friedrich Froebel

Kindergarten. It is such a natural part of childhood that we assume it has always been *there*. Each of us has evocative memories of being a Kindergarten student and based on those first-hand experiences, we share norms for every Kindergarten classroom. When any one of us walks into a Kindergarten, we expect to see a diverse collection of "manipulative materials". We assume that there will be sets of *Cuisenaire Rods*: brightly coloured wooden rods of varying lengths, carefully chosen to engage children in explorations of arithmetic concepts and relationships, e.g., children discover that each brown rod is the same length as two purples – or four reds. We expect that some tables will be filled with sets of colourful *Pattern Blocks*, the familiar polygon-shaped tiles that children use to create mosaic-like patterns and, in the process, learn important geometric concepts. We anticipate groups of children involved in paper cutting and folding, weaving, drawing, clay modelling and bead stringing. In our mind's eye we can clearly focus on the traditional tools and activities for a Kindergarten educational program.

Yet, as mathematics educators, have we ever stopped to wonder how this became the norm? How did manipulative materials (such as *Cuisenaire Rods* and *Pattern Blocks*) come to play such an important role in young children's learning? Who provided those first opportunities to learn in which young children were given the time, resources and prompts to explore mathematical and scientific concepts (such as number and shape) through direct manipulation of physical objects? Who first recognized that as little learners build and experiment with blocks they develop richer ways of thinking about mathematical concepts such as number, size, and shape?

Do we know who invented Kindergarten? Do we know why physical objects are so prominent in the Kindergarten class? Do we show enough respect for the relatively recent institution known as Kindergarten? And, perhaps most importantly, do we work diligently enough to ensure that the integrity of the original tools and goals for a Kindergarten program are never diminished?

The First Kindergarten

At its inception, the first Kindergarten was to be – quite literally – a garden of children in which the child would be treated as a seed in a nourishing environment. Developed for children between the ages of three and six years, Kindergartens were first introduced into the educational continuum in 1837 by German educator Friedrich Froebel. In 1861 American educator Elizabeth Palmer Peabody opened one of the first Kindergartens in the United States in Boston and by the 1920s Kindergartens were included in public schools in most parts of the United States.

Froebel regarded natural science as the underlying basis of all knowledge; thus, the focus of the Kindergarten, as the name implies, was a large, well stocked garden, with plots for each pupil's care. Part of the day was spent on the grounds, where the children learned by interacting with the natural world.

The rest of the day was spent in a brightly decorated classroom, participating in mathematical games, play and crafts that enlisted all of the child's imaginative powers, thoughts, physical movements, images and educational curiosity. The underlying idea was to keep the child engaged and active, while all the time he/she was, almost unconsciously, acquiring powerful knowledge.

Friedrich Froebel said, "A child's play is his/her work". And just as a carpenter or sculptor needs raw materials and tools with which to ply his trade, Froebel asserted that children needed tools with which to learn. He called the tools of learning "gifts" – with gifts the playing child experiences, discovers and constructs his/her world in microcosm. The "gaben" or gifts are a set of deceptively simple geometric wooden blocks that afforded many opportunities for important discoveries.

The Gifts

Froebel carefully designed the gifts (See Figure 1) or geometric blocks (mainly various rectangular shapes, with some arches, semicircles, square based pyramids and triangular prisms) to help children recognize and appreciate the common patterns and forms found in nature. By exploring with these "thinker toys", Froebel believed that children began to understand and internalize the concepts of shape, dimension, size, proportionality and their relationships. For example, Froebel's third gift contains eight cubes of equal size, forming, when properly combined, one perfect cube. Properly applied, the combinations supply the child with ideas of division into halves, quarters and eighths.

In the Froebelian Kindergarten, gifts were introduced singly and in sequence so that the child could discover their properties and possibilites for design by playing with them freely. Whenever the child ran out of ideas for play, the highly trained teacher would encourage her to compare the gifts to other objects like nuts or the building next door, and to think about the kinds of designs that could be made with the gifts.

By participating in self-directed activities - learning by doing as opposed to following rote instructions - Froebel believed that children also developed their eye/hand coordination, spatial perception and visual memory and gave expression to their imagination.

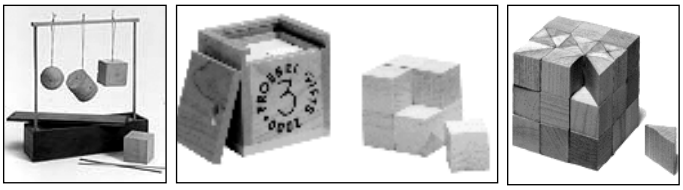


Figure 1. Five gifts were published by Froebel in his lifetime. Several more were used by Froebel in his Kindergarten and published after his death. They extend the exploration of solids to surfaces and lines, thus moving from the concrete to the abstract representation of solids using lines. Starting with feeling and comprehending the basic volumes, sphere, cylinder and cube, the gifts progressively unfold into activities that develop more complex skills of perception, manipulation and combination. The photographs above, from left to right, show Gift 2 (designed to impart ideas of form, size, sound and movement), Gift 3 [Eight one-inch cubes, forming a two inch cube (2 x 2 x 2)] and Gift 5 [Twenty-seven one-inch cubes, three bisected and three quadrisected diagonally, forming a three-inch cube (3 x 3 x 3).].

The First Teacher Training College for Women

To learn a thing in life and through doing is much more developing, cultivating, and strengthening than to learn it merely through the verbal communication of ideas. Friedrich Froebel

In addition to being the inventor of the Kindergarten, Froebel was the founder of the first teacher training college for women in 1849. Froebel believed that Kindergarten teachers should be trained within the Kindergartens themselves, developing an understanding of the methods and materials through play and actually discovering for themselves the lessons they would encourage the children in their care to discover. They also made sets of Froebel Gifts for use in their own Kindergarten.

While Froebel wrote extensively about his philosophy (which included religious, symbolic and spiritual components threaded into his pedagogical beliefs), little was written about the gifts and their implementation. Unfortunately, early attempts by followers of Froebel to provide manuals for the gifts contributed to a mechanical use of the gifts by teachers who had read about them rather than played with them.

Froebel also believed that in addition to being highly knowledgeable about their gifts and their embedded lessons, teachers should have another gift – that of asking open-ended questions. The aim of these questions was to make the child become aware of his/her personal way of learning and possibilities for development. Froebel believed that the result of purposeful and probing questions posed by the teacher was an increase in the child's ability to observe and concentrate and increased knowledge of the world and its structure. By applying knowledge and experiences in new situations and integrating them into the personal feeling, knowledge and behaviours, Froebel believed that the child "learned".

In addition to being knowledgeable about the gifts, their implicit content and their unlimited creative possibilities, Froebel also believed that the Kindergarten teacher should be a sensitive, open, and easily approachable person. Unfortunately, to some casual observers, it seemed that anyone could teach little children as long as they were motherly.

Frank Lloyd Wright – a Famous Froebelian Graduate

A few years ago Robert Fulghum wrote an oft-quoted piece *All I ever needed to know, I learned in Kindergarten*, which begins:

Most of what I really need to know about how to live, and what to do, and how to be, I learned in Kindergarten. Wisdom was not at the top of the graduate school mountain, but there in the sand box at nursery school.

These are the things I learned. Share everything. Play fair. Don't hit people. Put things back where you found them. Clean up your own mess. Don't take things that aren't yours. Say you are sorry when you hurt somebody. Wash your hands before you eat. Flush. Warm cookies and cold milk are good for you. Live a balanced life. Learn some and think some and draw some and paint and sing and dance and play and work everyday.

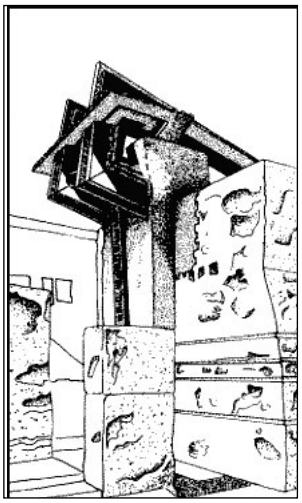
Seems everyone recognizes the value of Kindergarten, and a few have publicly credited its lessons with setting the course of their life.

From a mathematics educators' perspective, perhaps the most significant Kindergarten graduate is Frank Lloyd Wright. In 1876, Anna Wright visited Philadelphia and bought her son, Frank Lloyd, a set of Froebel's wooden blocks. At the same time, she trained in Froebelian methods. Both the blocks and his mother's questions inspired Wright, who would remember them all his life. "Mother found the 'gifts,' and what gifts they were," he once wrote. "I soon became susceptible to constructive pattern evolving in everything I saw. I learned to 'see' this way, and when I did, … I wanted to design."

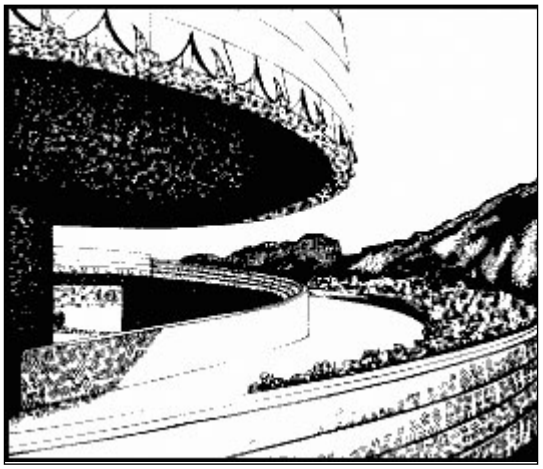
It is said that Wright designed in his head while playing with Froebel blocks. All of his plans are composed of units grouped in a symmetrical or systematic way. "Mother learned that Friedrich Froebel taught that children should not be allowed to draw from casual appearances of Nature until they had first mastered the basic forms lying hidden behind appearances. Cosmic, geometric elements were what should first be made visible to the child mind."

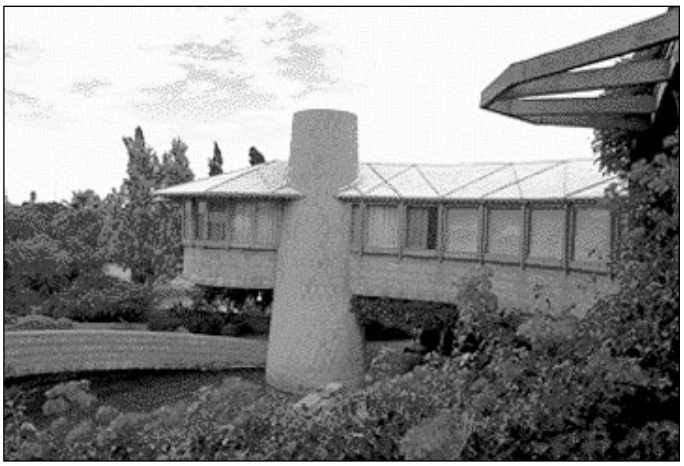
In his autobriography Frank Lloyd Wright states that he began to construct buildings with a definite geometric clarity and in tune with nature – design characteristics which he acknowledged were advanced for their time – because the Froebel toys led him in these ways.

Two examples of Wright's architecture are provided to the right. The first two illustrations show a schematic and a photograph of Taliesin, Wright's home and studio in Wisconsin. The second set of illustrations show the David Wright House in New Mexico.









Concluding Remarks

"That early Kindergarten experience with the straight line; the flat plane; the square; the triangle; the circle! If I wanted more, the square modified by the triangle gave the hexagon, the circle modified by the straight line would give the octagon. Adding thickness, getting 'sculpture' thereby, the square became the cube, the triangle the tetrahedron, the circle thesphere." Frank Lloyd Wright

Froebel's teachings caused major changes in the education of small children in that today the notion of Kindergarten is ubiquitous. His ideas provided the major direction for Kindergarten curriculum during the last half of the nineteenth century: learning through play, group games, goal oriented activities, and outdoor time.

While the idea of children learning through play has been retained, many critics of today's Kindergarten classrooms believe that a number of the new manipulative materials and activities that have been introduced to the Kindergarten lack the conceptual richness of the Froebel originals. They believe that there is simply not as much there for the child to discover. For example, playing with large floor blocks is significantly different from handling the blocks that inspired Frank Lloyd Wright and arranging them on grid. Froebel's insistance that every part of a gift be used in an arrangement may seem arbitary but it was not.

Similarly, Froebel was a firm believer in guided play as the most important learning tool for young children. Some critics of contemporary Kindergartens lament the demise of the Froebelian desk – a little Kindergarten table-top ruled by lines about four inches apart each way making four-inch squares – that could be used with the gifts in order for children to learn the elements of geometric form, mathematics and creative design.

With Ontario's current focus on Early Mathematics, it seems important to return to examine the beginning of a child's school life and evaluate how well our garden is growing.

For additional reading:

Inventing Kindergarten by Norman Brosterman, Harry N. Abrams, Inc., New York, 1997, (ISBN: 0810990709). Inventing Kindergarten uses beautiful photographs to reconstruct Froebel's approach to teach young children about art, design, mathematics, and nature.

A Child's Work: Freedom and Guidance in Froebel's Educational Theory and Practice by Joachim Liebschner, (Lutterworth Press, 2002, ISBN: 0718830148 presents a full account of guided play as the most important learning tool for young children.

Friedrich Froebel: His Life, Times and Significance by Peter Weston (ISBN 1 902743 25 3) helps us to understand the turbulent political and intellectual context in which Froebel invented Kindergarten. It also identifies those aspects of his educational practice that are of enduring value in the contemporary world. ▲

▲ Activities with a Daily Estimation Jar

ANN CARLYLE
GOLETA UNIFIED SCHOOL DISTRICT

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Often students who lag behind in Kindergarten mathematical skills do so because we are asking them to do abstract work that they have not yet conceptualized or to work with mathematical language that is unfamiliar to them. If we put our energies into finding ways to engage children with ideas and materials so that all have access to them, we can use these ideas to build concepts about numbers that are close to the numbers the child knows.

We want children to be thinkers and users of numbers. We want them to make sense of what they are doing. At every opportunity, we should provide them with a chance to think, to make sense, and to be engaged with their work. We want our students to see the world of mathematics as their own. Furthermore, the view of mathematics that we want our students to have is: *It is everywhere. People need math. I can do it. I like math.*

Interviews and Observations

During the first month of school, I use individual interviews and observations similar to those found in the *Mathematics Their Way Summary Newsletter* to find out the following information about my students:

1. How far can they count orally?
2. When dealing with a collection of 10 items in a line in front of them, are they able to point to the sixth one or a set of six?
3. If shown two equal collections of objects with one group spread out, do they use number conservation?
4. How accurate are they in counting a scoop of beans with one-to-one correspondence and how high can they go?
5. If shown five beans and then shown two more, can they count on to determine that there are seven beans?

6. Can they read any numerals? One digit? Two digit?
7. Can they write any numerals?
8. If shown 5 beans, then 2 are hidden, do they know (instantly) how many I am hiding?
9. How comfortable are they with numbers? Do they enjoy using them in their daily work?

Daily Estimation Jar

One effective strategy for developing number ideas over time is the everyday use of an estimation jar. Our jar is about the size of a pint jar and we use it all year. At the beginning of the year, it contains between 10 and 15 objects, each about the size of a sugar cube. The jar is used all year to assist the children in gaining a sense of the number of objects that might fit into it, given their size. Since many of the children can only count up to 10 or 20 at the beginning of the year, it seems an appropriate task.

I approach the task by asking a student helper to hold the jar and ask for estimates. The teacher records the children's estimates on a recording paper. Later in the year, children and/or the student helper record the estimates, once their abilities to write numerals are developed. In order to put the emphasis on thinking, not who does the estimating, no record is kept of who gives which estimate, and only the numbers are recorded. Once a collection of number estimates is gathered, the children are asked to examine the range. I often use the adding machine number line or the growing 1 – 100 pocket chart to point out the least and the greatest estimate. Then the objects are counted orally with the student helper assisting by putting one object at a time back into the jar after the contents have been spilled out. This daily modelling of a management system to count with one-to-one correspondence becomes useful to some students who have not yet developed a system for keeping track of the number of objects that they are counting.

Once the total number of objects in the jar has been determined, the estimates are revisited. Which ones are close? How do we know? Could we find the exact count on the number line or 100 chart? To provide an additional way to model how to keep track of our estimates, the teacher or the student helper draws a box around the actual count and underlines the estimates that are close to the actual count. Usually, there is a considerable amount of discussion about how to determine when an estimate is close. Many students have systems for determining closeness and I am always interested in hearing about their thinking.

During our class sessions with the estimation jar, I try to structure the discussions about reasonableness of estimates with a variety of strategies. I sometimes interrupt the actual counting of the objects and ask for new estimates. When we get to some milestone such as ten or twenty, I often ask for some revisions. This gives some students a chance to eliminate some of the numbers we've already counted and think about the ones that are outliers. Some children ask to revise their estimates when they have this more helpful information. I want children to have reasons for their revisions and once again will ask them to describe their thinking.

The daily estimation activity continues throughout the school year with several other variations. Sometimes we have a jar with a known quantity as a reference. For example, if the unknown number of objects is 25, I provide an identical size jar with 10 or 20 of the same objects in it and allow the students to use that information to inform their estimates. This referencing activity becomes very interesting to me because I am able to hear what students think when something is a little bit more, double, or quite close to the reference jar. Some children use that information and others do not.

Counting On Procedures

Counting on is another procedure that can be added to the estimation jar activities. I already have information about which students could count on 2 more objects and which students could not do this from my earlier assessments. To illuminate *counting on* during the daily estimation task, the original procedures always remain the same. I then dump out the contents of the jar and begin to put the objects back into the jar while we count orally one by one. When we reach a number that is two or three away from the total count of the jar, I stop and say, "There are two more. Does anyone want to revise their estimate?" Then I record the new estimates. This is very exciting as many students just seem to know how many are in the jar without us having to actually do the counting! I continue to do this sort of stopping just one or two items before the total is known and seeking revisions. As a result, there is a great deal of interest in "doing the estimate jar".

Working with Tens and Ones

We had been counting by tens, putting straws in bundles of tens, trading pennies for dimes, and so forth.

The children were fascinated with the tens patterns which were flagged with red transparent square flags on our hundreds chart. Often, we looked for patterns on the chart going down, going to the right, going to the left, etc. On one day there were 35 counters in the jar. There was a range of estimates from 20 to 66. As we were counting the objects, I decided to stop at 30 instead of one or two away from the total. I told the students that it looked like there were five more yet to count. My student helper confirmed my remarks. So, my question for them was, "If we have thirty in the jar and there's five more to count, do we have a way of knowing how many there are in all?"

We had several guesses of 32 and many guesses for 35. As I looked over the group before me, I saw lots of fingers being counted.

Counting on from a multiple of ten continued for about three weeks. It was amazing to hear their thinking and see the children struggling to find numbers. Some went up to the hundreds chart and used the pointer to show their thinking.

One day we encountered an interesting situation. Instead of stopping at 20 for the 23 objects in the jar, I stopped at 19 and told the children there were four more objects yet to count. When I asked the children if there were revisions or new estimates for our jar, many children suggested 24. I was surprised since I had expected them to continue with their counting on process. I asked for explanations and one student said, "Because there's four more!" Others agreed. One student, Jake, said that there were "23." Without a facial expression to show my gratitude, I asked him how he knew that. He said that he knew because he counted on, demonstrating with his fingers. I asked the other children what they thought of his explanation and there was some general confusion. I said, "Now we have some estimates for 24 and one for 23…does anyone want to revise?" There were no revisions. I was hoping that Jake would hold on to his idea and not be persuaded by the group. He did! I also hoped that his argument would persuade others to revise their estimates. It didn't. We decided to settle it and counted from 19 on to 20, 21, 22, 23.

This was a wonderful and awful experience for me. I am humbled by how much I need to learn about how children think and how I can support their thinking. I was going along my merry way thinking about the logical structure of the number system of "tens and ones" and many of the children were playing an entirely different game called "figure out the pattern and guess the number".

It is clear to me that when we ask children to think about numbers, we need multiple opportunities for them to construct their understanding. Using something as simple as a daily estimation jar will assist them with their development of number ideas and also be a routine that allows all to understand because the vocabulary and ideas are so accessible and real.

Reference

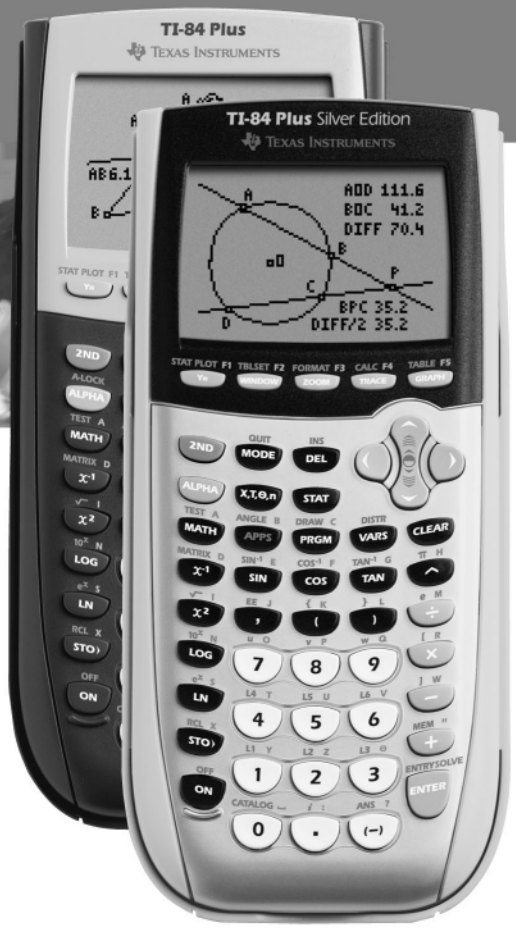
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▲ Resources for Teaching Data Management

JOEL YAHN, STATISTICS CANADA AND SHIRLEY DALRYMPLE, YORK REGION DISTRICT SCHOOL BOARD



Joel Yahn has been part of the Learning Resources Team at Statistics Canada for more than 10 years. As a mathematician he is passionate about developing StatCan resources for math and helping teachers use these resources with their classes.

Resources for Teaching Data Management: (MDM4U)

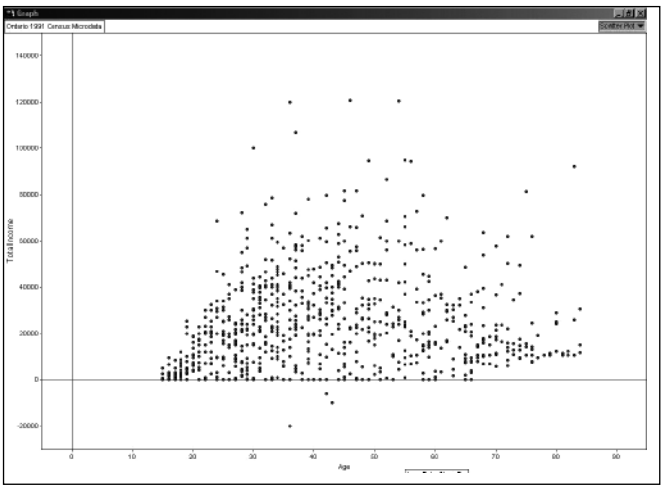
Many teachers of the Mathematics of Data Management course (MDM4U) are finding it challenging to help their students find appropriate data and resources for their culminating projects. Statistics Canada is working to provide new datasets, teaching activities and web resources, in collaboration with our education partners, to support teachers and students. This article will outline several of these resources. The following is a summary of some of the best and latest resources on 3 web sites designed to support teaching the MDM4U course.

1. Learning Resources at Statistics Canada web site (www.statcan.ca)

Find Statistics Canada's best resources for teachers on the Statistics Canada site under **Learning resources**, then **Resources by subject** at http://www.statcan.ca/english/kits/teach.htm. Then click on mathematics. This links to math lessons, organized by level and strand.

By clicking on the *Articles* tab, teachers and students are directed to resources including *Statistics: Power from Data*, an on-line resource designed for independent learning of statistics.

By clicking on the *Data* tab you will find links to data sets that are ideal for MDM4U projects. For example, there are 12 microdata files with about 1000 cases and 40 attributes per province from the 1991 Census. These datasets can be downloaded in spreadsheet format in English or French directly from the StatCanada web site at http://www.statcan.ca/english/kits/pumf91/intropages.htm and http://www.statcan.ca/francais/kits/pumf91/intropages_f.htm. Then you can use the e-drop to transfer the data directly to *Fathom* format. When used with *Fathom*, these data sets can produce scatter graphs and analyses as shown in the Figure below.



"Statistics: Power for data is a nice online alternative to textbook study and teacher directed discussions. Some of my students who read through the section entitled Data Collection said they liked using information from a 'real source'. It seemed more closely linked to the "real world" coming from Statistics Canada rather than from their textbook. The tutorial lessons are generally in plain language – very suitable for high school students. Although the topics do not completely mimic the Grade 12 curriculum, they provide a larger picture of the processes of gathering, organizing and analyzing information."
Dawn Ponzi, Math teacher and Department Head
The Woodlands School, Peel DSB, Mississauga, Ontario.

These Canadian census datasets can also be downloaded as *Fathom* collections with explanatory comments from the *Fathom* web site at http://www.keypress.com/fathom/SampleDocs/docs.html. You will also find other Canadian and international datasets and many useful *Fathom* teaching activities under "Activities" on this site.

The Daily is Statistics Canada's best source of updated articles on all data and information released from any of the more than 250 surveys and statistical

programs. No new data are made available, without first being announced and highlighted in *The Daily*. Once students have selected a project topic related to Canada, they can subscribe to receive automatic announcements from *The Daily* related to their project topic. To do this, from www.statcan.ca, they click on '*The Daily*' in the top navigation bar, and then 'Free Subscription'. They will be prompted to select the subject(s) of interest to customize their free subscription to *The Daily*. Then they will receive, by e-mail, hyperlinks to articles and data release announcements on their selected subject(s).

Census at School is an international online project that can be used to teach students about handling and interpreting data and can also be used as a source of data for student projects. The project began in the United Kingdom in 2000 and now includes participation from schools in Australia, Canada, New Zealand and South Africa.

Students in each participating country anonymously fill in an online survey in class. They supply non-confidential information about themselves and then submit their responses to a national database. The information from these national databases is added to an international database that is maintained in the U.K. Teachers access the results of their own classes' survey and can also request random information from the databases to make national and international comparisons.

Some of the questions on the Canadian survey are common to all participating countries; others were developed in Canada. Students answer general questions about such topics as their height, the time it takes to travel to school, the breakfast foods they prefer, and their favourite subject at school. None of the survey questions ask for confidential or identifiable personal information. Responses remain anonymous as no names or numbers are attached to them.

Several learning activities are available on the site, suitable for various grades from 4 to 12. Of particular interest to the MDM4U course is Random Data Selector for international data from the UK *Census at School* site. Get to it under "Data and Results" at http://www19.statcan.ca/04/04_000_e.htm. Specific activities using data analysis software and international data have been developed for the Ontario curriculum by Tom Steinke and Stewart Craven of OAME. A Grade 9 activity on "Exploring Linear Functions" is currently available on the site and others will be coming soon. All the resources and data are available from the Statistics Canada learning resources home page, http://www.statcan.ca/english/edu/index.htm

2. Brock University MDM4U web site - http://www.brocku.ca/cmt/mdm4u/resr/index.html.

The MDM4U Teacher Support Page at Brock University is a great resource which is very helpful in supporting the MDM4U course. Statistics Canada has helped to add links to new resources on this site which include:

- More student projects and links to over 20 exemplary culminating projects, many using StatCanada data.
- Teaching activities that can be used for introducing your students to the microdata files of individual cases provided in the Statistics Canada folder on the Ontario *Fathom* CD-ROM, and to the 1991 Census microdata files mentioned above.

3. Resources from the MDM4U site from the Ottawa Carleton District School Board http://www.ocdsb.edu.on.ca/teacher_res/secondary/tecint/mdm4u.htm

This MDM4U web site is organized by categories, as outlined below, for easy navigation.

Sample Culminating Projects from OCDSB Students

- This section provides teachers with possible project ideas and makes suggestions for how students might organize their projects.
- There are examples of full reports, Power Point presentations and project summaries.
- Teachers may prefer that students generate their own ideas for projects before visiting this web site and suggest its use after analysis has begun. If students gather new ideas from this site or others, they may want to document them in their project portfolio.

Sample Activities from Statistics Canada for the Data Management Course

- This is a selection of classroom ready activities that help students to find and analyze data from the Statistics Canada site and on E-STAT. Some of these are available in both English and French.
- There is also an activity to use with a class that shows how to combine any of the 1700 census attributes available on E-STAT for exploring relationships such as the link between education level and income.

Getting to Know the Statistics Canada Web Site

- This provides links to a 'First Visit' document that provides an overview of what you can find at the Statistics Canada web site and where to find it.
- This section also provides useful hints for finding data, reports, and other resources on the Statistics Canada web site.

Getting Project Ideas from the Statistics Canada Web Site

- There are many resources available on the Statistics Canada web site that can help spark project ideas.
- Starting points for students who are looking for project ideas are suggested along with links to relevant resources. The topics suggested have a wide appeal.

Researching Project Topics at the Statistics Canada Web Site

- Once students have chosen a topic to investigate, there are many different places on the Statistics Canada web site to look for information on their topic. A few starting points are listed.
- Resources include free publications, E-STAT articles, E-STAT CANSIM data, demographics and maps.

Statistics Canada Resources for Creating Your Own Surveys

- Students who are interested in creating their own surveys can benefit from looking at the surveys from Statistics Canada and reading about how real life surveys are created.

Other Data Sets from Around the Internet

- The Statistics Canada site is the best web site for finding data about Canada and Canadians. But it is a big world out there, and there are many other Internet web sites that provide useful and interesting data.
- The links include on line data sets at the Math Forum, U. K. National Statistics, U.S.A. National Centre for Educational Statistics and others.

Other Internet Web Sites of Interest

- These sites are aimed at assisting the teacher with planning and managing the culminating project.

This MDM4U web site is maintained by Dan MacKinnon, through the OCDSB's Educational Technology Integration program - a partnership between the OCDSB and the Ottawa Center for Research and Innovation. Readers are encouraged to send comments or suggested enhancements to Dan at Dan_MacKinnon@ocdsb.edu.on.ca. or to Joel at mdm4u@statcan.ca.

In future editions of this column, Statistics Canada will highlight the new Census of Schools project (www.censusatsschool.ca) and other great resources to support mathematics teaching with authentic Canadian data. If you have suggestions on what you would like to see in this column or stories to share related to the use of StatCan resources please e-mail Joel at mdm4u@statcan.ca ▲



▲ OAME/NCTM March 2004 Report



FRANCES SCHATZ

Membership Information and Benefits

To access everything on the NCTM web site, one needs to have at least an individual membership. Membership dues support the development, coordination and delivery of NCTM services. For Canadian dollar rates, please e-mail me for a current individual application form. Online with credit/debit card means you pay full exchange rate. In Canadian dollars a one year, one journal membership costs $117.50 including postage and must be paid by Canadian dollar cheque.

New Features on the NCTM Web Site

In December I introduced the Members Only sections. The newest feature is *Reflections*. This site is NCTM's video-based, professional development web site. It is designed to help teachers – individually and collectively – examine their teaching of mathematics. Whether the site is approached through the individual lessons or topics, the heart of *Reflections* is a set of critical teaching questions. Each question provides a set of video clips from the lesson and from pre- and post-lesson discussions. For more information, check out http://my.nctm.org/eresources/reflections. Unfortunately, this is available only to NCTM members. By drawing from other countries and cultures, the guiding belief is that *Reflections* is a powerful mechanism for reducing isolation, improving practice, and raising levels of student achievement.

A Few Out-of-Print Resources Available

Please e-mail, phone or write to me if there is a title you are looking for or if you wish to see the current list with sale prices given. As the Ontario representative I would like to find homes for these 'golden' gems before the display collection goes to the new Ontario representative who will be introduced in the June issue. These would also be excellent additions to new school libraries at wonderful prices.

New Publications Released

#12576 *Teaching Mathematics through Problem Solving: PreK-6*.

#12577 *Teaching Mathematics through Problem Solving: 6 – 12*.

The main goal for both of these books is to help students develop a deep understanding of mathematical concepts and methods by engaging them in problematic tasks. Both volumes give teachers the coherence and direction needed to use problem solving to teach mathematics. There are three main sections: I) Issues and Perspectives; II) In the Classroom; and III) The Role of Technology with a research perspective. The Teacher Stories represent a wide range of classroom settings.

Authors Needed

NCTM calls for manuscripts for the October 2005 Focus Issue of Teaching Children Mathematics. The focus is 'Posing and Solving Problems'. For a copy of the guidelines visit http://my.nctm.org/eresources/tcm/calls_tcm.asp. Potential authors should submit a first draft of the proposed manuscript by **July 12, 2004**.

There is also an open submission call for 'Teaching Entry Level Courses' for the *Mathematics Teacher*.

NCTM Annual Conferences

- **Philadelphia, April 21 – 24, 2004**. Watch the web site for the preview brochure.
- **Anaheim, April 6 – 9, 2005**. Watch the web site www.nctm.org/annual for more information.

If you are interested in being a speaker at the Annual in Anaheim, California, April 6-9, 2005, your proposal must be submitted by **May 1, 2004**. The proposal form is on the conference part of the web site.

Special Order to Please You

A most popular item for Ontario math teachers is the 'I Love Math' Postcals –a postcard with heart stickers that all say 'I Love Math'. NCTM discontinued them, so I asked if they would do a special printing of them. My wish came true. The price is CAD $1.00 includes GST and shipping. The original price had gone to $1.25 until they were discontinued. On your order write the number **#6020**. The price is the same, member or non-member. These make great motivator awards and 'surprise mail'. There are a few left; don't wait until the conference to obtain them. ▲

▲ A Surprising Solution to a Seemingly Standard Distance-Rate-Time Situation

BONNIE H. LITWILLER AND DAVID R. DUNCAN
PROFESSORS OF MATHEMATICS
UNIVERSITY OF NORTHERN IOWA
CEDAR FALLS, IOWA



Bonnie Litwiller and David Duncan teach mathematics and mathematics education courses at the University of Northern Iowa. They have published over 850 articles in journals for mathematics teachers and have spoken at numerous professional meetings. Each has served as President of the Iowa Council of Teachers of Mathematics and Dr. Litwiller has served on the boards of NCTM, SSMA and AMTE.

Consider the following situation. Danisha is swimming upstream (against the current) in a river at a constant rate. After swimming 400 metres upstream from the dock, she meets Monique who is floating downstream on an air mattress. Danisha continues to swim upstream for 10 more minutes. She then turns around and swims downstream. Danisha reaches her original starting point, the dock, at the same time Monique floats in on her air mattress.

Assume that Danisha's rate of swimming in the river is a constant for the entire trip. Based upon this information, find the rate of the current and the rate that Danisha can swim in still water.

Let the current of the river be x metres per minute and let Danisha's rate in still water be y metres per minute. Many algebra students are able to solve "river problems" involving the rate of the current and the rate of the boat or swimmer in which one rate is given and the other is to be found. Such problems resolve to one equation in one unknown. This, however, is not the case in our situation, since both variables represent unknown quantities.

Most algebra students remember that distance-rate-time problems employ the following formulas:

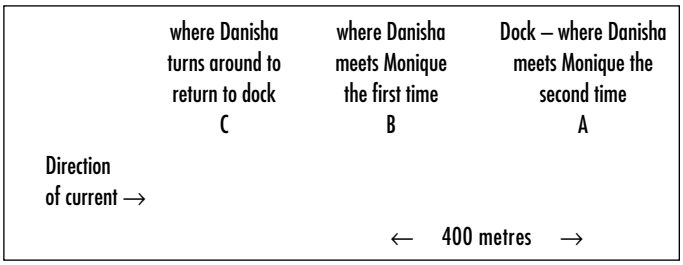
$$d = rt \quad (\text{Formula } 1)$$

$$r = \frac{d}{t} \quad (\text{Formula } 2)$$

$$t = \frac{d}{r} \quad (\text{Formula } 3)$$

Also, most students know that they should draw a picture to help them set up the equation. Figure 1 depicts the situation.

Figure 1



To write an equation, we will represent in two different ways, the length of time that elapses from the time that Danisha first meets Monique to the time that Danisha meets Monique at the dock.

1. Focus on Monique. She floats 400 metres at x metres per minute to go from B to A. The time required is $t = \left(\frac{400}{x}\right)$ minutes, using Formula 3.
2. Focus on Danisha. We must determine the length of time required to swim from B to C, C to B, and B to A. Consider these three times separately.
   (i) B to C. This takes Danisha 10 minutes.
   (ii) C to B. To find this time, we first need to know the distance from C to B; however, this is the same as the distance from B to C. Since Danisha's rate (relative to the bank of the river) when going upstream is (y – x) and since the trip from B to C took her 10 minutes, the distance from B to C is 10(y – x) metres, using Formula 1. Consequently, the time required for Danisha to swim from C to B is $t = \frac{(y-x)\cdot 10}{y+x}$ minutes, using Formula 3. The denominator, (y + x) is Danisha's rate relative to the bank of the river when she is swimming downstream.
   (iii) B to A. Since this distance is 400 metres and since Danisha's rate relative to the bank of the

river is (y + x), the time required is $\frac{400}{y+x}$ minutes, using Formula 3.

The total time required for all three parts of Danisha's trip is, thus:

$$10+\frac{(y-x)\bullet 10}{y+x}+\frac{400}{y+x}$$

The times of Monique and Danisha are equal; therefore, the following equation may be written:

$$\frac{400}{x}=10+\frac{(y-x)\bullet 10}{y+x}+\frac{400}{y+x}$$

$$\frac{400}{x}=\frac{10\bullet(y+x)}{y+x}+\frac{(y-x)\bullet 10}{y+x}+\frac{400}{y+x}$$

$$\frac{400}{x}=\frac{10y+10x+10y-10x+400}{y+x}$$

$$\frac{400}{x}=\frac{20y+400}{y+x}$$

$$\frac{400}{x}=\frac{20(y+20)}{y+x}$$

$$\frac{20}{x}=\frac{y+20}{y+x}$$

$$20(y+x)=x(y+20)$$

$$20y+20x=xy+20x$$

$$20y=xy$$

$$20y-xy=0$$

$$y(20-x)=0$$

Observe that the left hand side of the equation factors. Since one factor involves only x and the other factor involves only y, each of the factors may be set equal to 0 to achieve a solution. If either of the factors would have involved both variables, a second equation would have been required to find a solution.

Solution 1: y = 0. This would mean that Danaisha's rate in still water is 0. In other words, Danisha and Monique are both floating with the current. Regardless of the speed of the current, x, Danisha and Monique will float together from B to A. Therefore, any value of x may accompany y = 0 to yield pairs of solution of y(20 – x) = 0.

Most students reject this "trivial case" solution because Danisha could not have swum from A to B, and because C would have to be downstream from B, not upstream.

Solution 2: 20 – x = 0, so 20 = x. This would mean that if the current were 20 metres per minute, the conditions of the problem are fully satisfied regardless of the speed at which Danisha can swim, assuming that she is swimming faster than the current.

The fact that Danisha's swimming rate is immaterial so long as the current is 20 metres per minute does not seem intuitively obvious. The validity, of course, rests with the algebra. However, we shall cite two numerical examples to make the result seem more acceptable:

(i) Suppose that Danisha can swim 25 metres per minute. The distance from B to C is thus (25 - 20) •10 = 50 metres. The total distance from C to A is 50 + 400 = 450 metres. Since Danisha's rate relative to the bank of the river is 25 + 20 = 45 metres per minute when going downstream, she goes from C to A in only 10 minutes. Together with the 10 minutes required to go from B to C, Danisha's trip takes 20 minutes. While this is occurring, Monique floats 400 metres from B to A at 20 metres per minute. Her trip also takes 20 minutes.

(ii) Suppose that Danisha could swim at an "Olympic" rate of 100 metres per minute. The distance from B to C would then be (100 • 20) • 10 = 800 metres. Danisha would then swim the 1200 meters from C to A at 120 metres per minute. The trip from C to A would take 10 minutes, resulting in a "B - C - A" trip of 20 minutes – again the same as Monique.

Challenges to the reader and his/her students:

Vary the distance and times which were given and calculate the results for those new problems.

Make up other problems which involve two variables whose solution requires only one equation. ▲

▲ Jack Weiner's Friday Specials!



JACK WEINER

Well, hello and welcome to 2004. I know, I know, it's late March already as you read this, but I am writing at 2:20 pm on January 1. So, Happy New Year!

Here is my first official Friday Special, (since I used the last issue for "How to Get an 'A' in Math") – a really terrific card trick.

About 10 minutes before the end of Friday's class (or anytime you feel is the right time for a break from the routine), have your students close their books and join you at the front of the room between your desks and theirs. Have them form a circle around you, some sitting, some standing behind so that everyone can see as you sit on the floor in the centre with a deck of cards.

1) Have three students pick one card each from the face down proffered deck and have a fourth student hold all three cards.
2) Ask, "Do any two cards add up to 10?" If the answer is "Yes", exchange cards so the answer is "No!"
3) Place about 12 cards face up on the floor.
4) From the remaining deck, cover face-up pairs that add to 10, such as 4 and 6. Cover any 10 with one card. Cover Jack, Queen, King as a set.
5) If at any stage, there is nothing left to cover, put another four or five cards from the remaining deck face-up to make new piles.
6) When you run out of cards, you may have one left over. Let it be a separate pile. **(DO NOT use it to cover one half of a pair that adds to 10.)**
7) Now, combine piles using the same rules as in step 4. Set these aside. For example, if 3 and 7 are the top cards face up on two piles, put these together and discard all the cards in these two piles.
8) When there are no piles left that you can collect, you will be able to figure out the three missing cards. Congratulations!

Examples:

Look at the top card on each of the remaining piles.

1) Leftovers: 2 5 9	Solution: 8 5 Ace
2) Leftovers: 3 6	Solution: 7 4 10
3) Leftovers: 4 K	Solution: 6 J Q
4) Leftovers: J Q	Solution: K 10 10
5) Leftovers: Nothing!	Solution: J Q K OR 10 10 10.

Which? You will remember, I am sure, whether you covered hardly any 10's. If this is the case, the answer is three 10's. Otherwise, J Q K!

Why does it work?

Some students may suggest you are memorizing the forty-nine cards as each makes an appearance and thus determine the missing three. I don't know about you but I am not that smart. (I once lost a game of "concentration" to my senior high school crush Jan by a score of 50 to 2! Ruined our relationship! I was too embarrassed to see her again. Sorry, too much information.)

Consider, for example, leftovers 2 5 9. You only cover a 2 in conjunction with an 8. This is key: **ALL FORTY-NINE CARDS APPEAR FACE UP DURING THIS TRICK**. Three 2's are covered with three 8's. The remaining 2 could not be covered because one 8 is missing and so this 2 must remain atop an uncollected pile. Similarly, one 5 and one Ace were missing from the forty-nine cards forcing a pile topped with a 5 and another with a 9 to be leftover.

Go back to step 2. Why ask the "add to 10" question? Suppose the three missing cards were 2 8 7. At the end, there would be one pile with a 3 on top. You could only conclude that one of the missing cards is a 7 and the other two comprise a pair that adds to 10.

An alternative to exchanging cards is to renumber J, Q, and K as 11, 12, and 13 and ask if any pair adds to 13. If not, do the trick based on sums to 13. King is covered by itself, and all the other cards are covered in pairs. For example, Ace is paired with Queen (1 + 12).

A Note about the December 2003 Column

The electronic file included "How to Get an 'A' in Math" and "How to Get Extra Help". The latter was included in the column but without the title. Mea culpa. Please go back to the December issue and re-read the second part of the column with this second title in mind. All will become clear. Cheers, Jack ▲

▲ BOOK REVIEW: *TEACHING WITH RICH LEARNING TASKS*

AUTHOR: GARY FLEWELLING WITH WILLIAM HIGGINSON
REVIEWED BY: TREVOR BROWN

Trevor Brown is a former Mathematics Consultant with the Toronto District School Board. He is the Course Director in Mathematics Education for York University and OISE/University of Toronto. Trevor has been a presenter at Leadership, OAME and NCTM National Conferences and has been a co-author of two series of mathematics textbooks. He was also a developer of the Ontario 1-8 Mathematics Exemplar Project

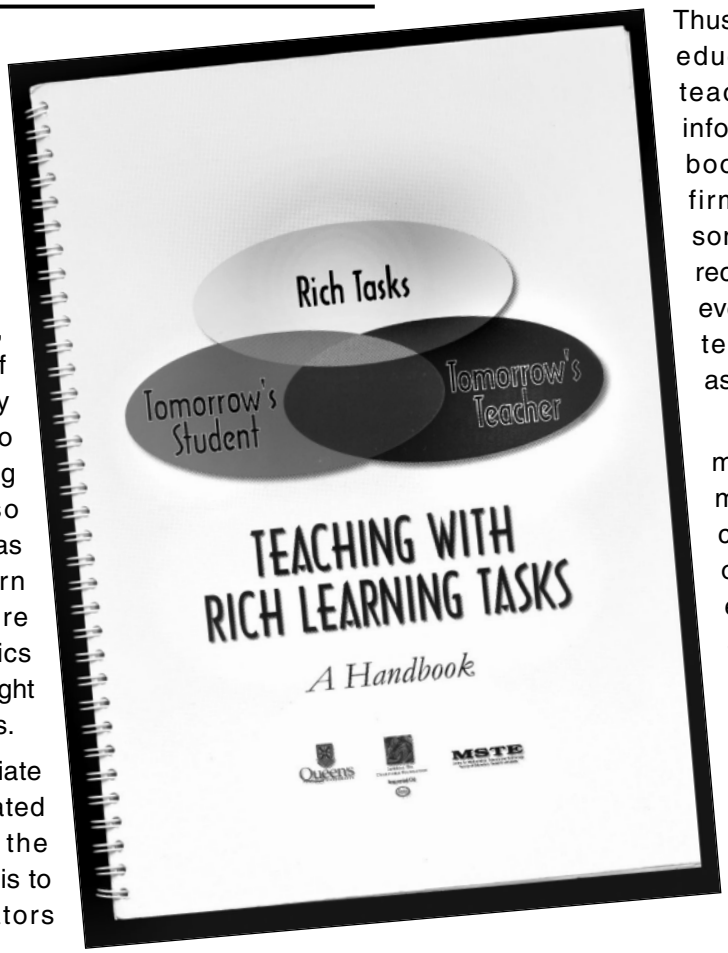
The on-going and at times very spirited debate as to what are the critical elements of rich learning or assessment tasks and how and when they should be used in the mathematics class, continues to be a focus of discussion amongst many educators. It is also fair to state that in discussing this topic, we are also expressing our opinions as to how students learn mathematics, the nature and value of mathematics and how it should be taught as to engage the students.

One way we can initiate a very lively and animated discussion about the teaching of mathematics is to ask a group of educators and/or parents, what should be happening inside the mathematics classroom? [Chapter 2, Simon Says Do This] What types of questions should we be posing to get the desired results? [Chapter 6, How Good Is It?] What are the main differences between traditional questions and rich questions? How frequently should students be asked or required to respond to rich questions? [Chapter 8, We Need Learning Tasks That Support Sense Making] What about the traditional questions, do they still have a role to play? [Chapter 4, Why Am I Doing This]

There are, as anyone who has discussed this issue knows, many theories and opinions on each of these theories that are in some cases not carefully thought through, and in some cases, theories which have been shaped by carefully researched pedagogical theories.

Does mathematics make sense to many students? How many grade 8 students can correctly state why they "invert and multiply" when they are asked to "solve"?

The most recent edition of *Teaching With Rich Learning Tasks* is a book that is a must-read for everyone who has discussed these questions and still has some unanswered questions. Thus students at the faculties of educations, consultants and teachers will find a wealth of information and nuggets in this book. Some of the author's firmly-held beliefs will cause some to rejoice and others to recoil. Either way, it will cause everyone to examine his or her teaching practices and assumptions.



The author sees mathematics as a sense making endeavour and the classroom as the area in which originality, creativity, excitement and learning should be the norm and not the exception. In Chapter 4 these is an excellent analysis of the relevance of the learning task and this is followed by a critical look at the ten conditions for learning.

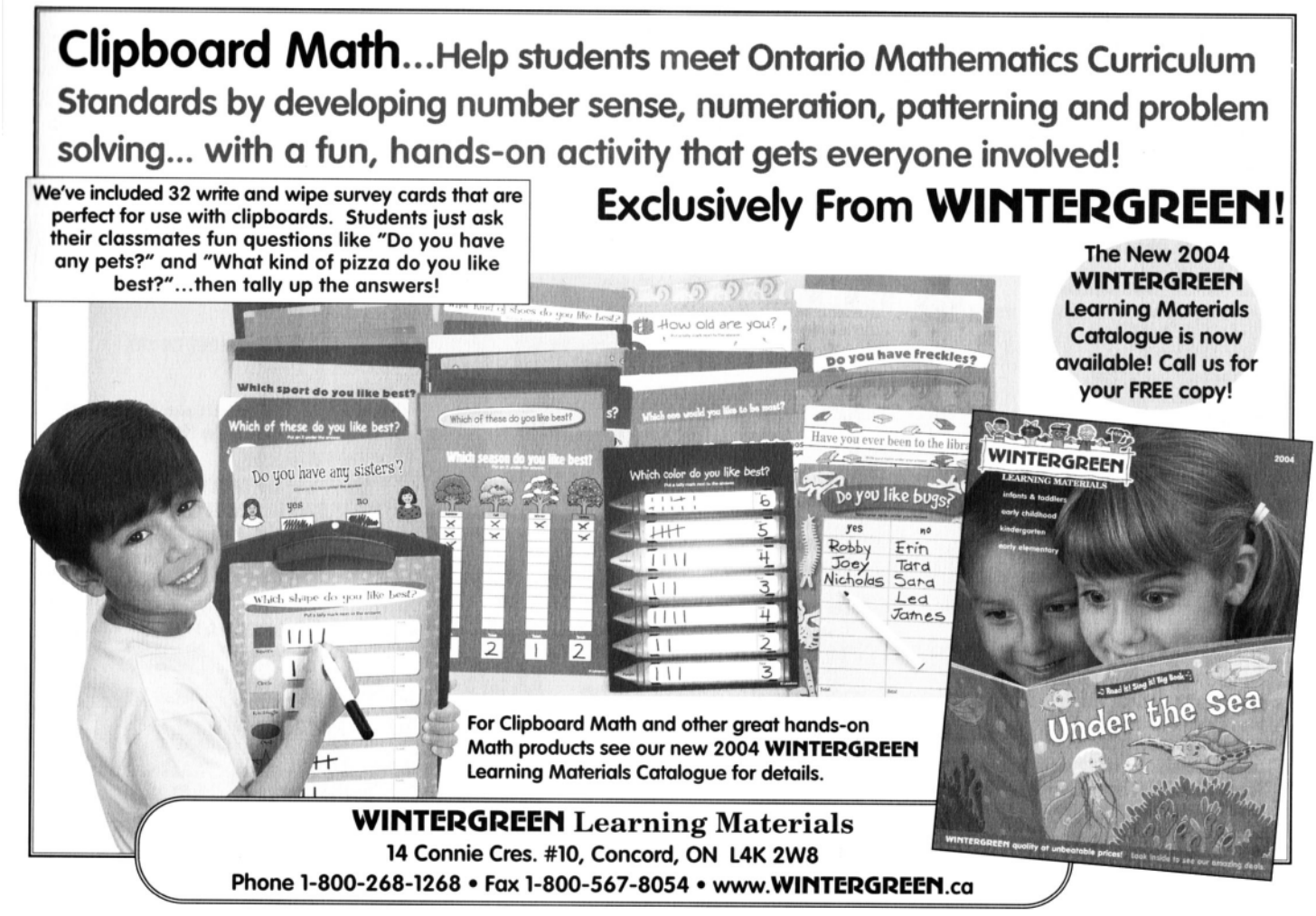
Chapter 8 compares a rich task with a pseudo-rich task. Teachers in Ontario will find this to be particularly instructive as the author has a critical look at some of the tasks, tasks which he calls pseudo-rich tasks, from one of the *Impact Math* books. This of course raises the question as to when to scaffold a task and what are the implications when this is done.

Many if not most (all?) teachers will find Appendix 1 to be both thought provoking and stimulating. This section discusses and analyses the idea that mathematics is a creative sense-making endeavour. In using some of the guiding principles found in *The Art of Problem Posing* by Stephen Brown and Marion Walter, he and Nathalie Sinclair have designed a set of rich and beautiful tasks that can be solved by using *Geometer's Sketchpad*. There is more than enough here to illustrate how one can empower students to see mathematics for what it essentially is – a study of patterns.

In the preface the author posed the question: "Who is this handbook designed for?"

He responds by stating: teachers in all grades and disciplines, faculty of education instructors, in-service providers, curriculum developers, resource developers, test developers and anyone with a serious interest or stake in education.

I concur! This is a must-read for all who have asked the question: "How should I be teaching the subject so that it is meaningful and 'relevant' to all my students?" ▲



▲ 2003-2004 OAME Board

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