

Ontario Mathematics Gazette

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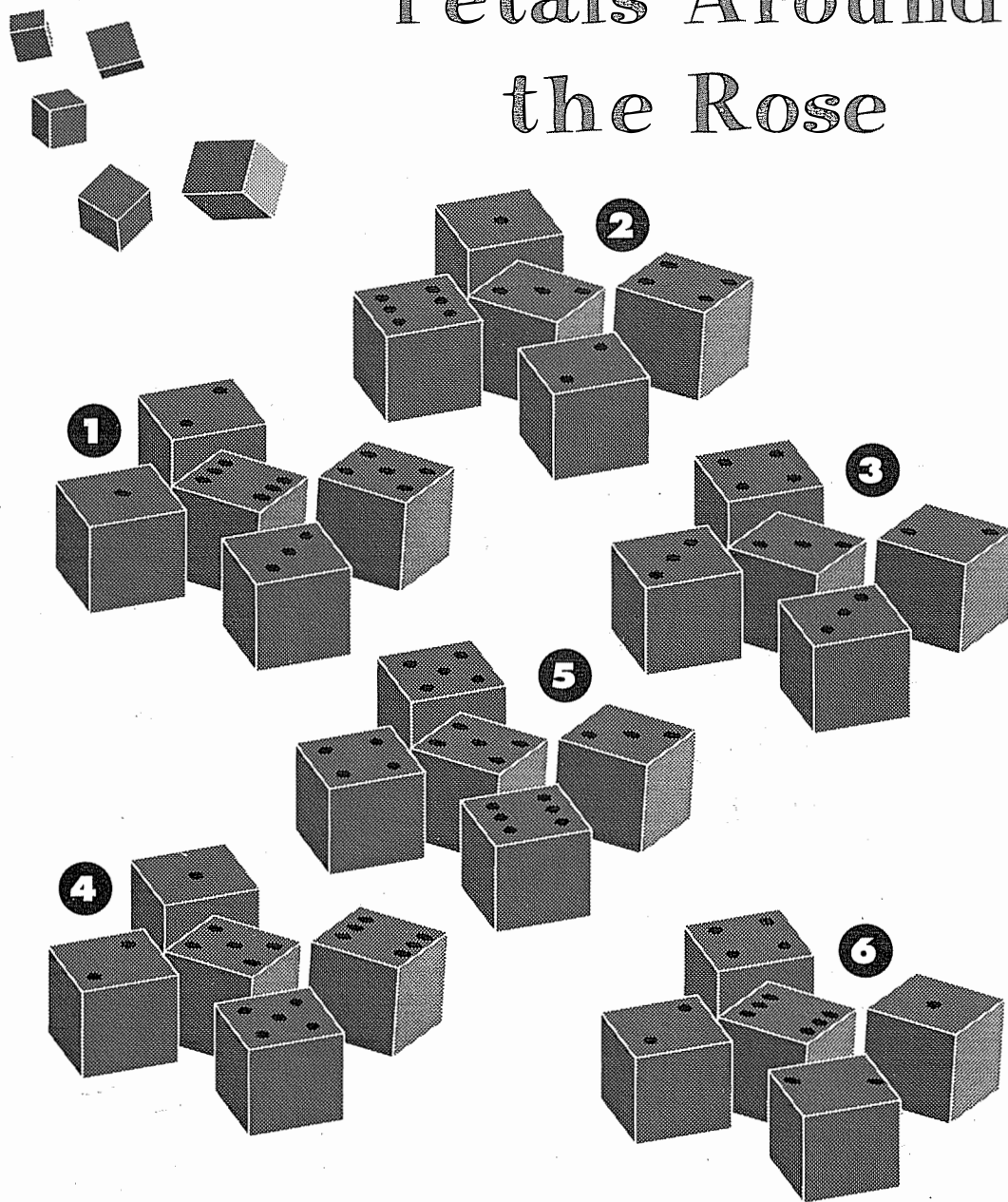
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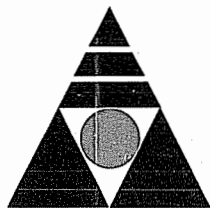
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"How do you write tests, homework & classwork?"

"by hand?"
(The old way)

Final Exam

- State the Domain of $y = \frac{x-10}{\sqrt{x^2-16}}$.
- Which relation is the inverse of $y = (x-2)^3$?
- Use a half-angle identity to find the exact value of $\cos 67.5^\circ$.
a) $\frac{1}{2}\sqrt{2-\sqrt{2}}$ b) $\frac{1}{2}\sqrt{2+\sqrt{2}}$ c) $\frac{1}{2}\sqrt{2}$
- If $f(x) = 2x-5$ and $g(x) = \frac{2}{x+3}$, find $[g \circ f](x)$.
a) $\frac{-(5x+11)}{x+3}$ b) $\frac{1}{x-4}$ c) $\frac{5x}{x}$
- If $\sin \theta = -\frac{1}{2}$ and θ is in quadrant IV, find $\tan \theta$.
a) $-\frac{\sqrt{3}}{3}$ b) $\frac{\sqrt{3}}{3}$ c) $\sqrt{3}$
- Given $f(x) = \frac{x^2-2x}{x+3}$ and $g(x) = 3x-2$, find $[f \circ g](x)$.
a) $\frac{4x^2-2x}{x+3}$ b) $\frac{4x^2+7x-6}{x+3}$ c) $\frac{4x^2-2x}{x+3}$

"struggling with your word processor?"
(The hard way)

Final Exam

- State the Domain of $y = \frac{x-10}{\sqrt{x^2-16}}$.
- Which relation is the inverse of $y = (x-2)^3$?
- Use a half-angle identity to find the exact value of $\cos 67.5^\circ$.
- If $f(x) = 2x-5$ and $g(x) = \frac{2}{x+3}$, find $[g \circ f](x)$.
- If $\sin \theta = -1/2$ and θ is in quadrant IV, find $\tan \theta$.
- Given $f(x) = \frac{x^2-2x}{x+3}$ and $g(x) = 3x-2$, find $[f \circ g](x)$.
- a) If $\sin \alpha = 1/3$; $\cos \beta = 3/4$; quadrant IV, find $\cos(\alpha - \beta)$
b) Evaluate: $\tan(\arcsin \frac{1}{3} + \alpha)$ quadrant angles.

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FINAL EXAM

- State the Domain of $y = \frac{x-10}{\sqrt{x^2-16}}$.
- Which relation is the inverse of $y = (x-2)^3$?
- Use a half-angle identity to find the exact value of $\cos 67.5^\circ$.
- If $f(x) = 2x-5$ and $g(x) = \frac{2}{x+3}$, find $[g \circ f](x)$.



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Deadlines for advertisements are January 23 for March issue, April 1 for the June issue, July 1 for the September issue, and October 1 for the December issue.

Full page advertisements are to be on 8.5" by 11" paper with a minimum of 1/2" margins and single sided. Each advertisement should be camera-ready and colour advertisements should have no bleeds.

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Articles for the Gazette should be submitted to John Egsgard at the address on the left.

Deadlines for information to be included in the Gazette or the Abacus are: June 15 for the September issue, October 15 for the December issue, January 15 for the March issue, and April 15 for the June issue.

Notice to Authors

Your article should be typewritten or word-processed, double-spaced on one side of 21.6 cm x 27.9 cm paper with 3 cm margins. Diagrams and figures should be drawn by computer, if possible, or neatly drawn in black ink in camera-ready form. Please submit four copies to the editor and keep one as protection against loss. Submissions are blind-reviewed, so please send your full address and affiliation on a page separate from the manuscript. Computer files of text, and graphics where possible, will be requested later if your article is accepted.

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▲ EDITORIAL

JOHN EGSGARD



Once again the Ministry of Education is abdicating its role in the curriculum. As we learned recently curriculum making is to be tendered out (to the lowest bidder?). Does this mean we may get a "made in the USA math curriculum" or one coming from Europe or Asia? If the Ministry persists in their error in this regard our only hope is that the OAME will see to it that capable mathematics educators in Ontario offer their services. See *Presidents Message*.

This issue of the *Gazette* contains an article that continues the discussion on the curriculum begun by Geoffrey Roulet in the December, 1996 issue. A new column called *The Devil's Advocate* begins in this issue. I hope that many of you will respond to this column with letters to the editor or an article. You will also find two articles that refer to the use of the computer, *Ontario Educational Software Service Math Software* and *Using the Equation Editor with Word Perfect*.

Exploring Mathematics on the World Wide Web

Math Internet Projects and Activities re-printed here with authors permission.

Evan Glazer, Glenbrook South High School, Glenview, IL

e-mail: eglazer@glenbrook.k12.il.us

The handout in hypertext form can be found at:

<http://www.glenbrook.k12.il.us/gbsmat/glazer/ho.html>

The following WWW addresses are locations which use and apply mathematics on the Internet. The locations have been categorized into areas related to communication, interactive sites, downloadable programs, accessing data, resource databases, and miscellaneous fun. If you have Internet access, you can view any of these sights by opening a WWW application, such as Netscape or Internet Explorer, and entering in a corresponding address.

Communication

Ask Dr. Math	http://forum.swarthmore.edu/dr.math/dr-math.html
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Base Plate Project	http://www.mste.uiuc.edu/davea/index.html
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Math Magic	http://forum.swarthmore.edu/mathmagic/
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Algebra Online	http://www.algebra-online.com/
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Noon Observation project	http://www.ed.uiuc.edu/coe/projects/noon-project/
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cont'd on page 16

▲ LETTER TO THE EDITOR

CAROLYN AYLWARD-VIVEROS
ST. JOHN'S-KILMARNOCK SCHOOL

Dear Editor

In the December, '97 issue, L. Keith Roy provides some interesting ways of factoring numbers of the form 2^k-1 in his article **Exploring 2^k-1** . He notes that 2^k-1 is a prime number for $k=2$ and 3 but not for $k=4$. This remark and the results discussed by Roy in his article invite the reader to ask: for what values of k is 2^k-1 a prime number? Of course, one would like an elementary answer to the question if possible.

An additional factorization of 2^k-1 to those discussed by Roy in his article stems from the basic algebra result: $a^2-b^2=(a-b)(a+b)$ for any a and b numbers. Using this result one immediately sees that when k is even, $k=2m$ with m a positive integer,

$$2^k-1=2^{2m}-1=(2^m)^2-1^2=(2^m-1)(2^m+1).$$

This has the following general implication: except for $k=2$, none of the numbers 2^k-1 is a prime number for k even. This provides a partial answer to the question raised, namely that at least "one half" of the numbers 2^k-1 are not prime!

Note that subsequent applications of the above factorization provide additional factors in some cases. For instance,

$$2^8-1=(2^4-1)(2^4+1)=(2^2-1)(2^2+1)(2^4+1)=3 \times 5 \times 17.$$

Is 2^k-1 a prime for any odd k bigger than 3 ? The answer is NO, why?

Sincerely,
Carolyn Aylward-Viveros

Statistics Canada is holding a web page building contest for classes, the main criteria being that the page contains data from the StatsCan web site. There will be a \$100 prize to the winning class. Further information may be obtained from Alanna MacDougall (macdala@statcan.ca) or from the web site at <http://www.statcan.ca/english/kits>.

▲ PRESIDENT'S MESSAGE

JUDY CROMPTON



This is my last message to you in the *Gazette* as President of OAME. I am having trouble getting it started. I'm not sure why.

Perhaps it is the time of year ... January exams start in two days and panic has begun to set in for students. For me too. I seem to be looking forward to an awful amount of marking in an awfully short time.

Perhaps I am having difficulty in choosing what to speak with you about.. It has certainly been an eventful year for teachers ... release of new Grades 1-8 curriculum guidelines for Language and Mathematics in June for implementation in September ... a two-week protest in October - November ... release of Secondary Reform Plans in January ... also in January the release of the Request for Proposals for writing secondary curriculum.

Where has OAME been through all of this? Right in the middle. As I mentioned in previous messages, our **Early/Formative Years Committee** has been reviewing the Grade 1-8 guideline, has produced one article and is working on a second. Our **Transition Years Committee** has just completed an augmented version of the continuum in the guideline for Grades 6-8. This is an excellent piece of work that will be of great use to you. It will be available to Chapter Representatives for distribution in the very near future (or may already be there by the time you read this). Ralph Connolly, our President-Elect, is leading a joint Primary assessment project with the Consultants and Coordinators Association of Primary Educators. The aim of the project is to produce the third in our series of assessment documents which are designed to provide classroom ready activities supported by field-tested ideas for assessment. We are very pleased to be in a partnership with CAPE on this project.

A major development in secondary is the request for proposal process being used by the Ministry to write curriculum. Qualified groups may make proposals to the Ministry within specified criteria to write curriculum for the

various secondary subject areas. OAME is preparing a proposal as part of a consortium with other members of the Fields Institute Mathematics Education Forum. The timelines for both proposal writing and curriculum writing are vary tight. But we believe that Ontario curriculum must be written by Ontario educators. We also believe that we have the ideas and the human resources to create a curriculum that will bring about meaningful and worthwhile change in mathematics education.

OAME will continue to be involved on your behalf. Through the Executive, the Board of Directors, the local chapters, we aim to promote excellence in mathematics education at all levels and to support teachers as they strive for it. We need your help in doing this. Attend the

Annual Conference in North Bay in May – a top-notch team is putting together a fabulous program for your benefit. Get involved locally. Attend the mini-conferences being presented by your local chapter. Call your chapter representative and see if there is a way that you can become actively involved in chapter activities.

Listen to speakers. Read the *Gazette* and the *Mathematics Teacher*. Tap into math education sites on the internet. Ask about issues. Write letters to the *Gazette*. Talk to teachers around you. Be a critical thinker.

Reach for your future ... and take apart in creating it.
All the best for the rest of the year.

**Ontario Mathematics Coordinators Association
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MARY J. STOREY
CURRICULUM CONSULTANT FOR COMPUTERS
YORK REGION DISTRICT SCHOOL BOARD



Mary has been teaching math in elementary schools for 25 years, consulting for over 7 years and writing for the Gauss Math Contest for 12 years. A Descartes Medalist, Mary is also the national winner of 1997 Prime Minister's Award for Teaching Excellence in Mathematics, Science and Technology.

The Ministry of Education and Training purchases several site licenses of software for every publicly funded school in the province. During the last few years several pieces of mathematics software have been among those purchased. Each year surveys are completed by Ontario teachers asking for categories of software and divisions where software is required. Watch for this survey coming to the computer committee in your school in April or May of this year. When the priorities are established a committee of 10 teachers called the **Ontario Software Acquisition Program Advisory Committee (OSAPAC)** views all titles submitted by the publishers and establishes the titles for negotiation both legally and financially.

This software can be obtained from the OESS representative in your school district.

The following chart included all software now available to all schools.

Division	Software	Strand	Format	Hardware
primary	Millie's Math House	several	disketteMac/Windows
primary	Math Team Pro	all	disketteMac/Windows
junior	Math Team Pro	all	disketteMac/Windows
junior	Tabs+	geometry	disketteMac/Windows
intermediate	Math Trek 7-9	several	disketteMac/Windows
intermediate	Tabs+	geometry	disketteMac/Windows
senior	Zap A Graph	graphing	disketteMac/Windows
senior	Math Trek 10-12	several	disketteMac/Windows
senior	Virtual Tiles	algebra	disketteMac/Windows

Other tool software such as *Claris Works* (spreadsheet, graphics) *MS Works* (spreadsheet), *MS Publisher* (graphics) and *Corel Draw* can be used for numeracy and geometry.

Several other pieces of mathematics software are being considered and will soon be made available.

To check on the progress of the negotiations of these pieces use the OSAPC web site. <http://www.tv.org/osapac>



GATEWAYS



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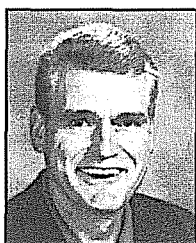
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▲ MATHEMATICS REFORM IN ONTARIO: SOME OBSERVATIONS AND SUGGESTIONS

BARRY BELAMY
HEAD OF MATHEMATICS
LAKEFIELD COLLEGE SCHOOL



Barry Bellamy has taught mathematics at the secondary level in Ontario for a quarter century. He is interested in the incorporation of technology into the teaching and learning of mathematics.

Dryden (1995) suggests that the content of what is taught is not as important as helping students to experience the joy of learning. While few teachers would dispute this notion, it can create tensions for mathematics teachers. Tensions are caused because mathematics is a subject where there are fundamental building blocks, which have an inherent logical sequence. Tensions may also exist as mathematics teachers sometimes find it challenging to facilitate mathematical development in ways that students might describe as joyful.

Adding to these tensions is the rhetoric of mathematics reform. Expressions such as, constructivism or constructivist teaching, usually convey little or no meaning for many experienced mathematics teachers. Schifter (1996) indicates "that using the rhetoric of reform could retard rather than advance the goal of reform." (p 197) It is therefore essential that these abstractions be replaced with descriptions of actual classroom practice from which meaning can be linked to the rhetoric as Clark (1995) does in describing his research into the challenges of teaching mathematics through inquiry.

Educational reform in mathematics has recently become associated with the vision as articulated in the NCTM Standards (1989, 1991, 1995) which is grounded

in a constructivist orientation toward the teaching and learning of mathematics. This perspective assumes learning to be a constructed active process as opposed to passive absorption of information. It follows then that no amount of oratory skill or lucid explanation on the part of teachers will allow them to understand for their students. A constructivist orientation has profound implications for teaching mathematics.

With this approach, teaching requires facilitation of the constructive process through the design and implementation of investigative activities and problems. It also involves a reflective stance toward assessing students' prior understandings, processes of learning, and performances as indicators of learning. Authority in the classroom is moved from the teacher or textbook to a greater understanding of the mathematics. Students assume more of the responsibility for their learning by engaging in problem solving activities through which they are able to develop their mathematical power. Teaching in this manner can be viewed as pedagogical problem solving. The teacher in this approach, as a reflective practitioner or as a professional engaged in practical action research, models the life-long learner. This is my interpretation of the vision of mathematics reform as articulated in the Standards. What role does this vision play in implementing mathematics reform in Ontario?

Many changes and proposals for changes in education have been announced in Ontario during this past year which have caused concern for most teachers. The provincial government of Ontario is currently engaged in a complete restructuring of public education. These efforts are seen by the government as a means to ensure that Ontario has the "best high school system in the world." The rhetoric of this reform, particularly the words used by the Minister of Education and Training, have caused a great deal of discontent among high school teachers. Throughout the province high school teachers have reacted by organizing public meetings, attending demonstrations, writing letters to the editor, and by staging a two week protest that closed down the education system.

The issues raised by the teachers express a concern over the quality of education and its direction as indicated by the government's recent proposals. Some teachers infer that these recent initiatives by the government will not allow them to provide opportunities for their students that "reinforce qualities like integrity, honesty, and open-mindedness." (Wink, 1996) They believe that the reform proposals do not address "the

needs of the whole person" and would instead reduce "our schools to become learning factories whose only purpose is to foreshadow the reduction of the individual to an employee." (Wink, 1996)

A great concern for high school teachers has been the pronouncement that OAC (Ontario Academic Credit) courses are to be dropped from the high school curriculum. Previous governments removed grade 13 courses from the curriculum by changing the name to OAC courses. It appears that this government is not going to remove OAC's by simply changing their name. It fully intends to provide public education only up to the end of grade 12, and have those students graduate with the same skills and knowledge that present OAC graduates possess. High school teachers are understandably concerned and anxious for answers to their questions such as "Where is the new curriculum... Who is writing this curriculum and when will it be available to teachers?" (Warren, 1997) The legislated changes already made and the proposed changes to the curriculum and structure of education cause many teachers to ask the question, "how can standards be increased?" (Warren, 1997)

In commenting on work in developing a specialization years mathematics curriculum for Ontario, Roulet (1996) suggests that a "constrained view of mathematics" is indicated in recent government publications like The Common Curriculum. Mathematics is seen to be presented as "simply a collection of procedures useful for solving problems in other domains" (p 5). This limiting view of mathematics, as a useful tool, can not serve as a basis to develop the new curriculum.

Roulet (1996) presents the vision of mathematics reform as expressed in the Standards as being the necessary broad based principles upon which a new curriculum can be built. In this manner the Standards are viewed as aspirations which McLeod (1995) has suggested "may help to extend the duration of their influence." (p 3) In addition to these guiding principles, Roulet purposes outcome statements be produced for all students with sub-outcomes differentiated according to students' post secondary aspirations. (p 7) Thus the initial phase of the curriculum development process involves identifying guiding principles and outcomes, in much the same manner as the Standards. The outcome standards can then "serve as a framework for identifying and justifying content." (Roulet, 1996, p 7)

To overcome the conundrum of having teachers evolve with the curriculum (Bosse, 1995), groups of

teachers are to collaboratively develop and identify specific content which Roulet (1996) sees being centrally stored for access by all school boards to develop course modules. (p 7)

Roulet's (1996) approach is to be commended as it: acknowledges the teacher as a professional; endorses a constructivist orientation to teaching and learning; and values the evolution of teachers with curriculum. However, it does not directly address the common obstacles to reform, nor the reasons for the "wide divisions in the Ontario mathematics community." (p 5) Some of those reasons can be attributed to technology and its potential to change what and how we teach mathematics.

Introducing technology into the mathematics curriculum often results, in its use becoming another add-on to the already over crowded curriculum (Bellamy, 1997). Students are still required to perform with paper and pencil as in the past, but added to this are additional skills to be learned employing technology.

Many teachers would prefer to teach mathematics using inquiry (Clark, 1995), that is, from a problem solving perspective. Further, most teachers would welcome the opportunity to be able to teach more in the manner of a reflective practitioner and to incorporate technology in their teaching as indicated in the NCTM Standards. However, repeatedly teachers feel constrained to choose content over process.

The question that needs to be answered is, what should technology be allowed to do for the student? Before it is possible to make progress in how we teach mathematics, we need to clarify the skills students require with and without technology. There is not enough time now to adequately address all of the topics in any given mathematics course. Technology can not become just another one of those topics. As stated by Waits and Demana (1996) "Educators need to be specific and explicit about this controversial issue... Our Students are waiting for us!" (p 714)

Teachers are also waiting and want to be involved in restructuring the curriculum that would enable them to incorporate technology into their teaching and allow them to assist their students to better develop their mathematical understandings. The restructuring of the specialization years mathematics curriculum will not be easy and will require a great amount of time, effort and money. Professional development programs need to be established that not only enable teachers to understand

the aims and objectives of mathematics reform, but would also integrate the wisdom and experience of those teachers in restructuring the curriculum. While this latter condition is essential (Stake, 1986), it is necessary to recognize it has been very difficult (Cooney, 1994) and requires a great deal of time outside of the classroom on the part of teachers.

The concern over content in the mathematics program is due in part to the question concerning which students are engaged in this enterprise. The reform movement has stressed that quality mathematics for all students is essential for a healthy democracy and economy in the new age of information technology. Clearly the NCTM Standards were developed with "the goal of developing mathematical power for all students." (NCTM, 1991, p 193) While advocates for reform have rightly promoted mathematics for all, some writers such as Cuoco (1995) have raised some questions over this emphasis. They perceive that in making mathematics accessible and attractive to a larger number of students, the nature of mathematics will be changed into a

different discipline than the one now used by scientists and mathematicians.

An additional problem arises when attempting to incorporate a mathematics program for all students into less time. This can not be done if our students are to have the same or better skills as our present graduates. Therefore in developing a reformed high school curriculum for Ontario, I would suggest that we need to have two mathematics courses for each of the three grades after grade 9. One course would be taken by all students in the same manner as is the present grade 9 mathematics course and the other course would be only for those students who intended to go to university and study mathematics or physical sciences. That is, each year all students would take a common mathematics course, just as happens in English, and those students who need to study mathematics as a subject would take an additional course. In this manner all of our students will be better served.

To develop the new curriculum, it will be imperative to involve the classroom teacher to help answer the question: How can technology be incorporated into a high school mathematics curriculum of reduced topics that would enable it to enhance existing practice and meet the growing demands of society for increased computer literacy? To bring about this involvement of experienced classroom teachers necessitates programs of continuous professional development be established that encourage teacher empowerment. I would hope that our professional organizations, such as OAME and the College of Teachers, will be able to assume some of this responsibility. For it is only by acknowledging teachers as professionals and empowering them to teach as reflective practitioners, that teachers will evolve with the curriculum as they develop it and in so doing move mathematics education toward the goals of reform.

It is encouraging to note that the school mathematics tradition as described by Gregg (1995), and illustrated in all of the literature advocating mathematics reform as practice which must change, appears to be slowly evolving and moving in the direction of reform. With the Standards as aspirations, the inclusion of the classroom teacher in restructuring the curriculum to incorporate technology and to design the necessary professional renewal strategies, I am confident that with time, a reformed mathematics curriculum for Ontario (Roulet, 1996), that exemplifies that vision, can be developed.

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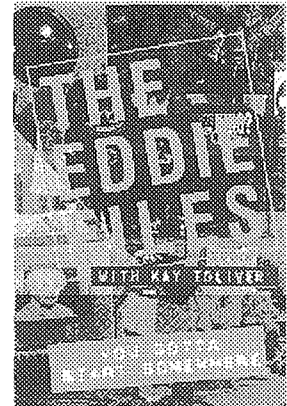
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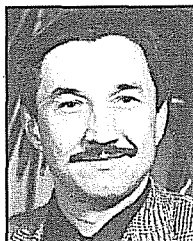


References

- Bellamy, B. Implementing Mathematics Reform: A Case Study, Doctoral Dissertation, University of Toronto. 1997.
- Bosse, M.J. The NCTM Standards in Light of the New Math Movement: A Warning!, *Journal of Mathematical Behavior*, v14, pp 171-201. 1995 .
- Clark, J. Moving Towards Inquiry - What Are The Implications For The Curriculum, *Ontario Mathematics Gazette*, v 33, n 3, pp 7-11. 1995.
- Cooney, T. Teacher Education as an Exercise In Adaptation, *Professional Development for Teaching Mathematics 1994 Yearbook*, D. Aichele (ed), NCTM, Reston, Va. pp 9-22. 1994.
- Cuoco, A. Some Worries About Mathematics Education. *Mathematics Teacher*, v 88, n 3, pp 186-187. 1995.
- Dryden, K. *In School: Our Kids, Our Teachers, Our Classrooms*. McClelland and Stewart, Toronto. 1995
- Gregg, J. The Tensions and Contradictions of the School Mathematics Tradition, *Journal for Research in Mathematics Education*, vol 26, n 5, pp 442-466. 1995.
- McLeod, D., Stake, R. E., Schappelle, B. and Mellissinos, M. "International Influences on the NCTM Standards: A Case Study of Educational Change", paper presented to the 17th annual meeting of the PME-NA, Columbus, OH, Oct, 1995.
- National Council of Teachers of Mathematics. *Curriculum and Evaluation Standards for School Mathematics*, NCTM, Reston, Va. 1989.
- National Council of Teachers of Mathematics. *Professional Standards for Teaching Mathematics*, NCTM, Reston, Va. 1991.
- National Council of Teachers of Mathematics. *Assessment Standards for School Mathematics*, NCTM, Reston Va. 1995.
- Roulet, G. Developing a Specialization years Mathematics Curriculum, *Ontario Mathematics Gazette*, vol 35, n 2, pp 4-8. 1996.
- Schifter, D. Starting the Conversation, *What's Happening in Math Class*, D. Schifter (ed), Teachers College Press, New York, pp 195-205. 1996.
- Stake, R.E. An Evolutionary View of Program Improvement, *New Directions in Educational Evaluation*, E. House (ed), Falmer Press, London, pp 89-102. 1986.
- Waits, B. and Demana, F. A Computer for All Students: Revisited, *Mathematics Teacher*, v 89, n 9, pp 712-714. 1996.
- Warren, S. We Need Details on Education Changes, letter to the editor, *Peterborough Examiner*, Mar 5. 1997.
- Wink, R. 'Reform' package demands response, letter to the editor, *Peterborough Examiner*, Nov 27. 1996.

▲ THE DEVIL'S ADVOCATE: GUILTY AS CHARGED ?

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When Alexandru Pintilie, B.Sc. Math, M.Sc. Stats, ex-A.S.A., does not teach math, he boasts about it, chaperons the soccer team, chauffeurs the chess team or lectures his teenage son.

Mrs. Y, a friend of a friend of mine called a couple of weeks ago. She sounded desperate and outraged. Friends, and friends of my friends tend to call me in situations of math panic attacks. It was about Dora , her grade eleven daughter. "Last year, Dora used to have an excellent teacher. - said Mrs. Y - She liked and understood mathematics when Mr. A explained it." "And her marks were in the nineties" - I ventured. "Yes, but this year her teacher, Mr. B, is awful. Dora does not understand much about grade eleven mathematics and her marks have dropped to the seventies. Nobody in the classroom understands what Mr. B explains."

I agreed to give Dora a hand with the latest homework assignment. One of the problems involved finding the intersection points between a line and a circle.

A.P.: "Why don't you write the equations of the line first?"

Dora: "We never learned equations of lines."

A.P.: "They must have been taught in grade ten. Have you seen the equation $y = mx + b$?"

Dora: Of course I know $mx + b$. I did it with Mr.A last year. I know that you find m first and then you substitute x and y to find b . I understand $mx + b$. Nobody told me to intersect circles with it, though.

Subsequent discussions revealed that Dora could easily find b , but had no idea where the line cuts the y -axis. She was capable to check if a point was on a line but could not check if it was on a circle. (Both equations were given.)

This anecdote is probably much too familiar to us. Many a student becomes prosecutor, judge and jury of our

competence and teaching style the moment his/her marks drop. Many a parent gladly joins the lynching mob. It is no wonder that Mr. A "played the system" and taught cook book recipes that would insure success on fool proof tests. The student memorizes the steps and s(he) thinks - or chooses to think - that s(he) understands the topic. Mr. B was probably new at the game and did not want or did not know how to provide quick fixes that would have kept the students content and the parents asleep for another year.

A poem in the last issue of The Gazette caught my attention. It was written by a young graduate of the faculty of education and it was recounting her experience with mathematics in high school. She readily classified her teachers into "the good, the bad and the ugly". The classification was based on how she and her parents felt about math teaching, not on some objective measure of the quality of the material that was being taught. When I was in high school I had my lowest marks in Physical Education and the teacher I judged "the worst" was the one that tried to develop our fitness level through exercises that were not always fun. The "best" teacher I had was one who would let us play soccer every single class and give us all 100%.

I do not want to suggest that teachers be given immunity to criticism from students and parents. We certainly need accountability, but we should also try to educate our "customers" not only about what they should expect from us, but also about what we expect from them.

They should expect competence, fairness, rigour, respect and academic standards. They should not expect us to entertain or to put up with the whims of a spoiled child. They should not expect us to pretend that we perform miracles that turn a math anti-talent into an engineering student. We, the teachers, should also expect from our "customers" - students and parents - respect, patience and cooperation.

I apologize if I sound righteous. I must admit that I am often "good" myself. I gave credits in OAC Calculus to students that I knew would not last two weeks in university Calculus. I "bell curved" marks in weak classes where the low average could have raised questions about my competence. I play silly games and I give my students candy the week before Christmas break. I cut corners and I use less than rigorous language when the material is too abstract for my audience. I make sure I don't fail more students than the next guy.

I believe that we are spending too much time and energy worrying about pleasing the student and not enough about serving his interests and the interests of the society. We have been competing with each other for too long for popularity ratings from our students. Let's cut some of the dessert, and start serving some main course.

Editors Note: Alexandru Pintilie will have a thought provoking column in most issues of the *Gazette*. Please do write him and/or the editor with your comments.

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▲ DOES 'WHOLE MATH' MEET THE NEEDS OF STUDENTS WITH LEARNING DIFFICULTIES? A MULTI-DISCIPLINARY PERSPECTIVE

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As a teacher who spends much of her time teaching students with a history of mathematics learning difficulties, I am extremely nervous about the call to redesign the mathematics curriculum, away from a sequential development of skills and towards a series of 'rich learning tasks'. According to the 1997 OAME Leadership Conference brochure, "A rich learning task is an authentic learning experience that...makes links between topics in mathematics, and from mathematics to other subjects or applications...requires that students apply a range of knowledge or skills and involves higher order thinking...simulates real life situations and problems...is meaningful and interesting to students...[and] links instruction and assessment." "Rich Learning Tasks provide [...] a way of organizing curriculum so that the focus of learning is reasoning and problem solving, and skill development is embedded within meaningful contexts."

This approach to mathematics education has been called 'Reform Math' or 'Complete Math' by its proponents and 'Whole Math' or 'New New Math' by those who question the changes. According to *Mathematically Correct* (1997), 'Whole Math' is "the

current revolution in mathematics curriculum, akin to the Whole Language experiment, that emphasizes group discussion, essays, calculators and guessing and de-emphasizes basic skills and direct instruction." My concerns, which will be addressed in this paper, parallel those that have been expressed about whole language, which proved especially detrimental to students with learning difficulties (Church, 1995).

I am not alone in these concerns. An entire 1993 edition of *Remedial and Special Education* was dedicated to the effects of the latest mathematics reform on at-risk students. Hofmeister (1993, p. 9) warns that, "As in the past, the individuals who have the most to lose by this failure to learn from the history of education reform are the weaker members of the school community." Giordano (1993), Hofmeister (1993), Hutchinson (1993), Mercer (1993) and Rivera (1993) all question the effectiveness of 'Whole Math' for these students. They point to a lack of reference to research of any kind, and particularly to research on instructional methods proven to work for learning disabled students. As Hutchinson (1993, p. 21) notes, "there is no recognition of the learning needs of students with disabilities." In addition, "there is no evidence to support the claim that the proposed content and experiences will result in mathematical power for [these students]" (p. 20). Unfortunately, the unique needs of these students have been virtually ignored by the mathematics education literature. The last mention of learning disabled secondary students appeared in the *Mathematics Teacher* in 1987 (Burton & Meyers), before the Math Reform movement gained momentum. As Hutchinson (1993, p. 20) states, "It is critical for researchers and practitioners to open a dialogue between those primarily concerned with mathematics education and those primarily concerned with students with disabilities."

This paper therefore attempts to evaluate the 'Whole Math' movement in light of the research findings which relate to the teaching of students with learning difficulties. Before Ontario mathematics educators jump 'head-first' into drastic reforms to both mathematics content and methodology, we must examine the research in order to determine how compatible are the proposed math reforms with the strategies proven to work for at-risk students. In addition, we need to consider the lessons learned by other disciplines which have implemented such changes. As Willoughby (1996, p. 8) warns, "we must avoid unthinking acceptance and

superficial compliance.”

TEACHING MATHEMATICS TO STUDENTS WITH LEARNING DIFFICULTIES: A Review of the Literature

Much has been written about the characteristics of students with learning disabilities and the effects of those characteristics on their ability to learn mathematics (Burton & Meyers, 1987; Hayes, 1985; Jordan, 1995; Levine, 1993; McCall, 1993; Mercer & Miller, 1992). These students may have memory deficits, resulting in difficulties memorizing and recalling basic math facts and/or algorithms on demand. They may have oral or written language disabilities which can result in their inability to understand verbal explanations or word problems. Or they may have graphomotor dysfunctions which lead to problems reading or producing written symbols. They could have attention deficits, which cause students to be impulsive and incorrectly read symbols. Alternately, they may have spatial or temporal disorganization, causing them to lose their assignments or arrive late to class frequently.

Mercer and Miller (1992, p. 20) note that these learning problems “are often compounded by ineffective instruction”. They report that students “with learning disabilities tend to progress approximately one year for every two years of school attendance” (p. 19). LD students often reach a plateau after grade 7 with only one year’s growth between grade 7 and 12. My experiences confirm these findings. After eight years of Ontario schooling, the students in my grade nine Numeracy class possess neither automatic basic skills nor well-developed problem solving abilities. They have come from a variety of elementary math programs, ranging from Resource Room withdrawal to integration in a problem-solving based class.

Many authors have written about effective strategies for teaching students with learning difficulties (Brophy, 1986; Burton & Meyers, 1987; Cherkes-Julkowski, 1985; Englert, Tarrant & Mariage, 1992; Goldman, 1989; Hayes, 1985; Levine, 1993; Lombardo & Drabman, 1985; McCall, 1993; Mercer & Miller, 1992; Miles, 1992; Moyer & Moyer, 1978). What is surprising is the consensus that exists. The same recommendations are repeated consistently from article to article. Interestingly, several of the suggested strategies contradict the philosophy behind the mathematics reform movement. Mercer and Miller (1992, p. 25) express my concern that

“instructional reforms are insensitive to their [students’] unique learning and emotional needs”.

I have grouped the recommendations for teaching mathematics to students with learning difficulties into the Ten Recommended Strategies which are discussed below. Note that most of these strategies would benefit the majority of our students.

1. Promote a positive attitude towards mathematics.

While essential for all students, those with learning difficulties are especially in need of a warm, supportive and non-threatening learning environment. Preoccupation, anxiety and hopelessness must all be overcome before a student can learn. Teachers need to communicate positive expectations, refuse to accept hopelessness, model the successful overcoming of difficulties, and give sincere and specific praise (Burton & Meyers, 1987, p.709). They must also provide an environment that stimulates communication between the teacher and student. Through such discourse, diagnosis of misconceptions, rehearsal of new skills and the interrelationship between new concepts may be made.

2. Teach for relational understanding.

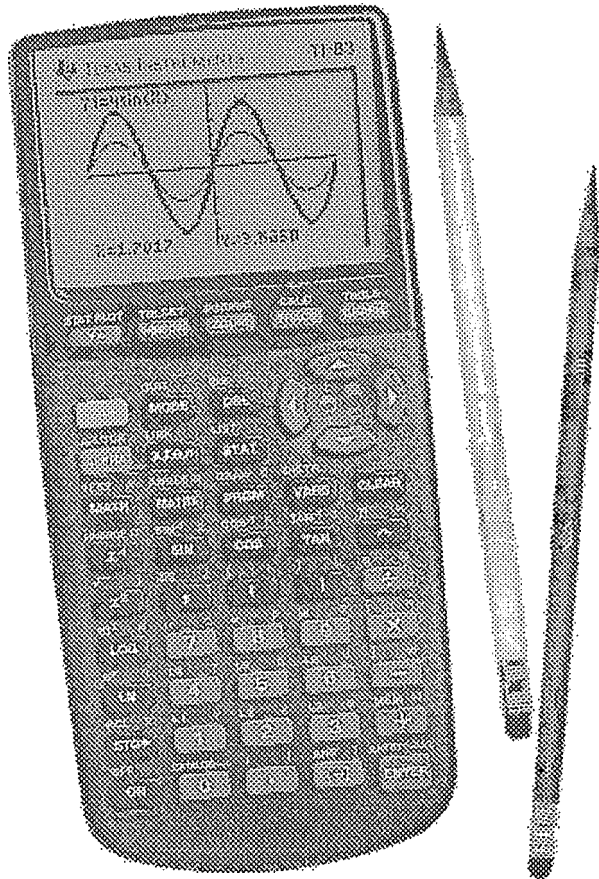
Skemp (1987, p. 153) defines relational understanding as “knowing both what to do and why”. While all students find new concepts easier to retain when meaning is attached, those with memory deficits are especially in need of meaningful rule development. By grade nine, many of these students have come to rely “heavily on borrowed algorithms and half-remembered rules” (Confrey, 1990, p. 118). As a result, teachers should stress conceptual understanding before skills development; progress from concrete to representational to abstract concept development; and emphasize patterns and relationships. Care needs to be taken to allow students to “construct meaningful algorithms by building upon informal knowledge” (Mack, 1990, p. 30) without the students feeling as if their intelligence is being insulted.

3. Provide systematic and explicit instruction.

This is perhaps in greatest contradiction to recent reforms in mathematics education. Burton & Meyers (1987), Cherkes- Julkowski (1985), Durkin & Shire (1991), Goldman (1989), Kelly (1990) and Mercer & Miller (1993 & 1992) all emphasize the need for carefully sequenced math programs with appropriate prerequisites and frames of reference developed. Mercer and Miller (1992, p. 21) call for “highly organized, step-

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by-step presentations [that] cover why the skill is important and how to apply it". Teachers need to associate new information with prior knowledge; provide a wide range of examples; give step-by-step instructions; allow abundant guided and independent practice; and provide frequent discrimination practice of related problem types.

4. Simplify mathematical language.

Students with language disabilities have particular difficulty with mathematical terminology. Durkin & Shire (1991) and Moyer & Moyer (1978) suggest that teachers simplify the mathematical language by initially using concrete examples and allowing students to use their own terminology. Teachers should then phase in precise vocabulary slowly by repeated teacher use.

5. Use a multisensory approach to teaching.

As discussed earlier, learning disabled students may have deficits in any one of a variety of cognitive skills. Teachers therefore need to provide multiple formats for registration with emphasis on each student's strongest modality. For instance, when illustrating an algorithm, steps should be illustrated graphically using visual

representations and colour for students with strong visual modalities; orally with students verbalizing the algorithms for students with strong oral language skills; and in writing by having students write out the steps in words for those with strong written language skills.

6. Teach basic skills to mastery.

Every article on teaching mathematics to students with learning difficulties stresses the importance of developing computational proficiency in terms of both speed and accuracy. Goldman (1989), Hayes (1985), McCall (1993), Mercer & Miller (1992) and Thornton (1983) all emphasize the importance of teaching basic computational skills with whole numbers, decimals, fractions and percents to automaticity. Skemp (1987, p. 61) states that "to make progress in mathematics it is indeed essential that the elementary processes become automatic, thus freeing our attention to concentrate on the new ideas which are to be learnt". Goldman (1989) adds that a good problem solver must have "readily accessible knowledge of basic facts". Enright (1985) compares the basic number facts to "sight words". Proficient readers develop a large number of sight words which enable them to read faster than if they had to

Exploring Mathematics on the World Wide Web

(Cont'd from page 2)

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cont'd on page 22

"sound-out" the words. Although these basic facts should first be taught relationally with concrete objects, automaticity can only be achieved by providing extensive daily (5-10 minute) drill using a variety of methods: games, flash cards, computer programs and worksheets. These drills should be designed to provide immediate feedback. Unfortunately, in the current climate of math reform, many students are not developing their basic skills to fluency. This in turn makes learning more advanced math extremely difficult.

7. Teach mnemonic strategies.

Students with memory deficits find learning isolated chunks of information, such as multiplication facts, impossible unless meaning is attached. Teachers could assist by creating associations through mental imagery, chunking, rhymes and songs. Teaching students verbal rehearsal through modelling is also helpful.

8. Allow compensatory strategies until proficiency is reached.

The reality is that many learning disabled students will take longer to master the basic math skills, and some may never become as fluent as we would like. For this reason, "back-up strategies" (Jordan, 1995) should be allowed. Such crutches could include addition or multiplication charts, finger counting, marks on paper or counting lines on a ruler. Using known facts to derive others is also a useful strategy to teach.

9. Teach all components of problem solving and making generalizations.

Goldman (1989) notes that a good problem solver has available a wide range of procedures from which to select; is flexible in the use of those procedures; actively monitors his/her own progress; and has readily available knowledge of basic facts. Students with learning difficulties lack these skills and need explicit instruction and practice for each component. They need to learn what to do and how. Jordan (1995) has found that these students "are less likely to modify strategies to maximize problem solving efficiently" (p. 63) and they "spend too much time trying to recall [number facts...to have] cognitive energy left over for higher level problem solving" (p. 65). Hofmeister (1993), Hutchinson (1993) and Mercer & Miller (1993) document studies showing the superiority of cognitive strategy instruction for math problem solving over tasks high in engagement like discovery tasks because "the intervention showed these students cognitive processes and strategies they did not use naturally" (Hutchinson, 1993, p. 22).

10. Make tests less stressful.

Burton & Meyers (1987) and Levine (1993) recommend giving students with learning difficulties special consideration when asking them to write math tests. They should be allowed both extra time to complete the test, in the Resource Room if possible, as well as the use of calculators and/or number charts as appropriate. Teachers should provide practice tests and teach test-taking and self-monitoring skills. Finally, tests are rarely stressful if students have learned the concepts and skills to mastery!

ARE THE PROPOSED MATH REFORMS COMPATIBLE WITH THE NEEDS OF STUDENTS WITH LEARNING DIFFICULTIES?

While several of the strategies for teaching mathematics to students with learning difficulties fit in nicely with proposed math reforms, others are in direct conflict and need to be seriously re-evaluated by Ontario's mathematics education leaders. Instructional practices recommended by the *NCTM Standards* (1989, 1991) and the *Ontario Common Curriculum* (1993, 1995), such as having students construct and apply mathematical ideas and encouraging the use of manipulatives and technology strongly support the need for conceptual understanding before skills development. The suggested methodology promotes a positive attitude towards mathematics, allows for the use of simplified terminology, and permits assimilation through multiple modalities. Even the proposed variety in assessment techniques are a means of making evaluation less stressful.

However, in sharp conflict are the characteristics of math reform which have earned it the nickname 'Whole Math'. Of grave concern is the lack of appreciation for the necessity of systematic, explicit instruction for at-risk students. The trend towards 'rich learning tasks', if not carefully selected for content, sequenced according to mastered prerequisite skills, and complemented by adequate guided and independent practice of component skills, will prove as devastating for weaker students as similar experiments in other subject areas. As Hutchinson (1993, p. 21) predicts, "students who are unable to represent one-step problems will probably be confused and aimless in approaching open-ended problems."

Controversies surrounding skills-based versus context-based programming, explicit versus implicit

instruction, and domain-specific versus content-independent problem-solving have been debated and resolved by other disciplines. Conclusions reached by others must be considered by mathematics reformers in order to prevent mistakes which can be detrimental to students' education. I will first consider the lessons learned from the most obvious debate, namely the Whole Language Controversy.

Lessons Learned from the Whole Language Controversy

Church (1995), Gersten (1993), Rogers (1995) and Stewart (1996) examine the Whole Language debate as it relates to poor readers. Church (1995, p. 6) recalls that Whole Language began as a large-scale, top-down change effort which emphasized the "what" of change without allowing for an open discussion of the "why". A camp mentality developed between the Whole Language proponents, who had the zealotry of a "new religious cult" (Stewart, 1996), and the Phonics supporters, who resisted every aspect of the changes. Adding to the controversy was the fact that the new approach was accepted without methodologically accepted research. The term was also vague enough to mean different things to different people.

The Whole Language (or contextual) approach to reading is based on the belief that "learning is an active process of constructing meaning within a social context" (Church, 1995, p. 6). Children will therefore learn to read and write on their own with little or no direct instruction, given time in an enriched language environment" (p. 9). "As children gain experience reading whole, connected, meaningful text, [...] their word recognition skills will develop" (Rogers, 1995, p. 7). This has often been interpreted to mean that word analysis skills, phonics and spelling should never be taught explicitly as they interfere with the joys of reading.

The code emphasis (or phonological) approach to reading, on the other hand, is based on the belief that "the teaching of phonological skills is critical in reading programs" (Rogers, 1995, p. 8). Good readers have fast and accurate word identification skills; they are able to recognize words quickly because their knowledge of how letters and letter patterns map onto sounds has become automatic (p. 9).

Whole Language has proved to be particularly harmful to students with learning disabilities. "An overwhelming number of studies show strong support for the claim that children experiencing difficulties learning to

read share deficits in phonological processing skills" (Rogers, 1995, p. 24). These students need explicit instruction in letter sounds and structures as well as in productive reading strategies that aid comprehension. "Poor readers are overwhelmed by the multitude of information contained within meaningful context [...] unless that information is teased apart and made crystal clear to them" (p. 14). At-risk students need comprehensive, systematic instruction within well-designed reading programs; "mastery does not materialize from brief encounters, but rather develops with comprehensive, systematic instruction" (Gersten, 1993, p. 9).

This does not mean that the contextual approach is without merit. As Rogers (1995, p. 38) notes, "balance needs to be struck between the code emphasis (phonological) approach and the whole language (contextual) approach to teaching reading." Researchers now agree that there needs to be a "return to intensive, sequentially taught reading skills, while retaining the use of rich literature" (Stewart, 1996).

The similarities between the Whole Language controversy and the current math reform movement are striking. Other debates shed additional light on issues that mathematics education leaders need to consider.

Lessons Learned from Second Language Acquisition Research

Comparable to the Whole Language versus Phonics controversy in reading instruction is the Communicative versus Form-based approach to second language acquisition (Archibald, 1995; MacWhinney, 1997). The traditional, form-based approach is a behaviourist position which views language acquisition as habit formation, requiring explicit instruction of grammatical features along with extensive practice. In reaction to this model is the communicative or meaning-based approach which argues that learners discover the rules of language for themselves by experimenting. As in the reading debate, extreme positions became entrenched, and by the late 1980's grammar instruction had been banished from second language classrooms.

Researchers now agree that explicit instruction of language forms helps students pay selective attention to language features, while practice and corrective feedback are key to developing automaticity (Archibald, 1995, p. 359). As MacWhinney (1997, p. 278) notes, "explicit instruction allocates attention to specific types of input, narrows their hypothesis space, and consolidates

their memory traces." More importantly, the two positions are no longer considered contradictory, but rather complementary. The current connectionist model argues that "form-based instruction within a communicative context contributes to higher levels of linguistic knowledge and performance" (Archibald, p. 398). Such an approach "works better than instruction that either avoids focus on form or avoids meaningful communication" (p. 398).

This conclusion needs to be seriously considered when reforming the mathematics program. Rather than arguing for a problem-based versus a skills-based approach to curriculum, perhaps a combined position would prove the most effective. Before exploring this idea further, I will turn to a lesson about the importance of subject-specific content learned from a controversy in gifted education.

Lessons from Gifted Education Research

Until recently, giftedness was believed to be a general, inherited trait measurable by non-academic instruments such as the IQ test. Programming for the gifted often consisted of attempts to develop creativity and broad-based thinking processes independently of subject-specific content. Researchers now subscribe to a domain-specific developmentalist perspective of giftedness. Intelligence is believed to emerge from socialization experiences and develop over time

(Matthews, 1993, p. 7). The goal of education should be to "raise the intellectual and creative ability" of every child (Shore, 1991, p. 91) by providing "novel, challenging and educationally relevant material to all students" (Keating, 1980, p. 59). Under this model, special programming for gifted students is offered only to those whose exceptional domain-specific development is mismatched to regular programming. When this occurs, the focus is on providing advanced content knowledge (Ban Tassel-Baska, 1995, p. 99) since that is the vehicle through which higher order thinking skills develop. As Keating (p. 58) writes, "Creativity emerges from solid content-oriented programming and ideational fluency."

Keating's four components of creativity are content knowledge, divergent thinking, critical analysis and communication skills. Without the first, the others cannot develop. The current trend towards a mathematics curriculum driven by 'rich learning tasks' ignores the fact that students cannot possibly extract from a problem situation all that is worthwhile without having the prerequisite content knowledge. Assuming that "students at different levels take different things away from an encounter with the same problem" (Taylor, 1997, p. 4) only puts those who have not yet mastered the content at a further disadvantage. A fairer approach would be to explicitly teach the prerequisite skills before asking students to apply them. The Learning Gap (Stevenson & Stigler, 1992) shows us how this is accomplished by Japanese elementary school mathematics teachers.



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Lessons from *The Learning Gap*

The Learning Gap describes the results of two comprehensive studies conducted in 1980 and 1987 which compare the academic achievement of first and fifth grade students in the U.S., Japan and Taiwan. Especially informative are the reasons for the differences: societal values, parental expectations, curriculum design, instructional practices and teaching conditions. Particular emphasis is given to differences between American and Japanese mathematics learning and teaching. Here, I will only discuss issues relevant to the mathematics reform movement.

The Japanese mathematics curriculum has one clear goal: to educate students in the **content** of the curriculum (Stevenson & Stigler, 1992, p. 168). Everything else is designed to achieve that aim. Genuine math content standards are explicitly stated; teachers are specialists in their subject area as early as in grade four; and parents as well as educators believe that academic success depends on dedication and hard work rather than on 'innate ability'. The curriculum is designed so that fewer topics are taught in greater depth each year, allowing students time to master material the first

time rather than spiralling through the same topics year after year.

In addition, Asian teachers are highly skilled in a variety of instructional methods, having spent their first year of teaching with a master teacher. Each lesson is collaboratively and elaborately planned by all teachers of a given grade level, something made possible by the fact that only 60% of their day is scheduled instructional time. Applications, materials and questions are discussed in detail. The lesson itself is coherent and explicit, promoting whole-class interaction. Students are actively involved as the teacher guides them to construct their own knowledge. Even when students are presented with a novel situation (a 'rich learning task') and asked to generate as many solutions as possible, the lesson does not end until the specific concept, which the problem was chosen to introduce, has been grasped by every student.

Interestingly, many of the 'new' instructional practices advocated by North American math reformers, such as constructivism, discourse, manipulatives and heterogeneous groupings, have been introduced as a direct result of the studies conducted by Stevenson and Stigler. Yet Asian teachers use these methodologies

along with explicit instruction and individual practice to teach **specific** math content in a **carefully sequenced** curriculum. They understand that "creativity in a domain depends on mastery of basic skills; it is not inhibited by their mastery" (p. 92). As the authors conclude, "[North American] children can comprehend far more complicated material than they learn now if it commands their interest and is explained clearly" (p. 219).

CONCLUSIONS

Research in the fields of mathematics learning difficulties, reading, second language acquisition, gifted education and comparative education all points to several obvious conclusions.

First and foremost, the mathematics education community must be careful not to turn math reform into a polarized debate of 'Whole Math' versus 'Skills-Based Math'. Instead we need to combine the cognitive and behavioural paradigms and "replace dogma with an intellectual honesty that recognizes the contributions of various paradigms" (Mercer, 1993, p. 17). The connectionist, or functionalist, paradigm is a "pragmatic paradigm that features the endorsement of strategies that work with youngsters" (p. 17). In this fashion, we can pair constructivism with direct instruction and independent practice (Rivera, 1993, p. 26). Asian teachers have been successful in this approach, not wasting valuable time and effort arguing over conflicting philosophical positions.

Secondly, reformers cannot continue to ignore the special needs of students with learning difficulties. Kelly (1990, p. 28) advises that "the quality of curriculum design can have a significant impact on student acquisition...Providing a wider range of examples, clearer step-by-step strategies, and discrimination practice can augment the effectiveness of any mathematics curriculum". Hofmeister (1993, p. 9) adds that "the research on information processing helps explain why students taught with structured curricula generally do better than those taught with either individualized or discovery learning approaches." These comments must be seriously considered when devising a mathematics curriculum based on 'rich learning tasks'. At-risk students will be more successful if necessary skills are first taught with understanding and subsequently followed up with enjoyable practice and application (Willoughby, 1996, p. 9).

Finally, math reformers must come to believe that weaker students can learn real math content if

appropriate teaching strategies are used. There is no need to water down the content and turn math class into a 'Math Appreciation' course. This happened all too often in many Ontario destreamed grade 9 programs, where algebra was virtually eliminated from the curriculum. My experience is that even Numeracy students can learn algebraic operations with understanding in grade 9. Far too often, educators become carried away with the new methodologies, forgetting that the goal is to teach mathematics. As Eckmier and Hansen (1995) conclude, "Paramount to success is the BALANCE between content and methodology. We cannot sacrifice math content for methodology, or methodology for math content. Teaching math content is the goal, and methodology is the means. The wise mathematics teacher will be able to establish and maintain this balance in the current math reform movement."

I fear that Ontario's mathematics reformers are not heeding this sage advice.

REFERENCES

- Archibald, J. & Libben, G. (1995). *Research Perspectives on Second Language Acquisition*. Toronto: Copp Clark Ltd.
- Ban Tassel-Baska, J. (1995). The Development of Talent through Curriculum. *Roper Review*, 18(2), 98-102.
- Brophy, J. (1986). Teacher Influences on Student Achievement. *American Psychologist*, 41(10), 1069-1077.
- Burton, G & Meyers, M.(1987). Teaching Mathematics to Learning Disabled Students in the Secondary Classroom. *Mathematics Teacher*, 80(9), 702-709.
- Cherkes-Julkowski, M. (1985). Information Processing: A Cognitive View. In Cawley J. (ed). *Cognitive Strategies and Mathematics for the Learning Disabled*. Rockville, MD: Aspen Systems Corp, 117-138.
- Church, S. et al. (1995). Reconsidering Whole Language: Five Perspectives. *English Quarterly*, 27(1/2), 5-14.
- Confrey, J. (1990). What Constructivism Implies for Teaching. *Journal for Research in Mathematics Education*, Monograph Number 4, 107-122.
- Durkin, K. & Shire, B. (1991). *Language and Mathematical Education: Research & Practice*. Philadelphia, PA: Open University Press, p. 194.
- Eckmier, J. & Hansen, P. (Sept. 1995). Math Reform Should Balance Methodology and Content. *The International Educator*, p. 21.
- Englert, C.S., Tarrant, K.L. & Mariage, T.V. (1992). Defining and Redefining Instructional Practice in Special Education: Perspectives on Good Teaching. *Teacher Education and Special Education*, 15(2), 62-86.
- Enright, B. (1985). Mastery of Math Facts: Activities that Help. *Childhood Education*, 62,148-150.
- Gersten, R. & Dimino, J. (1993). Visions and Revisions: A Special Education Perspective on the Whole Language Controversy. *Remedial and Special Education*, 14(4), 5-13.
- Giordano, G. (1993). The NCTM Standards: A Consideration of the Benefits. *Remedial and Special Education*, 14(6), 28-32.
- Goldman, S. (1989). Strategy Instruction In Mathematics. *Learning Disability Quarterly*, 12, 43-55.
- Hayes, A. (1985). Classroom Implications. In Cawley, J. (ed). *Cognitive Strategies and Mathematics for the Learning Disabled*. Rockville, MD: Aspen Systems Corp, 209-236.
- Hofmeister, A. (1993). Elitism and Reform in School Mathematics. *Remedial and Special Education*, 14(6), 8-13.
- Hofmeister, A. (1993). Innovativeness Is Not a Synonym for Effectiveness. *Remedial and Special Education*, 14(6), 33-34.
- Hutchinson, N. (1993). Students with Disabilities and Mathematics Education

- Reform - Let the Dialogue Begin. *Remedial and Special Education*, 14(6), 20-23.
- Jordan, N. (1995). Clinical Assessment of Early Mathematics Disabilities: Adding Up the Research Findings. *Learning Disabilities Research and Practice*, 10(1), 59-69.
- Keating, D. (1980). Four Faces of Creativity: The Continuing Plight of the Intellectually Underserved. *Gifted Child Quarterly*, 24(2), 56-61.
- Kelly, B. et al. (1990). Student Error Patterns as a Function of Curriculum Design: Teaching Fractions to Remedial High School Students and High School Students with Learning Disabilities. *Journal of Learning Disabilities*, 23(1), 23-29.
- Levine, M. (1993). *Developmental Variation and Learning Disorders*. Cambridge: Educators Publishing Service.
- Lombardo, T. & Drabman, R. (1985). Teaching LD Children Multiplication Tables. *Academic Therapy*, 20, 437-442.
- Mack, N. (1990). Learning Fractions With Understanding: Building on Informal Knowledge. *Journal for Research in Mathematics Education*, 21(1), 16-32.
- MacWhinney, B. (1997). Implicit and Explicit Processes: Commentary. *Studies in Second Language Acquisition*, 19(2), 277-281.
- Mathematically Correct. (1997). <http://ourworld.compuserve.com/homepages/mathman>
- Matthews, D. (1993). Domains of Development: Linguistic Giftedness Understood Contextually. *Exceptionality Education Canada*, 3(3), 1-23.
- McCall, C. (1993). Training Strategies to Enhance the Memorization of the Multiplication Tables with Children Who Have Arithmetic Disabilities. MA Thesis. Toronto: OISE.
- Mercer, C., Harris, C. & Miller, S. (1993). Reforming Reforms in Mathematics. *Remedial and Special Education*, 14(6), 14-19.
- Mercer, C. & Miller, S. (1992). Teaching Students with Learning Problems in Math to Acquire, Understand and Apply Basic Math Facts. *Remedial and Special Education*, 13(3), 19-35, 61.
- Miles, T.R. & E.(eds). (1992). *Dyslexia and Mathematics*. London: Routledge.
- Moyer, J. & Moyer, M. (1978). Computation: Implications for Learning Disabled Children. In Suydam, M. (ed). *Developing Computational Skills: 1978 Yearbook*. Reston, VA: NCTM, 78-95.
- National Council of Teachers of Mathematics. (1989). *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: NCTM.
- National Council of Teachers of Mathematics. (1991). *Professional Standards for Teaching Mathematics*. Reston, VA: NCTM.
- Ontario Ministry of Education and Training. (1993). *The Common Curriculum: Grades 1-9*. Toronto, ON: Ontario government.
- Ontario Ministry of Education and Training. (1995). *Provincial Standards: Mathematics Grades 1-9*. Toronto, ON: Ontario government.
- Rivera, D. (1993). Examining Mathematics Reform and the Implications for Students with Mathematics Disabilities. *Remedial and Special Education*, 14(6), 24-27.
- Rogers, J. (1995). *Teaching Poor Readers in Grade One*. PhD Thesis. Toronto: OISE/UT.
- Shore, B.M. (1991). Building a Solid Professional Knowledge Base in Gifted Education. *Exceptionality Education Canada*, 1(1), 85-102.
- Skemp, R. (1987). *The Psychology of Learning Mathematics*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Stevenson, H.W. & Stigler, J.W. (1992). *The Learning Gap: Why our schools are failing and what we can learn from Japanese and Chinese education*. New York, NY: Touchstone.
- Stewart, J. (1996). How Whole Language Philosophy Kept a Whole Lot of California Schoolkids from Learning to Read. *San Juan Mercury News*. <http://www.sjmercury.com/special/reprints/read/html>
- Taylor, P. (1997). *A Senior High School Mathematics Textbook: In Process*. Kingston, ON: Queen's University.
- Thornton, C. et al. (1983). *Teaching Mathematics to Children With Special Needs*. Menlo Park, CA: Addison-Wesley, Chapter 11.
- Willoughby, S. (1996). The Standards - Some Second Thoughts. *Mathematics Teaching in the Middle School*, 2(1), 8-11.

Exploring Mathematics on the World Wide Web (Cont'd from page 16)

Sports scores and statistics	http://espnet.sportszone.com/ OR http://www.sportline.com/
Stock reports	http://www.stockmaster.com/ OR http://www.irnet.com/
stock project	http://www.ncsa.uiuc.edu:80/edu/RSE/RSEyellow/stockmarketmath.html
Foreign currency exchange	http://www.dna.lth.se/cgi-bin/kurt/rates OR http://www.xe.net/currency/
currency project (algebra)	http://www.glenbrook.k12.il.us/gbsmat/travel/bonvoyage.html
currency project (advanced algebra)	http://www.glenbrook.k12.il.us/gbsmat/bonvoyage/bonvoyage.html
Mean temp display every hour for 10 days	http://www.ems.psu.edu/cgi-bin/wx/tempstats.cgi
Population (US census)	http://www.census.gov/
Population (World Fact Book)	http://www.odci.gov/cia/publications/nsolo/wfb-all.htm
population activity	http://www.glenbrook.k12.il.us/gbsmat/population/pop.html
Postage rates	http://www.usps.gov/consumer/rates.htm
Tide predictions high and low tide activity	http://www.ceob.nos.noaa.gov/makepred.html http://www.cs.rice.edu/~mwies/Lessons/lesson2.html
Descriptive statistics activity	http://www.mste.uiuc.edu/hill/dstat/dstatintro.html

Resource Databases

MSTE lesson database	http://www.mste.uiuc.edu/mathed/queryform.html
The Math Forum	http://forum.swarthmore.edu/
Glenbrook South Internet projects	http://www.glenbrook.k12.il.us/gbsmat/home/IP.html
K-12 Lesson Database	http://archives.math.utk.edu/k12.html
Mega Math	http://www.c3.lanl.gov/mega-math/menu.html
Susan Boone's Internet projects	http://www.cs.rice.edu/~sboone/Lessons/lptitle.html
Math Forum Internet projects	http://forum.swarthmore.edu/~steve/steve/mathprojects.html
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Statistics Resources	http://www.mindspring.com/~waus2/apstat/aplinks.html
AP Statistics on the web	http://www.mindspring.com/~waus2/apstat/
AP Calculus on the web	http://www.seresc.k12.nh.us/www/alvirne.html
Math dictionary/encyclopedia	http://www.astro.virginia.edu/~eww6n/math/
Miscellaneous Fun	
metacrawler search engine	http://www.metacrawler.com/
The math humor page	http://www.cyberspc.mb.ca/~dcc/phys/humor_ma.html
Math related comics	http://www.csun.edu/~hcmth014/comics.html

cont'd on page 30

OAME/AOEM AWARDS NOMINATION PROCESS

Deadlines

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

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

The OAME/AOEM Nomination Form

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

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

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

The Nomination Cover Page

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

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

OAME/AOEM LIFE MEMBERSHIP AWARD

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

KENNETH D. FRYER AWARD

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

MONA MACGREGOR AWARD

In recognition of the contributions made by Mona MacGregor, former OAME/AOEM Co-Secretary-Treasurer, OAME/AOEM established the Mona MacGregor Award. This is to recognize an individual who has made significant contribution to OAME/AOEM, but who is not necessarily an educator or a member of OAME/AOEM.

MORLEY MACGREGOR AWARD

In Memory of the late Morley MacGregor, former OAME/AOEM Secretary-Treasurer, OAME/AOEM established the Morley MacGregor Award. The award is to be given annually to recognize an elementary teacher who has demonstrated excellence in mathematics education, as well as contributing to the overall development of students beyond classroom activities.

DON ATTRIDGE AWARD

In recognition of the contributions made by Don Attridge, a founding member, former president and the previous Executive Director of OAME/AOEM, OAME/AOEM established the Don Attridge Award in the spring of 1995. The award is presented annually to recognize an exceptional and creative secondary school mathematics teacher who enhances the teaching of mathematics in Ontario.

AWARD NOMINATION COVER PAGE

Send to: David Zimmer

Intended Award (please check one)

- Life Membership Mona MacGregor Morley MacGregor Kenneth D. Fryer Don Attridge

Nominee Information:

Name of Nominee (Principal and Department Head for K.D. Fryer Award)

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Telephone Number () _____

Fax Number () _____

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Nominator Information:

Name of Nominator

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▲ USING THE EQUATION EDITOR WITH WORDPERFECT FOR WINDOWS

GREG.CLARKE@ENCODE.COM



Greg is the Chairperson for Information Technology & Science at Patrick Fogarty Secondary School in Orillia, Ontario, as well as the school's Computer Site Administrator and acting Math Department Head. He graduated from the University of Waterloo and is presently in his tenth year of teaching. His wife Julie teaches French at Patrick Fogarty S. S., and they have three very busy children, Jonathan, 7, Alexandra, 6, and Daniel, 2 1/2 .

When typing a test, or assignment in WordPerfect (as in most high-end word processors that have come out over the last few years), it is possible to insert an equation directly into your document.

In WordPerfect for Windows, versions 5.2 and 6.0, the tool that is used is called the **EQUATION EDITOR**. This will allow you to put together any type of mathematical equation, and then WordPerfect will "draw" that equation as a graphic, and insert it into your document.

BACKGROUND NOTE: WordPerfect can treat graphics in two different ways:

- 1 they can take up space on the screen in a graphics box (default WordPerfect method). Equations created using this method are placed in **EQUATION GRAPHICS BOXES** OR
- 2 WordPerfect can treat the graphic like a single character, which will allow you to type text, put in the equation, and continue typing on the same line. *THIS IS THE METHOD USED EXCLUSIVELY IN THIS ARTICLE.* Equations created using this method are called **IN-LINE EQUATIONS**

PRE-STEP ZERO: Setting up WordPerfect to Facilitate IN-LINE EQUATIONS

WordPerfect version 5.2

- A. Add the IN-LINE EQUATION macro to the MACRO menu
 - > Click on MACRO > ASSIGN TO MENU
 - > INSERT
(unless the Inline Equation Macro already exists)
 - > For MACRO NAME: Find macro **file inline.wcm**, > SELECT
 - > For MENU TEXT : Type: **In-Line Equation**
 - > OK / OK

WordPerfect version 6.0

- Add the IN-LINE EQUATION command to the list of Graphics Styles
- > Click on GRAPHICS menu
 - > If IN-LINE EQUATION does NOT appear in the list THEN
 - > Click on GRAPHIC STYLES > MENU
 - > Check the box beside **InLine Equation** > OK / CLOSE

OR

- B. Add the IN-LINE EQUATION macro to the BUTTON BAR.
 - > Right-Click on the Button Bar
 - > Choose EDIT
 - > Click on ASSIGN MACRO to BUTTON
 - > Find the macro file called **inline.wcm**, > ASSIGN
 - > OK

Using the InLine Equation Editor

STEP ONE

- A>Click on Macro > In-Line Equation (should now appear in the list) (WP 5.2)
or Click on Graphics > In-Line Equation (for WordPerfect 6.0)

OR

- B > Click on the InLine Button on the button bar.

STEP TWO

Enter your equation (*details to follow - try $y=3x + 5$ to start with*)

STEP THREE

Click on REDISPLAY to check that the Equation looks correct

STEP FOUR

Click on CLOSE to exit the Equation Editor, and you should return to the main screen. If viewing graphics is checked ON (View → Graphics), you will see the equation you just entered !

DETAILS about the EQUATION EDITOR

- Use ^ or **sup** for exponentiation.
- Use _ or **sub** for subscripts
- Use the word **times** for a multiplication symbol
- Use the word **div** for a division symbol
- Use the symbol != to represent the not equals symbol (equal sign with slash)
- Use **deg** for the degrees symbol
- Use { } around expressions that should logically stay together (like parts of a fraction). WordPerfect

makes the assumption that with no {}, single objects will be parts of a fraction, or limit, etc..

- * Use the ~ (tilde) symbol to put an extra space between symbols, numbers, or variables.
- * Use the words **lbrace** and **rbrace** for the curly brackets { and } if you want THEM to appear in your equation
- * Use the keyword **over** when writing a fraction. (or **oversm** when using mixed fractions)
- * Use the keywords **sum**, **int**, (integral) and **matrix** for special math functions
- * Use the keywords **from** and **to** to specify the limits below and above the summation formula, or limits, or integration.
- Use the greek letter names directly to specify angles, etc., NOTE: Names are case-sensitive - so **pi** is different from **Pi**
- Use the & to separate columns and # to separate rows in a matrix. Also use **scalesym** to enlarge symbols, like brackets around matrices.

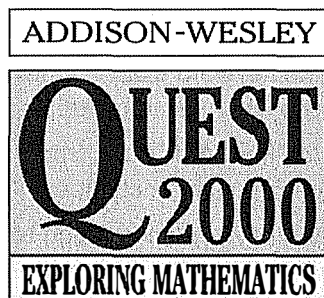
Examples:

EQUATION EDITOR COMMAND

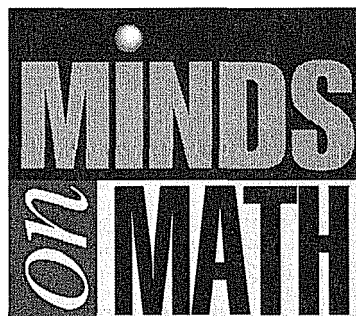
REDISPLAY

y = 3 x sup 4 - 5 H sub 2 O	$y = 3x^4 - 5h_2O$
6 over 9 = 2 over {4 - 1}	$\frac{6}{9} = \frac{2}{4-1}$
7 oversm 2 ~ = ~ 3 1 oversm 2	$\frac{7}{2} = 3\frac{1}{2}$
5 times 3 + 8 div 2 - sqrt 9	$5x8 + 8 \div 2 - \sqrt{9}$
23 longdiv 4563	$23 \overline{)4563}$
A = pi r ^ 2	$A = \pi r^2$
gamma != Gamma	$\gamma \neq \Gamma$
theta ~ approx ~ 30 deg	$\Theta \approx 30^\circ$
sum from {j=5} to 20 {4 j ^ 3 - 2}	$\sum_{j=5}^{20} 4j^3 - 2$
A = scalesym 250 [matrix { 2 & 3 # 4 & 1 } scalesym 250]	$A = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$

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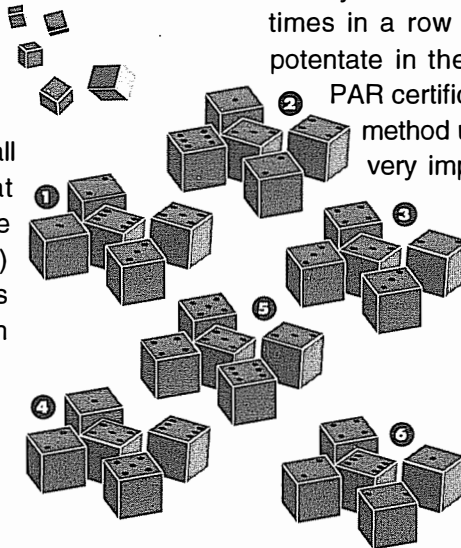
Supplementary Resources

▲ TEACHING IDEAS FROM THE EDITOR

Petals Around The Rose

This is a game that I play with all of my students no matter at what level they are. The game is quite simple. A potentate (the teacher) rolls five dice. The potentate informs the students that the potentate can tell them three things.

1. The name of the game is *Petals Around the Rose*, and the name is important.



2. The answer for any roll is an even number.

3. The answer for this roll is ____, (The blank is filled by the number represented by the roll.)

Any student who can give the correct number five times in a row in 3 above automatically becomes a potentate in the Society. I always give the student a PAR certificate. No potentate may ever reveal the method used to obtain the answer in 3. This is a very important regulation of the *Petals Around the Rose Society*. Any potentate may test and enroll others in the Society.

Here are the answers, given in order, for the six rolls shown here and on the cover of this issue of the *Gazette*.

6, 2, 6, 8, 10, 0

▲ DIRECTORS' DIALOGUE



BY PETER SAARIMAKI
COORDINATOR OF MATHEMATICS
TORONTO BOARD OF EDUCATION

These notes are from a special meeting of the OTF Curriculum Forum held January 23/24, 1998.

Introduction

As the deadline for this *Gazette* precedes OAME's next meeting of Directors, this report concerns recent and future initiatives in elementary and secondary reforms as they affect OAME through connections to OTF.

OAME is a member of the OTF Curriculum Forum (and I am OAME's rep). The Forum is the one official link we have to the Ministry of Education and Training. OTF has sponsored the Forum sporadically the last few years, due to budget constraints and a lack of vision. Recently though, the OTF executive has recognized the need for a curriculum voice in all the initiatives "planned" by the Minister.

The Forum provides an opportunity to meet with reps from subject associations across the province and from our federation affiliates. Besides updates on the new elementary report cards and curriculum guidelines (English and Mathematics) we were told to expect guidelines in:

- Science and Technology - in line with the Pan Canadian curriculum (February they said - how close were they?)
- Kindergarten - not separated into Junior and Senior (March?)
- FSL in late March/early April
- guidelines still to come include: the Arts, Social Studies and Healthy Active Living Education (remember Phys and Health Ed?)

MET is also working on a pilot project with OISE/UT to provide a summer inservice program in mathematics aimed at grade 7/8 teachers with a focus on **Data Management and Probability, and Patterning and Algebra**. Watch for notices later in the spring: they may even have it on a web-site.

Secondary Reform is the other biggie. The process for developing the new subject guidelines involves RFPs (Requests for Proposals). [If you really want to find out more about that, visit the MET web-site, at www.edu.gov.on.ca, or MERX, at www.merx.cebra.com.] I will spare you the details, except to point out that the

process is very rigorous, very detailed, time-consuming and expensive.

OAME has been working towards this event for quite a while through the **Fields Institute Mathematics Education Forum**, with members of OMCA, Universities, Colleges, and business. At the time of writing (Jan. 98) OAME was one of a few subject associations planning to be part of a bid. (Others may include Phys Ed and FSL).

Under the basic timelines set out by MET, OAME will be invited to comment at each stage of the writing process, with the final product going to the Minister for approval by the end of 1998. The first deliverable we will see is not due out till mid June. This process is designed to produce guidelines for schools early in 1999, preparatory to implementation of the Grade 9 courses in September 1999. This upper level document will be the policy part, and will be followed by course profiles

dealing specifically with each course in each grade at each level.

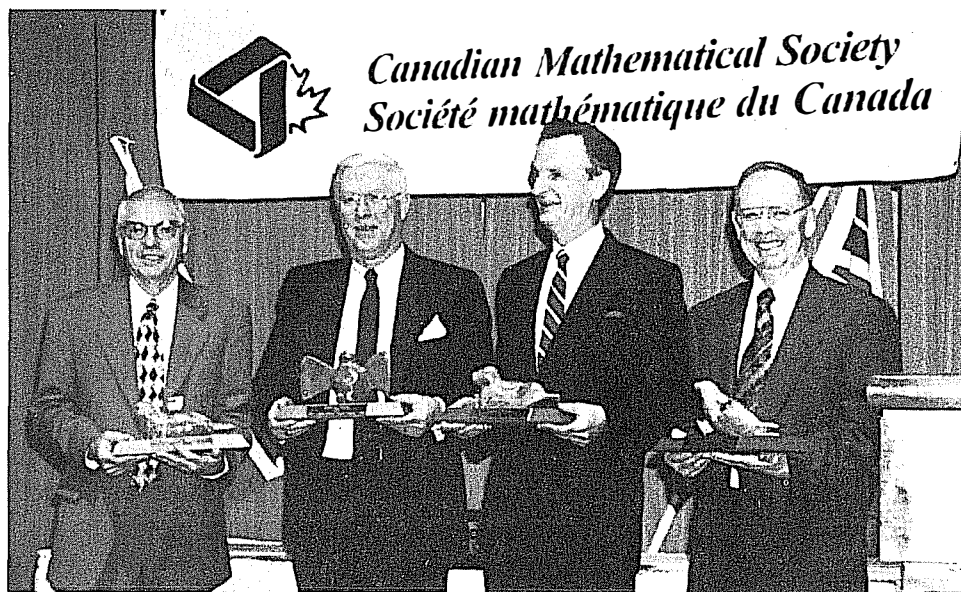
One shared opinion of the reps at the **OTF Curriculum Forum** was that OAME has a long history of involvement and influence with the Ministry and mathematics documents. We were held up as one organization that has affected change for the better; change that reflects the views and opinions of educators in our subject. The visionary work of the **Secondary Mathematics Expert Panel** last spring was envied by many. Congratulations and thanks are extended to Mary Lou Kestell and Marg Warren along with Steve Halperin and Paul Hietala and the community reps.

If any of these events are of interest or concern, contact your local OAME chapter, a member of the executive, or myself for further information. Your federation rep should also hear of your support for the work of the **Curriculum Forum**.

THE 1997 ADRIEN POULIOT AWARD

The **1997 Adrien Pouliot Award**, for individuals or teams of individuals who have made significant and sustained contributions to mathematics education in Canada, has been awarded to the team of **Ronald Scoins, Ronald Dunkley, Donald Attridge and Edwin Anderson. The Centre for Education in Mathematics and Computing, University of Waterloo.** They were honoured for their pioneering work in the creation and development of the **Canadian Mathematics Competition** and for their central and essential role in its growth to the present. These contests not only involve students (over 200,000 each year) but are also responsible for developing and supporting a network of mathematics teachers in every province: providing an environment that stimulates professional development as well as opportunities for teachers from schools and universities to meet and exchange ideas.

The awards were presented at the **Canadian Mathematical Society** banquet which took place at the Empress Hotel, Victoria, BC on December 14, 1997. The Adrien Pouliot Award was inaugurated to recognize individuals or teams of individuals who have made significant and sustained contributions to mathematics education in Canada. The first award was presented in 1995.



▲ THE "FIELDS" OF DREAMS

ALAN CHAN
WOBBURN COLLEGIATE INSTITUTE



Alan Chan teaches mathematics to gifted children at Woburn C.I. He is currently the vice-president of S.A.M.E., a chapter of O.A.M.E. and assists with the local board doing inservices for other teachers regarding graphic calculators.

During this climate of political turmoil regarding education, there is a bright light down the road. This bright light is known as SIMMER, the **Society Investigating Mathematical Mind-Expanding Recreations**. This society is sponsored jointly by the Fields Institute for Research in Mathematical Sciences and the University Of Toronto Mathematics Network. Their mandate is to bring together enthusiastic mathematics educators to share ideas, and to investigate recreational mathematical problems and concepts that arise from these problems.

The society meets on the fourth Thursday of each month at the Fields Institute located at 22 College Street from 6:00 p.m. - 9:00 p.m. There is usually a featured presentation by a well respected professor/mathematician followed by a light supper where people can relax and enjoy the festive atmosphere. The first ever meeting took place on March 27, 1997 as teachers from the greater Toronto area came to participate in this exciting event. So far, it has been a success as teachers have expressed an interest in promoting and participating in this professional organization.

The following list is an up to date record of all meetings held at the Fields Institute.

- | | |
|----------------|---|
| March 27, 1997 | Combinatorial Block Designs
by Brett Stevens |
| May 22, 1997 | Numbers Ancient and Modern
by Will Traves |
| Sept 25, 1997 | Mathematics Of Risk Management
by Professor Luis Seco |

New From

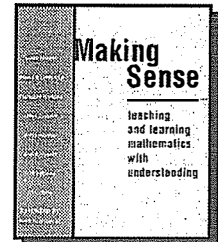


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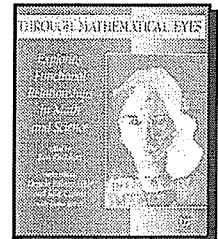


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- Nov 27, 1997 *The Causitic in a Tea Cup*
by Professor Antonio Sa Barreto
- Jan 29, 1998 *How to See in More Dimensions*
by Professor Ragnar Buchweitz
- Feb 26, 1998 *Numbers - Finite and Infinite*
by Professor A. I. F. Urquhart
- Mar 26, 1998 *Hands-on Algebraic Topology*
by Jonathan Scott
- April 23, 1998 *Statistics and Distributions*
by Alison Gibbs and
Martin Van Driel
- May 28, 1998 *Economics is based in Mathematics*
by Professor Nancy Gallini

The mathematics, problems and solutions related to the talks can be found on the web site,
<http://www.math.toronto.edu/mathnet/simmer/>

The coordinator of this society is Nami Bland. Nami is the mathnet coordinator from the department of mathematics at the University Of Toronto. Her hard work and determination has led to the birth of SIMMER. This will certainly be the starting point for many educators of today and tomorrow to explore, to learn, to share and to grow in the area of mathematics education. Anyone interested in attending Teacher's SIMMER meetings can find information a the website listed above or you may contact Nami Bland at work: Phone: (416) 978-3472 or by E-mail: namib@math.utoronto.ca

Exploring Mathematics on the World Wide Web (Cont'd from page 22)

History of mathematics	http://aleph0.clarku.edu/~djoyce/mathhist/mathhist.html
Escher's art museum	http://lonestar.texas.net/~escher/gallery/
Harper's Magazine	http://www.harpers.org/
Puzzle Archive	http://www.nova.edu/Inter-Links/puzzles.html
Math magic activities (tricks and games)	http://www.scri.fsu.edu/~dennis/CMS/activity/MM-calcw.html
Paper folding	http://www.lwcd.com/paper-folding/
Math Land	http://www.maa.org/mathland/mathland_archives.html
Math puzzle page	http://www.xmission.com/~ericward/puzzle.html
Lateral thinking puzzles	http://www.interlog.com/~badinage/LATERAL.HTML
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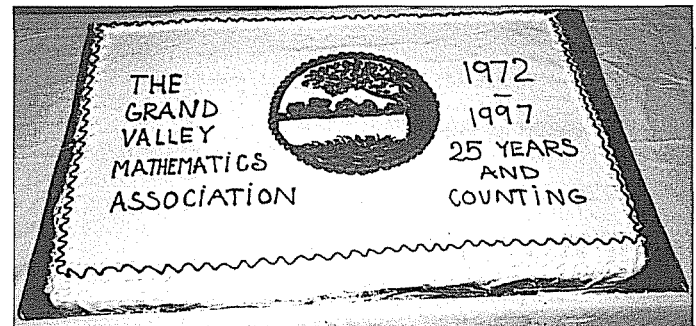
SANDRA EMMS JONES

This year **The Grand Valley Mathematics Association** celebrates twenty-five years of service to mathematics education. To commemorate the occasion, Ed Baumgart compiled *Twenty-Five Years and Counting, 1972-1997, A History of the Association*, that traces the growth of the organization. The trends and concerns in the past quarter century of mathematics education will become evident when the programs of twenty-five years of conferences are studied.

On December 4, the celebration continued at the annual fall conference. Balloons and banners greeted the 250 conference delegates. As coffee and juice were sipped and snacks enjoyed, registrants perused and purchased publications available at the NCTM and GVMA booths.

While we celebrated the successes of the past twenty-five years, the sessions looked at present and future concerns. The secondary panel joined Judy Crompton (President of OAME) in a lively discussion of **Specialization Years Mathematics**. Gord Plumridge from Orangeville District Secondary School demonstrated how to motivate students by presenting mathematical concepts in a casual disguise. Bob Duff, Galt Collegiate Institute, Cambridge, gave delegates a guided tour of the Internet. Stu Telfer, Forest Heights Collegiate Institute, Kitchener, examined the requirements that other countries have for their math students. Ross Honsberger, University of Waterloo, dazzled us with another edition of *Mathematical Morsels*.

The elementary panel looked at the new curriculum with Margaret Warren, Program Coordinator, Peel Board of Education. Carol King of Elmira's Park Manor Senior School demonstrated how to make the Math/Visual Art Connection.. Keith Bauman, Waterloo County Board of Education consultant, shared strategies to give students a Positive Start to Integers.



At the banquet a huge cake bearing the GVMA logo and a picture gallery were on display. Along with our salad came three courses of fun with Bill Boettger's 25th Anniversary Edition of G.V.M.A. Dinnertime Math. The first course was TASTY TRIVIA. This was followed by CRUNCHY CRYPTICS and a NUTRITIOUS NUMBER PUZZLE. Winners from Halton region received a prize donated by Frances Schatz on behalf of NCTM.

As we enjoyed the special anniversary cake, we thanked Tom and Diana Rajnovich for the near twenty years they have dedicated to GVMA as directors of membership and sales of publications, and as conference registrars. They were presented with a commemorative plaque and, in keeping with their wishes, a donation will be made to Anselma House in Kitchener, a shelter for abused women.

After dinner we were entertained and inspired by Jack Weiner's energetic presentation of "5 Five Minute Mathematical Diversions for Your Classroom". On a historical note Jack remembered Ken Fryer, a teacher of great inspiration in his life and the featured speaker on the eve of the formation of the GVMA.

In April the GVMA conference "Returns to its Roots" at the University of Waterloo. The celebration continues.



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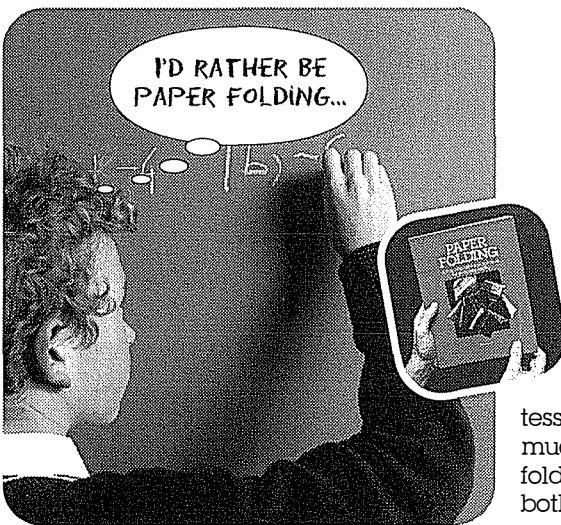
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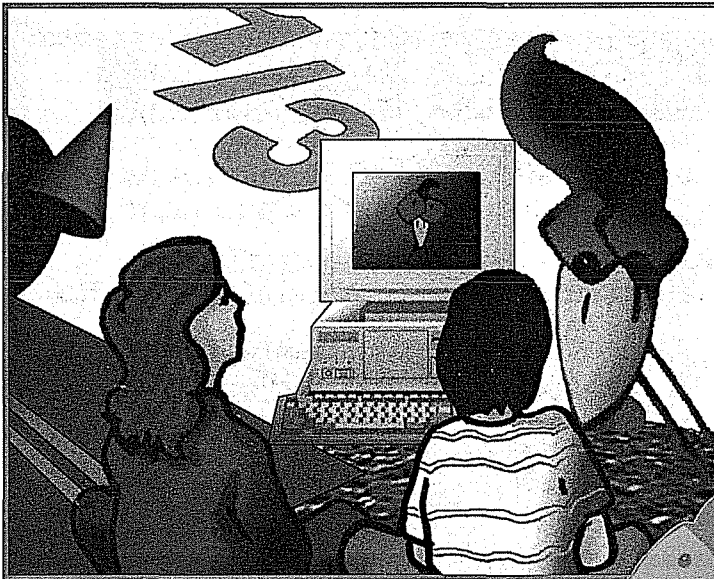
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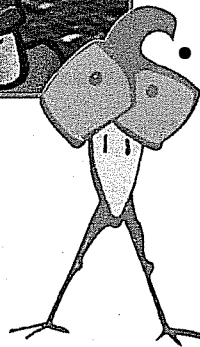
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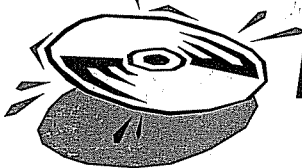
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