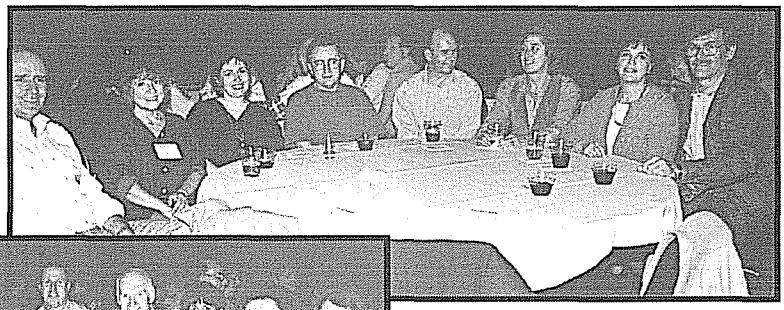
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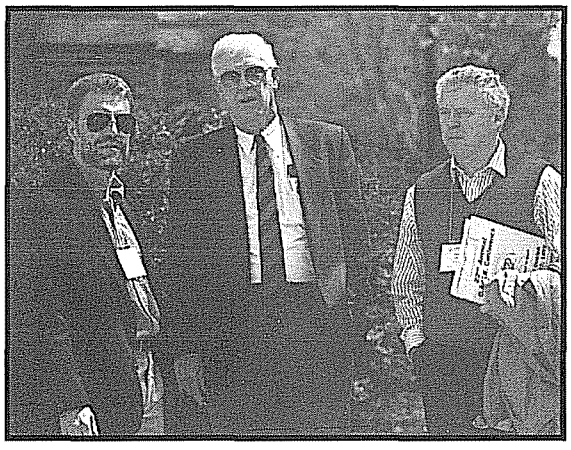
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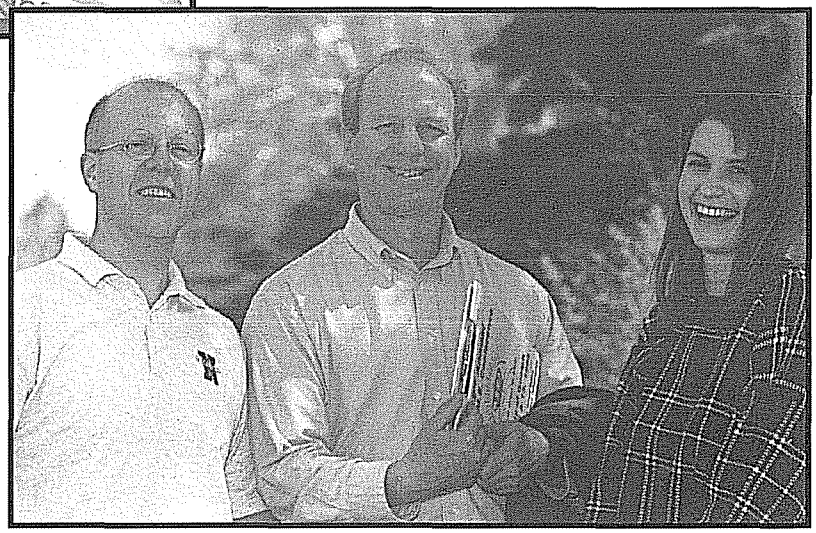






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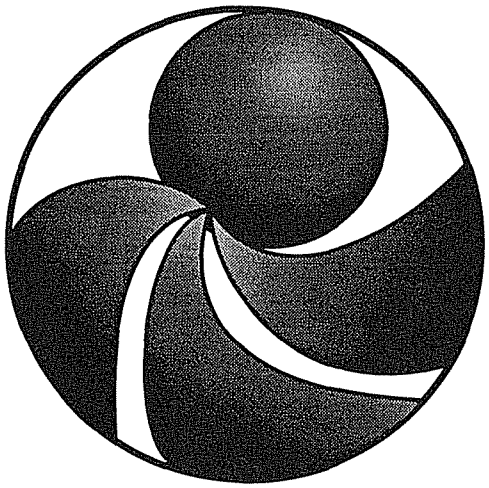
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EDITORIAL



At least once every two years, I take on the challenge of teaching a course for the first time. A few years ago, it was Math Modelling. More recently, I taught Differential Geometry. Now here is a fascinating branch of mathematics whose very existence in many math departments is threatened by the need to cut back course offerings. The usual negative reasons: slashed budgets, faculty positions lost through attrition, and the other ailments of 1990's education. But disappearing curricula is not my concern for today. The topic is the role of the teacher.

For the first time, I am teaching a course in Numerical Methods. Here is the University Calendar description:

"This course provides an overview of and practical experience in utilizing algorithms for solving numerical problems arising in applied sciences. Topics covered will include solutions of a single nonlinear equation, interpolation, numerical differentiation and integration, linear algebraic systems, and systems of nonlinear equations. A computer will be utilized in solving problem assignments."

The real challenge for me is that I have never studied numerical analysis. To make matters worse, I have always been a computer user, but not a programmer. So I'm relearning Basic, becoming familiar with C and Pascal. Before the course is over, I may even use Fortran again.

I could have made my life easier. The teaching assignments for this Spring, 1995 semester were announced last Spring. I had ample time to trade away this course for a calculus or a linear algebra. No way, I thought. I have a full year to get a handle on the material. It'll be great. It'll be fun.

It's not fun. First of all, you and I have full time jobs and more. Over the year, I only managed an hour here, a day there, to the course. And I can't learn that way. I have to dig way down deep into the subject, prove the theorems logically, and understand them intuitively. I have to do the exercises thoroughly and repeatedly so that the little tricks are no longer tricks, but inevitable steps on the road to a solution.

I tried, but found I just couldn't really get into it until Sunday, May 14. The day after OAME/95 was over. On May 15, the Spring Semester would begin. I did not have my first class prepared. In this course. I'm also teaching another course, preparing the *Gazette* and ... Crunch time.

I've been at it for a month. How's it going? Not very well. I manage to keep a few classes ahead in the theory. But after each class, I think, "I want to do that all over again, because now I think I know how to put this material across. Now I know what's important, and where the pitfalls are." In short, I think I know all those teacher things I would have learned if I had taken the course from a good teacher. Things you don't pick up from a text.

Well, I'll do the best I can. I'll ask my colleagues for help until I become a pest and then pester them some more. And as I teach, I'll project myself into a front row seat and I'll learn. I will give my students as fine a course as I can this time. And I will learn.

Next summer, I am scheduled to teach this again. It'll be great. It'll be fun.

Have a great summer.

Jack

CALL FOR EDITORS:

The Ontario Mathematics *Gazette* and the *ABACUS* are taking applications for two year terms as editors commencing with the September, 1996 issues.

If you are interested or would like to recommend a colleague for either position, please contact Executive Directors Dave and Bonnie Alexander at the address on the masthead (inside front cover).

▲ LETTER TO THE EDITOR

Dear Editor,

First congratulations on the work done by many GVMA members to make the OAME Annual Conference in Guelph this year a big success. The Annual conference is a special time when we can rejuvenate our teaching, renew former working relationships, review the year's successes and rethink our dreams for the future. Your conference provided opportunities for all those activities to occur.

There was, however a disturbing set of events that occurred as well. Every time I discuss the conference with a colleague, the name of one of the visiting keynote speakers, Tony Gardiner, arises. What makes the conversation disturbing is that consistently people are searching for something positive to say about his presentations. Wednesday night, he told the coordinators at the OMCA dinner, that it was acceptable to have a vision of how to really teach mathematics but that, in reality, few teachers were capable to delivering mathematics in context and in great depth so we should be telling them to continue to teach math as drill-and-skill because, at least then, "We would have a few winners." That says mathematics education is for a very few. This is a nightmare and not a dream.

Over the next few days, Mr. Gardiner proceeded to attend the presentations of some of Ontario mathematics education's strongest and best promoters: Trevor Brown, Peter Taylor, and Ed Barbeau. People from those audiences have said it was disappointing to have gone to listen to a well-respected speaker, only to have him interrupted and argued with for up to half the time of the presentation. These people report that Mr. Gardiner's negative comments and challenges did nothing to enhance the presentations. He never had anything constructive to share, only cynicism and a rear-view mirror picture of mathematics education. OAME and OMCA members are wondering how Gardiner knew which high profile people to harass.

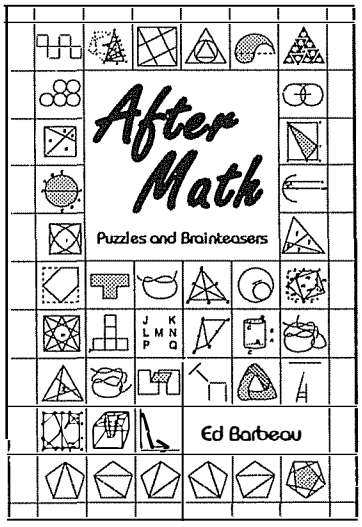
It was also disappointing to hear that during his keynote he tore apart the Assessment Project. This is a project to which many members have given long, hard hours. Sixty-nine teachers did some part of the field testing of materials. All along, people had a chance to be pro-active in its development. Sabotaging the project at the late stages of its production does nothing to enhance and promote mathematics education. Further, it drives shafts down through the ranks and divides the math community.

As one of many people who has worked hard for the last twenty years to bring that community of people together and to make all members pro-active as opposed to re-active, I find this kind of activity deeply disturbing. The real "kicker" is that although he said we were completely off track and in danger of destroying math education, he went on to tell "jokes" about other people who have also messed up mathematics. I question whether or not the man has even stepped into an elementary or secondary math classroom to see and hear what is happening there. Surely, a speaker of his caliber, should be telling us how to avoid the traps, not sitting on the sidelines sneering. If his point is that we are leaning too much on process and not enough on content, then he should be helping us bridge the gaps between the two so we can have some success. He simply says, "You guys are doing it wrong. Do it the way we used to do it twenty years ago, even if our method results in only a few winners. At least then, we know we can win a few math contests." For most of us in Ontario, Mr. Gardiner, your vision is very limp. Such advise does little to help us. I only hope it does not drive us further apart.

Sincerely,

Mary Lou Kestel

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▲ Outgoing President's Message



TODD ROMIENS

My year as President of OAME has been very enjoyable. It is a pleasure to work with so many people committed to the advancement of mathematics education in Ontario. My thanks goes to the Council for its hard work, the Executive, for its guidance and support and to our new Executive Directors, Dave and Bonnie Alexander for seeing to it that the transition was done in a smooth and professional way. There is always some apprehension when change occurs, but Don, Carol, Dave and Bonnie made it easy for me and OAME.

OAME has been active this year. The following highlights some of the initiatives and activities that have been carried on. A lot of hard work has been devoted to these initiatives and I am proud to say, a great deal has been gained.

The Special Projects Committee, under the leadership of Mary Lou Kestell (OMCA) and Judy Crompton, have put together an excellent assessment package for the Transition Years. It has been field tested and the response has been super. The goal is to publish it with samples of student work tied to the standards. It will be available to all teachers on a cost recovery basis, probably in the fall. The committee is now moving on to produce a similar document for Junior Division teachers.

The Specialization Years Committee is producing an addendum booklet to supplement the Focus on Renewal document which was so well received across the province. With so little being said by the Ministry about these years, it provides OAME with an opportunity to be on the forefront of education at this level. We are still looking for input to our work so please pass your ideas along.

I'm sure you noticed how flashy our *Gazette* is becoming with the addition of full colour ads. I think we have the best publication of all subject interest groups in the province. Jack Weiner has done a great job along without new Advertising Manager, Dean Murray. Congratulations Jack, to you and your team for a splendid publication.

As an organization, we have always been concerned with how we best help teachers in our elementary school system. The Formative Years Committee under the leadership of Shirley Fairfield has produced an excellent *ABACUS* Insert to this month's *Gazette.* More material is being produced and it too will be available as a publication from OAME.

This past year's Leadership Conference was also directed at elementary school teachers, and again was an oversubscribed affair. Keynote speakers such as Dave Whitin from South Carolina and Maureen Sullivan from Ottawa made the conference a great success. Get your application in early when this year's conference is announced.

Another new chapter has been added to our growing numbers. Mac^2 (The Mathematics Association for the Cottage Country) was recently accepted as our newest chapter. Congratulations and thanks go to Paul Pogue and Bill Morrison for their hard work in getting this chapter off the ground.

The Ministry has recently issued The Common Curriculum Grades 1-9, the Mathematics Standards and the Commission on Education's report. OAME members have been actively involved in either structuring or responding to these documents. The Ministry knows who we are and what we do. Future documents produced in the area of assessment of curriculum will, I feel, continue to have OAME representation.

The Publicity Committee is hard at work planning ways to make OAME and mathematics more visible in the community. A number of great ideas have been discussed and you should look for some exciting happenings this year.

A number of new members have been added to our council this year. I look forward to working with them and to continue to work closely with our new president, Susan Stuart. I know under her leadership our organization will continue to break new ground and move forward.

GVMA ran a very successful conference in Guelph last month. I look forward to hearing the final numbers. My thanks to Ron Dunkley and Ron Scoins, chairs of the conference, and to all committee members and support help. Well done!

I encourage all of you to get involved with OAME. My association with OAME over the years has been a great learning experience. It has broadened my horizons both professionally and personally. OAME is always looking for help with all aspects of the organization. Write an article for the *Gazette* or an activity for the *ABACUS,* attend conferences, help to organize a conference, or just get a friend to join. Your contribution will be appreciated.

Thank you, the members, again for the opportunity to serve you. I look forward to my year as Past-President.

▲ Incoming President's Message



SUSAN STUART

It is my great pleasure to greet you for the first time as President of OAME. I have looked forward to this time with excitement, but some trepidation. Education is changing, and so quickly. Your OAME executive and council try to keep ahead of things, but at times feel as if they are barely keeping up. We are not alone in our efforts.

In May of this year, educators from across the country met in Quebec City for the first Canadian Forum for Education in Mathematics organized by the Canadian Mathematics Society. The goal of the Forum was to initiate a dialogue which might lead to a clearer understanding of the goals and aspirations of educators, mathematicians, parents, industry and business regarding the mathematical education of Canadians. Did all Canadian educators agree on the future of our math education? No, of course not! We did, however achieve our stated goal.

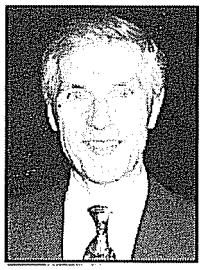
Although no clear-cut solutions were provided in our dialogues, the questions and the problems became clear and they are common to all. We agreed that we need a strong Canadian voice in math education. "We must create a positive culture in mathematics" both in and out of the school setting and we must decide what is relevant in math education and therefore what is relevant to teach to students who have variety of needs and talents. We must honour excellence, foster teamwork, and support teachers as learners. New ideas? No, but comfort is often in knowing we are not alone in our beliefs. Change is difficult and it is encouraging to know that we are not alone in taking steps to rethink curriculum and create learning environments that are supportive, create a desire to learn and encourage creativity. Now we need to grapple with solutions. OAME will begin by coordinating a meeting of math educators at the Fields Institute in the near future.

During the next year, we will strengthen these partnerships in order to provide outstanding materials and service to OAME members. The Transition Years evaluation activities will be ready and we will begin to work with the Ontario Association of Junior Education (OAJE) on Grades 4 to 6 evaluation material. Meetings will continue with university and college teachers to help refine the Specialization Years document.

And so we look toward an exciting 1995-96 school year. Until then, I hope that you will all have a safe, happy and restful summer.

▲ Moving Towards Inquiry - What Does It Mean for the Classroom?

JOHN CLARK



John Clark is a retired coordinator of mathematics for the Toronto Board of Education. Recently he completed research into teaching through inquiry at grades 7 and 8. He is interested in issues related to curriculm and teacher development.

In the December '94 issue of *Gazette,* I explored the meaning of inquiry and how the values on which it is based conflict with those of transmission which assumes knowledge can be passed from a teacher to students. In the April '95 issue, based on a case study of three grade 7/8 teachers, I described how moving from transmission towards inquiry raised fundamental questions about the expected curriculum. In this article, based on the same case study, I describe how moving towards inquiry affected the teachers' practices; important aspects of classroom life changed including the roles of both teacher and student, communication, and student assessment. I also address issues of the professional development of teachers raised by the study.

Roles of Teacher and Student

Prior to the study, the role of the teachers had been primarily to explain, tell, question about things known, and assess the correctness of student response. As they changed their practices, however, the roles of both teacher and student changed. The role of teacher which evolved was one of listening to and observing students, initiating and nurturing investigations, and identifying and using student responses as hooks to sustain inquiry.

In their role of initiating and nurturing investigations, however, they needed help finding suitable starting points. For example, they used an activity from a current textbook to introduce fractions. Generally, we tried to find starting points which were simple enough for all students to get started but also had the potential to grow depending on student response. We struggled with the question of what was "enough" direction

from the teacher: how much and what kind of scaffolding should be provided without diminishing the opportunities for students to take greater control of their learning? We realized that such questions could only be answered in terms of individual students; some took off on their own with little assistance while others needed more support. As the teachers moved toward inquiry, therefore, a major difficulty in their new role was discovering how much they should do for students.

As the teachers changed they were caught between their previous role in transmission and a developing role in inquiry. The pressure to teach by transmission was great. As professionals, teachers are entrusted with specific responsibilities and paid to carry them out. These responsibilities are dictated by official documents and policies including assessment and their interpretation by the public and educational community. These pressures give strong support for transmission but not much for inquiry. On the other hand, the teachers discovered in the study that students can make a significant contribution to learning and have an active role to play. The teachers acknowledged that they learned from their students and depended on their responses to plan daily. Thus conflicting pressures produced a dilemma for the teachers which can be characterized as teaching "outside-in" or "inside-out" (Hunt, 1987).

The changing role of the teachers coincided with a new role for students who realized that their teachers now had different expectations. Their teachers frequently justified changes in methods by explaining that they wanted their students to learn how to think mathematically, not just memorize rules. Symptomatic of the difficulty encountered by students, however, was a comment to me that I was torturing them because I knew the answer to a question but would not tell them. Schoenfeld (1992) cites a list of typical student beliefs (developed by Lampert); for example, "Mathematics problems have one and only one right answer" (p. 359). The student who complained to me likely believed this statement. An inquiry approach challenged students' beliefs just as it did the teachers' beliefs. As teachers assumed less control, students were expected to assume more, and the roles of both became more mutually dependent.

The changing roles of teacher and student raised the difficult question of the degree and nature of control which teachers can share with students. Freire (1970) describes the change for students as one of becoming subjects of their education rather than objects. The teachers tried to find a balance between the two extremes of students totally as subjects or objects. It is significant, however, that initially and throughout the study, the teachers reported that, with some exceptions, their students were responding enthusiastically to their new experiences.

Inquiry and Communication

As the teachers changed their practices, patterns of classroom communication also changed. At the beginning of the study, students were not accustomed to writing about mathematics and believed they should be quiet in class. Although they found it difficult as first, they eventually became more comfortable describing their thoughts in writing and engaged in lively discussions. The emergence of language as a tool for learning resulted from the active exploratory approach taken by their teachers.

The teachers believed that to foster inquiry they should talk much less and listen more carefully to students. They utilized students' questions and comments to further an investigation by recording them on the board or chart paper, and asking students to explain and justify answers. By doing so, they validated student thinking; students learned what they said was important and would be used. Initially, students sought permission to make personal statements about mathematics so the teachers encouraged them to write in the first person and say what they thought and felt. In assessing the written work of one student, a teacher valued the fact that he could hear the student's "voice". Students began to use a language of argument in which they made conclusions supported by justification.

At the beginning of the study, the teachers doubted the effectiveness of concrete materials but grew to recognize their power to motivate and engage students actively in learning. Materials such as fraction strips, string, cut-out shapes, measuring tools, and dot paper acted as catalysts for inquiry. Hiebert and Carpenter (1992) state that concrete materials focus student attention and provide "a public representation to which attention can be drawn and a focus for discussion" (p. 71). They note that the language used to talk with others about materials may be crucial to student understanding. The teachers recognized the need to allow time for "play" or "mucking about" with materials and the ideas they generated. This need is also acknowledged in the Piagetian concrete operational stage of cognitive development.

The teachers asked far fewer questions and students asked many more. Dillon (1988) who studied the dynamics of student and teacher questioning believes that development of students' ability and desire to question should be one of the primary aims of education. Analysis of actual classroom discourse leads Dillon and Carlsen (1991) to doubt that traditional forms of teacher questioning stimulate thoughtfulness and encourage expression by students. They believe that such questioning is mainly an exercise of teacher power and control which actually limits discussion and discourages student questioning.

The transition to effective use of oral and written language, however, was not without difficulty. The teachers struggled to know when to jump in and when to keep quiet. They wanted to support their students' inquiry but were uncertain when and how far to intervene. Rather than tell students what was mathematically correct, the teachers tried to let them decide. But the teachers worried that their students were not learning

what they wanted them to. The teachers believed that they should use student responses, but found it easier to hear them than use them. There were class discussions in which students spoke inaudibly and without confidence, or spoke only to the teacher as if no one else needed to listen. This was frustrating for the teachers who occasionally responded using language to control students. Students took risks offering personal thoughts, but on some occasions, others laughed discouraging them from volunteering again. These observations indicate the difficulty both students and teachers had finding their new roles.

Barnes (1976) argues that patterns of classroom communication reflect teacher and student values, their views of knowledge and who controls it. In our study, the transition from transmission to inquiry was a shift in values which could be seen in the shifting purposes for oral and written language. Observation of classroom communication revealed the struggle by the teachers to find a balance between direct teaching and student-directed learning. Classroom communication is an acting out of the intended curriculum.

Inquiry and Student Assessment

Previously, the teachers had marked work correct or incorrect, but now that they valued and were able to see students' mathematical thinking, the difficulty was how to assess it. Written and oral work presented two separate challenges. For written work, I shared my experience with holistic scoring in the Toronto Benchmark programme which is a qualitative as well as a quantitative form of scoring applicable to language and mathematics. The teachers used holistic scoring on test questions and write-ups of investigations thereby expanding their skills in student assessment.

The teachers also began to attach much greater value to information gained through daily observation. They frequently commented that they were surprised by who was "on the ball", and were captivated by student discussion and methods. Using observation as a tool for assessment, however, posed these problems: what to observe, how to record and retain information, how to use observational data to assign grades, and how to integrate information obtained from observation and written work.

And what standards were the teachers to use? Mostly, they used previous experience. Being grade 7/8 teachers prior to destreaming also meant that they had a special responsibility for making judgments which would help students determine a programme in grade 9. But if their judgments were to be equitable and consistent, the teachers needed standards reflecting a broader base than their own experience. Thus a need developed for exemplary written samples which could serve as standards when evaluating students' work and effort in investigations.

Our study group's experience with assessment in 1991-92 was a relative oasis of calm in a public political climate which was becoming increasingly controversial and this continues today. The controversy is ultimately one of conflicting values. Teachers striving to use an inquiry approach are likely to be discouraged by political pressures emanating from incompatible views of education, mathematics, and student assessment, unless they receive official and public support.

Our study demonstrates the importance of making assessment an integral part of educational change. From the beginning, the teachers believed that addressing student assessment was integral to the goal of fostering inquiry. Silver and Kilpatrick (1988) argue that recent attempts to control assessment of problem solving for teachers have had the effect of "deskilling" them and serious efforts are needed to "reskill" teachers so that they not only have tools, but also confidence to determine what and how their students are doing.

Professional Development

The teachers made remarkable progress in changing their practices. What is the explanation? First, the teachers themselves, taking a great risk, initiated the change. They were dissatisfied with what they were doing and wanted to make mathematics more interesting for themselves and their students.

The teachers believe, however, that their growth was the result of the activities of our study-group. Lunch-time and occasional half-day meetings alternated with classroom work and the focus was the classroom. The response of students had a profound effect on the teachers producing a reciprocal relationship between teachers' actions and student response which was our primary source of energy. The blending of discussions of theory and practice at meetings with classroom work was a powerful combination.

A parallel existed between the teachers' development of pedagogical knowledge and their students' development of mathematical knowledge. The common thread was inquiry into student learning by the teachers, and mathematical ideas by students. The two processes were concurrent and interactive. Just as good teachers take into account the individual differences among students, administrators responsible for teachers' professional development need to respect individual differences among teachers and their developing understanding of concepts of mathematics education.

Our study demonstrates the effectiveness of a small group of committed and compatible teachers conducting its own inquiry into learning supported by a resource person. The teachers used the term "mentor" to describe my role in the study-group. At meetings, I facilitated each teacher's developing understanding by identifying emergent questions, and modelled inquiry by writing key questions and comments on the chalkboard. I spoke frankly about my own personal experience and beliefs. I made suggestions for how to start and continue investigations, and led the teachers themselves

through a few investigations. Half-way through the study, I began working in their classrooms observing interactions between them and their students, and occasionally teaching. In my role as mentor, I provided advice and encouragement. The teachers said that sharing the journey with colleagues was invaluable because of the mutual support. But they also said that they could not have sustained their effort and commitment individually and as a group without my assistance. This last point is significant in the consideration of inservice models which facilitate effective change in teacher practice.

As a group we actually developed rather than implemented a curriculum centred on inquiry, and this curriculum development was integrated with the improvement of the teachers' practices. Stenhouse (1975) states there cannot be teacher development without curriculum development, and that curriculum development must be grounded in the study of the daily practices of teachers. Initially, the concept of mathematical inquiry and how to foster it in the classroom did not exist in any practical form. Although there was a broad literature advocating new approaches, the concept of inquiry was ill-defined, and historically there has been a large gap between the rhetoric of reform and what teachers can actually accomplish (Cooney, 1988). Mathematical inquiry was a shared vision held uniquely by each of us, and its meaning deepened through the group's own inquiry into learning. The teachers did not do the same thing in each of their classrooms; they adapted and shaped ideas to fit their own situations and preferred ways of working. They believed, however, that as a result of the year's experience, they had a substantial basis for a curriculum which they looked forward to using the next year; a curriculum of starting points to investigations, strategies for nurturing them, and methods for assessing students as inquirers. This curriculum comprised beliefs, methods, and materials (Fullan, 1991).

Analysis of the study-group's effectiveness raises a number of important questions, especially about the prerequisite knowledge needed by teachers to effect change. Should teachers have a specialist knowledge of mathematics or a general knowledge of many subjects? Should they have a specialist knowledge of mathematics education or a general pedagogical knowledge of many subjects? What kind of background do teachers need in order to teach effectively through inquiry? These are difficult but not new questions (Fennema & Franke, 1992; Nodding, 1992; Thompson, 1992). Our study demonstrates, however, that some teachers without specialist qualifications in mathematics can, in certain conditions, make excellent progress towards teaching through inquiry.

Being grade 7/8 teachers, they taught several subject, not just mathematics. Their responsibilities, therefore, involved potentially a vast, even boundless knowledge. Given this reality, how much and what kind of knowledge should they have? We might ask the same question about their students, even ourselves. For example, how much do secondary mathematics teachers know about other subjects? It is significant that the three teachers had taken virtually no mathematics beyond the senior secondary school level.

This brings the question of prerequisite teacher knowledge back to inquiry. The teachers initiated a process for their own professional development; they were motivated to learn and grow. Throughout the study, they demonstrated curiosity about mathematics learning and mathematics itself, and increased their understanding of both. I believe, therefore, to resolve the problem of boundless knowledge and information, the priority for the learning of both students and teachers should be knowledge which is the power to think critically and inquire. Authentic inquiry, a collaborative process which seeks meaning through curiosity, willingness, and commitment, challenges established priorities for the education of teachers and students alike.

Thompson (1984) identifies two contrasting conceptions of mathematics, dynamic and static. The teachers in this study began with a transmission view which was static, but throughout the study, like their students, they began to experience mathematics dynamically, as in ill-structured discipline open to questioning and debate. The distinction between "inside-out" and "outside-in" made by Hunt (1987) applies to both student learning and teacher professional development. I believe that outside-in (imposition and exposition) does not work with students learning mathematics nor teachers improving practices. When students and teachers begin with implicit theories rooted in personal experience, deeper and more lasting growth occurs.

Hunt (1992) distinguishes between "change" and "renewal" in personal development. It is significant that the teachers spoke of having a "totally different mindset about learning generally", and one teacher said she felt "rejuvenated". The teachers said they were transferring what they learned from our experience in mathematics to other subjects. This is what Hunt means about renewal. The key for both teachers and students was the opportunity to probe concepts deeply, about learning for the teachers, and mathematics for their students. For both, a necessary condition for knowledge acquisition was the opportunity to inquire into "big" ideas, build connections among them, and develop questioning habits of mind.

Summary

Moving towards inquiry had a profound effect on the beliefs and practices of the three teachers. Their role of questioning, explaining, and controlling in transmission changed to listening, facilitating, and learning along with students in inquiry. The beliefs and expectations of students were also affected. Their role became more active requiring greater initiative and responsibility. The changes for both teachers and students were risky because the consequences were unpredictable and could create anxiety.

As students became more active in discussions, their teachers observed a wider range of abilities and they needed new strategies for assessing oral and written work. The teachers began to rely more on daily observation and examination of students' write-ups or investigations, and used holistic scoring for both. Although their skills in assessment broadened, they needed reference points in the form of exemplary student work to judge student progress fairly and consistently.

The study-group of three teachers and mentor was the vehicle for effecting significant change in beliefs and practices. The teachers' conception of mathematics and the curriculum changed from static to dynamic. The group conducted its own informal research into learning by planning for and then reflecting on innovations in the classroom. Curriculum and professional development occurred together and both were grounded in the daily practices of the teachers.

Our study demonstrates the far reaching implications of taking inquiry seriously; it challenges fundamental beliefs and firmly held practices. To make progress towards inquiry, not only in mathematics, but also across the curriculum, we must address major questions involving philosophies of education and the professional development of teachers.

References

Barnes, L., *From Communication To Curriculum,* UK: Penguin, 1976.

Carlsen, W.S., Questioning In Classrooms: A Sociological Perspective, *Review of Education Research,* 61(2), 157-178, 1991.

Cooney, T.J., The Issue of Reform: What Have We Learned From Yesteryear?, *Mathematics Teacher,* May, 352-363, 1988.

Dillon, J.T., Questioning and Teaching: A Manual of Practice. NY, Teachers College Press, 1988.

Fennema, E., & Franke, M.L., Teachers' Knowledge and Its Impact, D.W. Grouws (Ed.) *Handbook of Research on Mathematics Teaching and Learning* (pp. 147-164), Toronto, Maxwell Macmillian Canada, 1992.

Freire, P., *Pedagogy of the Oppressed,* NY, Continuum, 1970.

Fullan, M.G., *The New Meaning of Educational Change* (2nd ed), NY, Teachers College Press, 1991.

Hiebert, J. & Carpenter, T.P., Learning and Teaching with Understanding, D.W. Grouws (Ed.) *Handbook of Research on Mathematics Teaching and Learning* (pp.65-97), Toronto, Maxwell Macmillan Canada, 1992.

Hunt, D.E., *Beginning with Ourselves,* Toronto, OISE Press, 1987.

Hunt, D.E., *Renewal of Personal Energy,* Toronto, OISE Press, 1992.

Noddings, N., Professionalization and Mathematics Teaching, D.W. Grouws (Ed.) *Handbook of Research on Mathematics Teaching and Learning* (pp. 197-208), Toronto, Maxwell Macmillan Canada, 1992.

Schoenfeld, A.H, Learning to Think Mathematically: Problem Solving, Metacognition, and Sense Making in Mathematics, D.A. Grouws (ed.), *Handbook of Research on Mathematics Teaching and Learning* (pp. 334-370), Toronto, Maxwell Macmillan Canada, 1992.

Silver, E.A., & Kilpatrick, J., Testing Mathematical Problem Solving, R.I. Charles & E.A. Silver (Eds.), *The Teaching and Assessing of Mathematical Problem Solving,* (pp. 178-186), Reson, VA, National Council of Teachers of Mathematics, 1988.

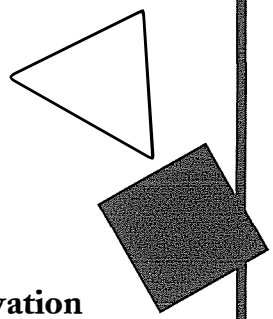
Stenhouse, L., *An Introduction to Curriculum Research and Development,* London, UK, Heinemann, 1975.

Thompson, A.G., Teachers' Conceptions of Mathematics, *Educational Studies in Mathematics,* 15(2), 105-127, 1984.

Thompson, A.G., Teachers' beliefs and conceptions: A Synthesis of the Research, D.W. Grouws (Ed.), *Handbook of Research on Mathematics Teaching and Learning* (pp. 127-146), Toronto, Maxwell Macmillan Canada, 1992.

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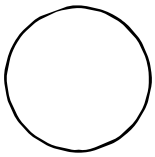


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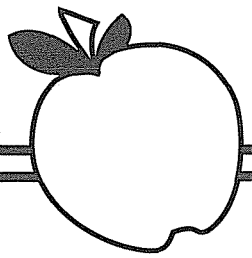
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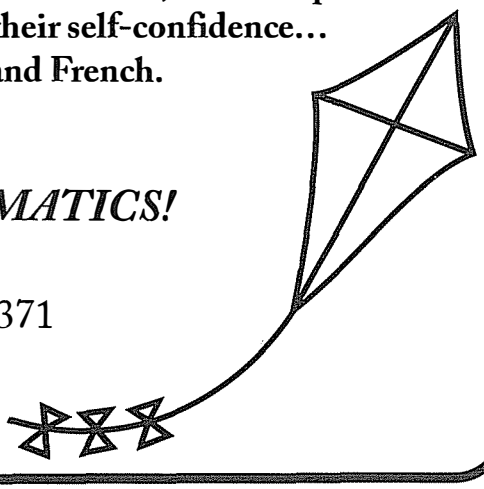
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▲ MOROCCO, AND ICOTS 4

ERIC MULLER
BROCK UNIVERSITY

I met a man in Tisi n'Isli,
no formal education.
Keen problem formulation
and so in math solution.
Where from this rich tradition?

This brief report on The Fourth International Conference on Teaching Statistics held last July in Marrakech gives me the opportunity to tell you about my first hand experience of a rich mathematics oral tradition.

In 1979 Professor Ha Oudadess, of Rabat, undertook a study of the mathematics oral tradition of Moroccans living in the High Atlas mountains. He interviewed a number of individuals who had no formal education and yet possessed an extensive repertoire of interesting mathematical problems. In his unpublished report he lists no less than 30 different problems. Should we choose to classify the problems by solution techniques, we find partitioning, linear systems, sequences, geometry, games, etc..

But first we go to Marrakech for ICOTS 4.

With close to 400 participants, this conference was on a much smaller scale than ICME 7. Except for three hours set aside for Working Groups, the program for the six day meeting was composed of invited and contributed papers in lecture type facilities. There were nine different Working Groups. I went to the one entitled "The Statistics Curriculum: Towards the Year 2000" - the English speaking group. (There were parallel groups in French, Spanish and Arabic). The other working groups dealt with software for the various language groups. In three hours a large group cannot come to any earth shaking conclusions. If we, in Ontario, can implement the recommendations contained in the Focus on Renewal, our statistics education will be in line with other English speaking countries. Some of the European countries are calling for a more formal and earlier treating of probability. At the secondary school and undergraduate university levels there was much discussion (but few concrete suggestions) as to how to bridge the gap between the 'mathematical probability and statistics' approach and the computer driven 'data analysis' approach which, in North America, has the majority of student enrolments. It is unfortunate that the organizers did not provide more time for similar interactions on other themes.

What about the other sessions? Having read the two books of abstracts, I moved from one session to the other, catching those speakers which had something new for me - mainly speakers with innovative ideas for large enrolment first year undergraduate classes in statistics or speakers addressing teacher education. I heard about some interesting research projects, some useful projects aimed at developing materials, and some ideas about projects for my first year courses. It was possible to run around from one session to the other because all sessions were held in one building, the impressive new "Palais des Congres" air-conditioned and possessing all the required conference facilities. I was disappointed that so few of the English speaking presenters took care to speak slowly and clearly for the many participants who struggled with English. The other disappointment was the small number of participants from the African continent.

The hosts and local organizers did a marvellous job. Marrakech is situated in the hot and fairly dry south west plains of Morocco, at the foot of the Atlas mountains. With a daily temperature above 40° C, the city sleeps between noon and 3 pm. It comes alive after 6 pm and one feels safe in the parks and more popular areas as families with children stay out late at night. In the Medina, the old walled city, the souk or market keeps active during the early evening. As a tourist you are continuously approached to buy local handicrafts of leather, copper, pottery or wood. Later in the evening Place Jemaa El Fna, the large central square of the medina, is vibrant with colour, noise and smells as orange sellers, barbecues, story tellers, jugglers, snake charmers and others ply their trade and try to attract a crowd. A real hive of activity into the early hours of the morning. Marrakech, like other major Moraccan cities, has a rich history, having been founded in 1062.

The Atlas mountains are very special and we could not resist visiting them on three different occasions. High and majestic, mostly dry, they shelter, along the river valleys, small villages of square red mud huts. There families eek out a meagre existence keeping goats and planting grains and vegetables on terraces which have been worked for centuries. One cannot imagine how a mathematics oral tradition was established and has survived in such an isolated environment. My experience of this tradition came from the small isolated villages of Aghbala and Tizi n'Isli. Two villages located on one of the plateaus of the High Atlas. There we stayed with Ha's brother who is just establishing his own medical practice. It was in Tizi n'Isli, on the terrace of the only café in town, over the inevitable cup of sweet mint tea, that we talked to Qlla Ikhlef. He speaks only Berber, which Ha translates for me into French. He was born in 1962, in a small village higher up in the mountains, 150 kms. from where we sit, but accessible only by mule and jeep. There he spent his first twenty years as a shepherd. Since then he has been to various places working as a manual labourer. He has no formal education but recalls that at the age of fourteen he was allowed to sit with some elders who would spend time inventing and solving problems. Can he

recall any of the problems? "Oh, yes."

"Three people own 30 she-goats. In the spring 10 of them bear 3 kids, 10 bear 2 kids and 10 bear 1 kid. The three owners decide to split the herd equally so that they have the same number of goats and kids. No kid is to be separated from its mother. How can we do this?"

This same problem is found in Ha's collection which he gathered from another village in a distant part of the Atlas. We try to explore Qlla's thinking. Why 30 goats? "Because it is not too big and not too small," he replies. Do you know the solution? After a few scratches on a piece of paper he provides the division. So you can write. "Yes, I taught myself to read and write a few things, I can write my name." Is he really solving the problem, or has he remembered the solution? We ask him to solve the problem with six goats (2 each with three, two and one kids). Takes a while but he finds a solution. With nine goats he has no difficulty. We suggest the problem with twelve goats. This he finds difficult. Many more scratches on the paper - a lot of crossing out. He is tired and we move on. Qlla recalls a social 'problem competition' between men from his village and others from a different village. This would be held at the time of the souk (the travelling market which, in small villages, is held once a week). On warm nights, before the souk, men would gather in an open tent, drink sweet mint tea, talk, and sometimes would pose problems for members from the other village to answer.

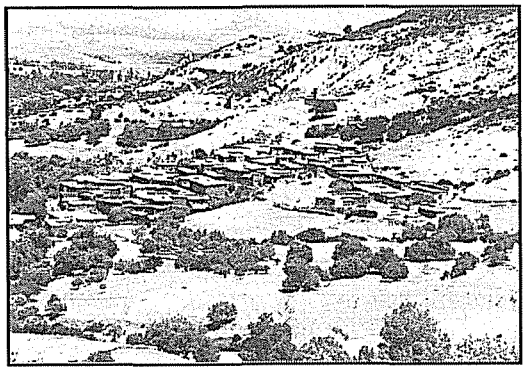
We wonder where this tradition comes from. What in this culture makes mathematics problem solving a social activity? We know it is quite old because Ha remembers that as a youngster, in the Atlas, he was stopped and challenged by elderly men from the village to solve problems. It is also quite extensively spread throughout the Moroccan Atlas. The original work done by Ha comes from a very different part of the Atlas. Similar problems can be found in the literature. Were they formulated afresh here, or were they brought here by other more nomadic people?

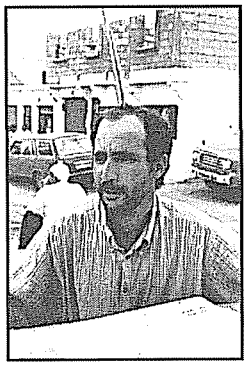
Our foursome on the café terrace attracts attention, the word has spread that these strangers, in shorts, are interested in problems. A group of men come forward, one of them wants to share a problem. It is a version of the river-crossing involving a boat, a wolf, a goat and a cabbage, re-worded for the local situation. No one else in the crowd has a problem to share. So ends our marvellous experience. To complete your experience of this mathematics oral tradition here are a couple more problems gathered by Ha. You'll have to imagine yourself sitting on a terrace in a little village in North Africa, sipping sweet mint tea, enjoying the sunshine, and listening to someone posing a mathematical problem in Berber. (These problems seem so dry when they are written down on paper!):

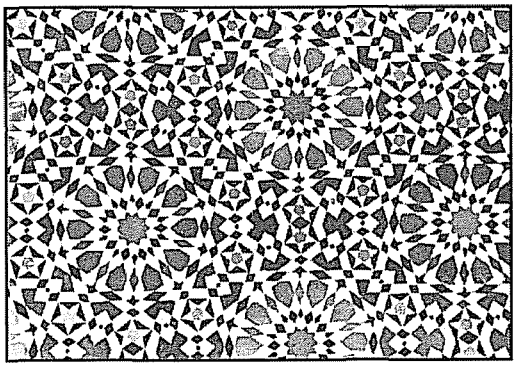
1) A person wishes to purchase 100 birds using exactly 20 rials. For one rial the person can get either one hawk, or two pigeons or five sparrows. The person must buy at least one bird of each type. How many of each type can the person buy?

2) Three people go to the barber. To pay, each person opens a drawer and places a payment equal to what is found in it and then closes the drawer. After the customers have left the barber finds 10 rials in the drawer. He wants to know how much each person paid.

Alice and Eric Muller wish to thank Ha and Rachida Oudadess for their hospitality during part of their stay in Morocco.









Top Left: A village in the high Atlas - Morocco.

Top Centre: Qlla Ikhlef Tisi n'Isli Morocco.

Top Right: Tiled geometrical patterns can be found all over Morocco.

Bottom Left: Palais des Congrés - Marrakech - Morocco.

Bottom Right: The main street of Tisi n'Isli village in the high Atlas plateau Morocco.



▲ About Problem Solving: Building on the Basic Operations



BY JOHN GRANT MCLOUGHLIN
EDUCATION PROGRAM
OKANAGAN UNIVERSITY COLLEGE

How can problem solving activities be designed around seemingly basic tasks such as addition, subtraction, multiplication, and division? I propose that elementary mathematical concepts lend themselves well to mathematical problem solving. Let me explain.

Problem solving situations place us in contexts which are unfamiliar. It is the nonroutine nature of these situations that challenges us to step back and formulate some plan of attack. The difficulty often lies in the planning stage rather than in the actual execution of the plan. That is, the mechanics may be basic but the organization may demand greater skills. Thus, we are provided with rich opportunities for developing mathematical thinking when students have demonstrated a mastery of basic skills such as the four fundamental operations. While the operational skills may be required to produce a solution, it is not these skills that represent the principal objective of the activities themselves. Instead we are called to shift the focus towards developing the reasoning and problem solving skills of students.

The centrepiece of this article is a problem that would be well suited to students in the junior/intermediate grades. The problem reads as follows:

Fill in the blanks to make the product correct.

Each of the digits 1, 2, 3, 4, 5, and 6 must appear once.

___ ___
x ___
___ ___ ___

You are encouraged to attempt to solve this problem before proceeding further. There are many possible arrangements to consider. How might we eliminate some of them? Here are some observations that may be noted.

- The product must be greater than 100. In fact, it can't exceed 6 x 54 or 324.

Therefore, the first digit in the product must be 1, 2, or 3.

- None of the units' digits can be 1 or 5. (I'll let you convince yourself of that fact.)

Consider the two observations noted above. They tell us indirectly that 5 must be a tens' digit. This reduces the number of feasible arrangements considerably. Furthermore, consider the pairs of units' digits that may be multiplied together. For example, 2 x 6 = 12 and 3 x 6 = 18 are inadmissible because they either require a digit to be used a second time or a digit that is unavailable for use. Only 2 x 3, 3 x 2, 3 x 4, and 4 x 3 provide workable solutions. Suppose that 5 is to be the tens' digit in the first number. Then we need only consider four possibilities, namely, 52 x 3 = 156, 53 x 2 = 106, 53 x 4 = 212, and 54 x 3 = 162. Aha - a solution! The requirements are satisfied by 54 x 3 = 162. You may wish to verify that a satisfactory product with a 5 in the tens' column of the three digit number cannot be produced with the given restrictions.

Suppose that you share this problem with a class. I suspect that most students would resort to the brute force approach and succeed after several trials. It is here that the challenge may be greatest for the teacher. Try to generate observations or reasons that may have surfaced in students' own experiences with the doing of the problem. It is important to discuss these ideas as we attempt to develop mathematical thinkers. If necessary, feel free to share your own insights on the problem. We may all benefit from hearing others think aloud during the actual process or afterwards. Gradually you will find that students' skills as mathematicians and communicators are being enhanced.

The *National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards* [1] explicitly state the need to create opportunities in classrooms that give students the chance to "discuss mathematical ideas and make conjectures and convincing arguments." (1989, p. 78) The first two standards discussed in each of the three levels (K-4, 5-8, and 9-12) pertain to mathematics as problem solving and mathematics as communication. Interested readers may wish to consult relevant sections of the document.

One drawback of the above multiplication problem is that it has a single solution. In an effort to engage students in mathematical communication, it is suggested that you consider as a secondary question: "Is the solution unique?" It is likely that students will be forced to consider some of the underlying mathematical principles to convince themselves of this fact. Personally I find it helpful to develop such skills through familiar concepts. If there is no need to worry about the mechanics associated with multiplication, then we can get at the conceptual ideas nestled in the problem. Ideas such as even/odd, multiples of 5, place value, and the commutative property may arise in discussion. Such experiences contribute to the spirit of another NCTM standard, namely, mathematical connections:

The intent of this standard is to help students broaden their perspective, to view mathematics as an integrated

whole rather than an isolated set of topics... (1989, p. 84)

Problems can be based upon other operations as well as multiplication. Perhaps addition is perceived to be the most basic of operations. Hence, I will conclude by providing a couple of examples based on addition. The first example is taken from the resource book, *Mathemagic: Taking the "Numb" out of Numbers,* by Don Fraser [2].

Use the nine digits 1 through 9 each once to create true addition statements. In each case, the sum of two three digit numbers is to equal another three digit number.

Don Fraser notes that there are 320 solutions to this "Brain-stretcher". The beauty of such a challenge is that it allows students at different levels to achieve success without feeling that the question has already been completed by others. It is productive to have students work in groups or individually for a specified period of time before inviting them to write some of their solutions on the board. Of course, it is likely that any enthusiatic student could continue with the problem after class - unless you find all 320 solutions in class!

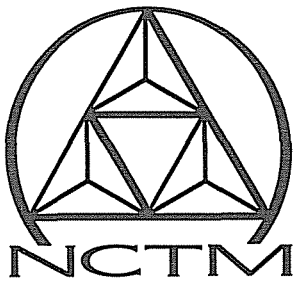
Alphametics provide a challenging source of problems. Different letters are used to represent different digits. For example, A + A + A = HA could be solved by substituting A = 5 and H = 1. Then we would get 5 + 5 + 5 = 15. The following challenge appears in a collection produced by the Grand Valley Mathematics Association [3].

```
  HOCUS
+ HOCUS
-------
 PRESTO
```

Your feedback on any of the problems or other aspects of mathematical problem solving is welcomed. Those who like to plan ahead may be interested to know that the next column will feature some high school mathematics contest problems.

Bibliography

1. National Council of Teachers of Mathematics, *Curriculum and Evaluation Standards for School Mathematics,* Reston, VA, NCTM, 1989.
2. Don Fraser, *Mathemagic,* Don Mills, Addison-Wesley Publishers, 1985.
3. Grand Valley Mathematics Association, *Recreational Math Problems for High School Students Book I and Book II,* GVMA, 1984.



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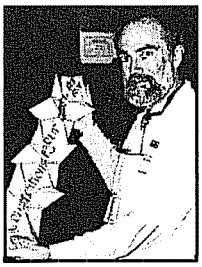


NCTM Selects New Logo

Beginning 1 June, NCTM will sport a new logo. The Council has redesigned its logo to reflect its renewed commitment toward excellence as it moves into the next 75 years. The logo, which draws upon the geometric shapes used in the Standards, is an abridged version of NCTM's 75th anniversary logo introduced last year.

Several variations of the logo are available for example: the logo can stand alone; be produced with the acronym NCTM; or be coupled with NCTM's acronym and the Council's full association name placed at the bottom. All NCTM materials, produced or reprinted after 1 June, will sport the new logo.

▲ Non-Traditional Assessment Strategies in the Transition Years



GARY FLEWELLING

A joint OAME/OMCA project is under way to produce a resource package to help Transition Years teachers assess more open-ended, broader, less-traditional activities. A large part of this new resource will consist of a sample set of non-traditional activities, along with instructions on how to conduct and assess each activity. The resource should be available to OAME members for use in the 95-96 school year. This article is intended to provide a rationale for the need for such a resource and to share with teachers a (draft) sample of one of the activities in the package. (Gary is a member of the assessment project team.)

Introduction

To understand how and why assessment practices need to change is to understand where mathematics education is going, the premises involved, the priorities, what is valued, and what is not. I have tucked a lot of the ideas involved in this issue under two admonitions, Teach for understanding and Use rich learning activities.

Teach for Understanding: Mathematics (not just in) the Transition Years is to be taught for understanding. Unfortunately, understanding is not the teacher's to give but the student's to get, with the teacher facilitating the getting. Students construct their own understanding and they need tools and allies to help them in the construction process. The tools (things to think with) include physical models, manipulatives, pictures, words, images, metaphors, calculators, and computers. The allies include teachers, parents, and (most often) classmates. An investigative approach to learning is important as investigations give the student the opportunity to identify the patterns and make the connections needed to make sense of things.

Use Rich Learning Activities: Learning activities should be sufficiently accessible and rich to give a wide range of students the chance to use their (mathematical and non-mathematical) skills in an integrated fashion to, among other things, experiment, hypothesize, understand situations, solve and pose problems, reason, evaluate, and make decisions. The activities should encourage student interest, student interaction, the use of technology, the use of communications skills, and the connecting of mathematics within the subject and beyond. Like many writing or visual arts projects, the products of these activities will usually (and necessarily) differ from student to student. Even when the product is the same, each student will likely arrive at it by a different route. Learning activities should seldom be characterized by a search for the answer using the method. Many of the skills and other things that a teacher would want to assess in these activities can only be (or are best) assessed during the conduct of the activity. Products are shared, revised, saved and (often) assessed holistically.

Implications for Assessment: Teachers need to use a greater variety of assessment strategies. Teachers are being asked to involve students in many more non-traditional learning activities and these activities, by their nature, require the use of non-traditional methods of assessment. Though paper-pencil, timed quizzes and tests will continue to be an important method of assessing students, their grip on assessment will have to be broken if we are going to effectively implement the kind of mathematics curriculum being advocated in the NCTM Standards, the OAME/OMCA Focus on Renewal, and the MOET's Common Curriculum and Provincial Mathematics Standards Grades 1-9.

Sample Activity
EMPLOYMENT: GOOD NEWS/BAD NEWS

The statistics shown on the next page appeared in the Toronto Star on Saturday, October 8, 1994.

Task 1: You are an editor for a small local paper. Use these statistics to write a short positive, upbeat article on this situation. Your paper requires that your article fill a 12 cm-long column. A sample of text from a newspaper is shown below. Use it to help you decide how many words your article should be.

Task 2: Using evidence from the same set of statistics, write a second article, but this one should take a negative point of view. The article should fill a 12 cm-long column.

ST. JOHN'S, Nfld. (CP) - Prime Minister Jean Chretien declared the 500th anniversary of John Cabot's discovery of Newfoundland an event of national historic significance on Wednesday.

"Only in Newfoundland can you have a party that lasts three years," quipped Chretien, referring to the planning time between now and 1997 when the anniversary will actually be celebrated.

Many attended the announcement, including former Fisheries minister John Crosbie, who took some good natured kidding from the prime minister.

The 500th anniversary committee unveiled its multi-colored logo - a fanciful sketch of the Italian explorer - and invited the world to follow Cabot's example and explore Newfoundland.

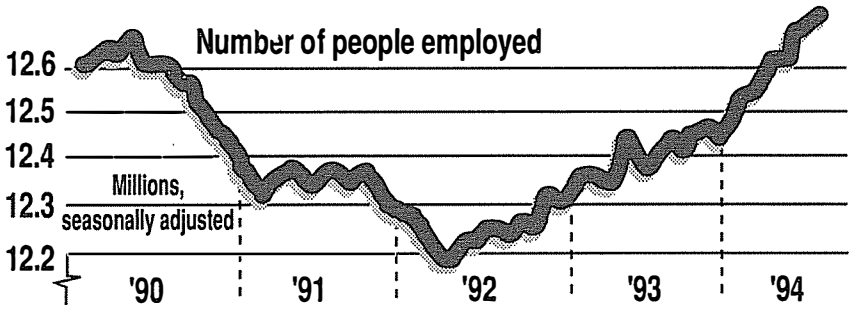
Chretien, who had just returned form an international security conference in Hungary and is facing a Quebec referendum battle at home, said the 500th anniversary is an appropriate way to celebrate 'national pride in the great country we have built together.'

Cabot was the first of many explorers to open up Canada, said Chretien, enabling people from all over Europe to come and settle here.

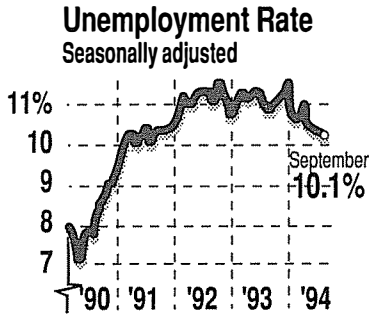
"Our cultural diversity is the strength of the nation," he added. "We have taken the best from all that was offered and made a new world."

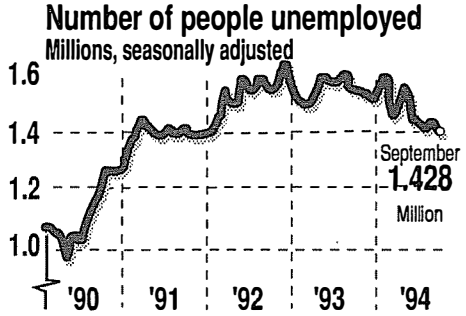
From the Toronto Star on Saturday, October 8, 1994.

WHO'S WORKING . . .



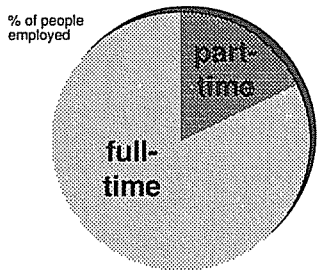
. . . AND WHO'S NOT



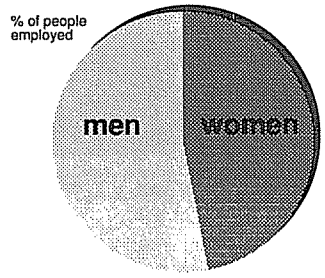


WORKER PROFILES

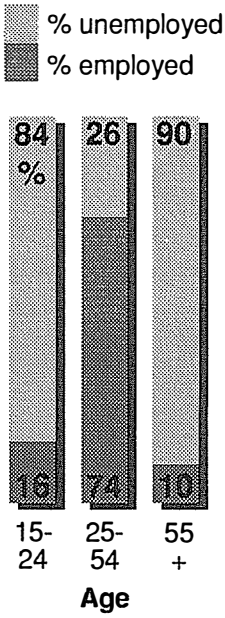
Full-time vs. part-time



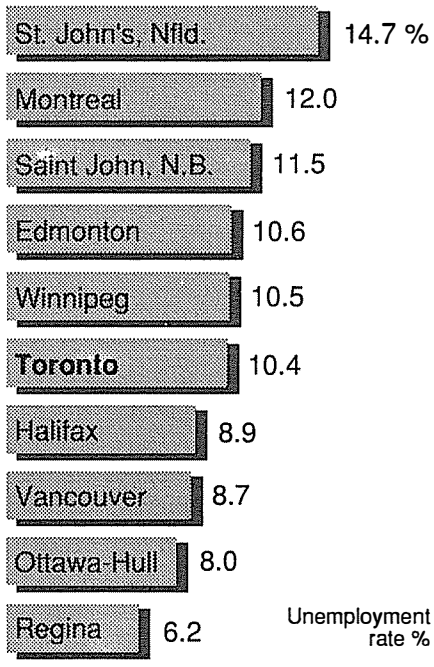
Men vs. women



Age Breakdown



Unemployment across Canada



NOTES TO THE TEACHER

LINKS TO THE PROVINCIAL STANDARDS

The activity centres on interpreting statistics for the purpose of providing evidence to support a point of view or position. This gives the student practise at being a discerning consumer of information.

Problem Solving	Reasoning	Communication	Connections	Number Sense & Numeration	Geometry & Spatial Sense	Measurement	Data Management	Patterning & Algebra

SUGGESTIONS FOR RUNNING THE ACTIVITY

Suggested time for running the activity: 2 hours

- Expect to spend about two hours of class time on this activity, about one hour to complete the two initial writing tasks and one hour to discuss, assess and extend the initial activity.
- Have students work individually, but associated in groups of two or three so that they can discuss ideas, critique one another's writing, and revise their articles. It is important that each student gain experience in supporting different points of view.
- If word processing is available, have students print the articles in the same format for comparison. Otherwise, have students write their final articles on flip chart paper.
- A sample rubric for assessment is provided on the next page. You may choose to use this rubric or you may prefer to generate assessment criteria with students. You might use a process in which you brainstorm criteria with students, record them in a chart and post the chart in the classroom for reference throughout the activity. No matter how the rubric is determined, it should be discussed with students and posted.

SAMPLE STUDENT ARTICLES

Positive Article

As of September 1994 12.75 million people were employed across Canada. 10.8 million had full-time jobs. Currently the most popular age group working is 25-54. 74% of this age group was working as of September of last year.

The highest rate of employment is in Regina where 93.8% of the population is employed.

More and more women are working. approximately 45% of persons employed are women. Hopefully in the net 20 years we will see an equal 50-50 division between genders.

The number of people working has risen by about half a million since the end of 1991. This number is still rising.

In Toronto only 10.4% of the population is unemployed, that leaves a high 89.6% employed. Toronto is neither at the top nor bottom of the Canada unemployment list but we may see the situation improving in the future. The job situation looks hopeful for people out of work as employment numbers continue to rise.

Looking for a Job? Good News

Good news on the employment front!! Statistics have shown that Canadians are going back to work. Not since 1989 have so many people been on the job. Looking at the recent stats, 12.75 million Canadians are employed, which is the highest level in the past five years. Unemployment has dropped from 1290 to 1090, it's lowest in four years. The number of unemployed Canadians has fallen to 1.428 million, the lowest number in three years.

Experts say these statistics prove that Canada is back to work.

SUGGESTIONS FOR ASSESSING THE ACTIVITY

- Have students exchange articles. Each student will see at least three other articles and will assess the articles using the rubric below.

0	1	2	3	4
The article:				
no article submitted or point of view cannot be followed	is not convincing because a clear point of view is not stated or supported	makes good points, but does not sway the reader	is convincing	presents a compelling point of view that is thoroughly convincing

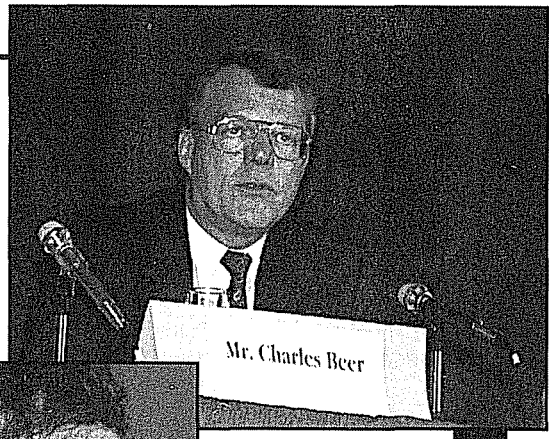
- The teacher will assess each article using the rubric below or a rubric generated by the class.

0	1	2	3	4
The article:				
no article or reasoning in article cannot be followed	does not have a discernible point of view	has a point of view that is not stated clearly	has a clearly stated a point of view	has a clearly stated and compelling point of view
	does not cite supporting evidence	cites one piece of supporting evidence	cites two different supporting pieces of evidence	cites at least three different supporting pieces of evidence
	demonstrates a major error in interpretation of graphical data	demonstrates a minor error in interpretation of graphical data	demonstrates that the graphical data have been interpreted correctly	demonstrates that the graphical data have been interpreted correctly and contains questions about the presentation of the data
	contains incorrect or inappropriate mathematical language	contains some inaccurate mathematical language	contains descriptions given in correct mathematical language	contains comparisons and conclusions expressed in correct mathematical language
	is judged at level 1 by other students	is judged at level 2 by other students	is judged at level 2 or 3 by other students	is judged at level 3 or 4 by other students

EXTENSIONS

- Have students to review newspapers, magazines or other legitimate sources, looking for statistics of interest to them. Challenge them to write two articles supporting opposing points of view. This can be treated as a homework assignment running over several days. It is strongly recommended that students bring their first drafts of both articles back to their groups for feedback and editorial comment before the final articles are prepared.
- Have students role play an interview in a radio or TV setting.
- Run the activity in a debate format.

1995 OAME Conference

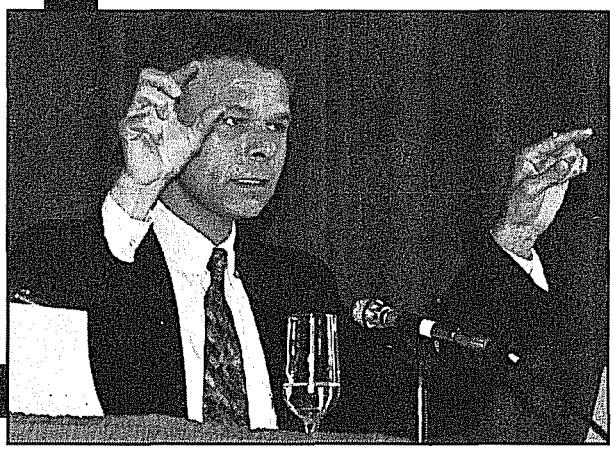


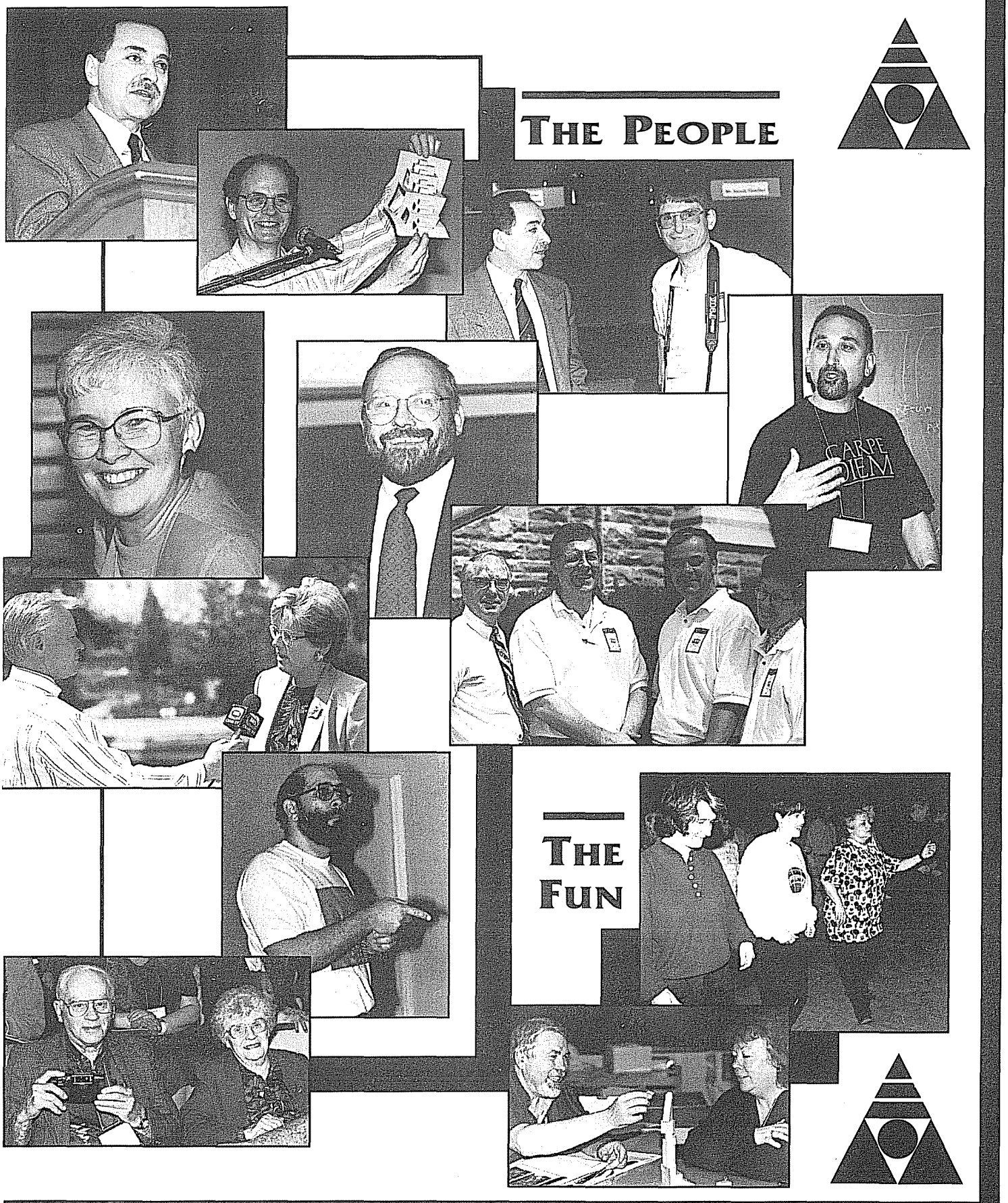
The Royal Commission on Learning










THE PEOPLE
CARPE DIEM
THE FUN

OAME
MTNY CONF
SUMMER
TORONTO
'95
CONFERENCE

OAME-AMTNYS

JOINT INTERNATIONAL MATH CONFERENCE

SUMMER '95

SCARBOROUGH COLLEGE

JULY 28 - JULY 31, 1995

A unique, interesting, and valuable learning experience . . . with old faces and the opportunity to gain lots of new friends. The OAME and AMTNYS, American Mathematics Teachers of New York State, are hosting a math conference this summer at Scarborough College. For most of us, a summer conference is a new experience; however, for AMTNYS, this is their **33rd Annual Summer Workshop.** Why come to this conference? The conference will offer a wide variety of interesting sessions from early education to formative to transition to specialization areas. For a number of the presenters (over 100 at last count!), this will be the first time that they will be speaking in Ontario or in Canada. Many of them speak regularly at the NCTM regionals or the NCTM annual including the latest in Boston in April. A few of the speakers are President Award winners, which in the United States is the highest recognition a teacher can receive. Not to be outdone, there are many Canadian speakers who are, perhaps, known to you and have been recognized as outstanding math teachers in Canada as well. Thus, this is a unique experience to hear excellent speakers from both sides of the border. They bring a wealth of experience and refreshing new ideas in mathematics teaching and have access to the latest technological applications from hand-held graphic calculators to computers.

Most importantly, this is a chance to meet people and make new contacts. Those of us who have attended conferences over the years know how important it is to hear and share ideas from our colleagues. Don't forget, you do not have to suddenly teach the next day or the next week. The whole conference is a relaxed, informative affair.

What about the costs? The registration fee is only $ 70 Canadian for OAME members. There is an inclusive package including registration, accommodation, all meals, the BBQ and the Banquet. For commuters, we offer a package including registration, all lunches and snacks. There is also a one day registration price but we are sure that if you come for one day, you will come again. For non OAME members add $40 which includes a year membership to the OAME.

The following is a brief synopsis of a few of the many speakers.

Origami and Mathematics hands-on multi-sensory, tactile geometric experience of "unit origami". For all levels.

Peanuts, Popcorn and Jelly Beans Demostrations of applications in the Early Childhood Years

Chaos and Fractal Activities for the Classroom Fly a Fractal, Eye Popping Video Feedback and Swing with Magnetic Pendulums

Make Everyday Special Meaningful , stimulating activities incorporated into daily lessons. Hand outs.

Applications Using a TI 81-82 Graphing Calculator Explore real life applications in medicine, business, science and technology. CBL demostration

Integrated Mathematics Link mathematics to language arts, health, social science and science.

Program Outline

Friday July 28	Saturday July 29	Sunday July 30	Monday July 31
registration	Breakfast	religious observations	Breakfast
desk open 9:00 am	workshops	Brunch	workshops
1:00 start	Lunch	Blue Jays Lottery	Lunch
workshops	workshops	workshops	workshops/Science Centre
BBQ dinner	Dinner	Banquet	Dinner
Math Mystery	Evening in Toronto CN Tower, Caribana	Math Entertainment	Math Magic

A complete booklet is being compiled and will be available shortly. Further information can be obtained from the Canadian Director, John Kersley (905) 389-1367 Ext 207 or Chris Swan, registration, (416) 287-0485
Plan to come and enjoy yourself.

▲ Council Comments



PETER SAARIMAKI
COORDINATOR OF MATHEMATICS
TORONTO BOARD OF EDUCATION

Introduction

These notes were taken at the OAME Council meeting held Saturday March 25, 1995. Comments about Council and its activities should be directed to the President. Comments about my comments can be sent to the editor.

General

Council welcomed a NEW CHAPTER ... MAC^2, the Mathematics Association for the Cottage Country. It will represent mathematics educators in Simcoe County, Muskoka and surrounding areas. Bill Morrison, Head of Math at Barrie North C. I., will be the inaugural president and Council rep. Public, separate and community college educators will be involved.

The chapter is already planning a spring mini-conference (for April, likely at Georgian College in Barrie) and a fall conference for November to coincide with PD days of the boards. Congratulations to the organizers - you sound like a really busy bunch already - and welcome to OAME.

OAME 95 conference

Successful, fun, and well-attended. Congratulations, GVMA

OAME future conferences

The following dates and locations were discussed: 1996 in London; 1997 possibly in Toronto; 1998 possibly in North Bay; 1999 probably a regional NCTM in Hamilton (NCTM to confirm) plus a possible NCTM annual in 2007 in Toronto. Don't you wish the boards would support our professional development in going to these conferences?

Resources

Ron Lancaster again shared many excellent resources with members of Council. Ask your council rep. (listed on the back page) to find out what materials are given out to chapters at these meetings. A sad note: with Ron's leaving Council, where will we now get such great packages of educational stuff three times a year?

Special Conferences

The first international AMTNYS - OAME conference is set for Friday, July 28 to Tuesday, August 1, 1995. The Association of Mathematics Teachers of New York State (AMTNYS) will bring an international flavour to the workshops on software, calculators, integration, transition years, specialization years, and many other areas. The cost looks VERY reasonable and the session line-up VERY impressive. You will find further information elsewhere in this Gazette.

Rendezvous with the Future/Rendez-vous avec Lavenir, a conference on effective teaching of math, science and technology, is being held in Thunder Bay October 19 to 21. It is sponsored by Science North and the Ministry of Northern Development and Mines, with the support of OAME, STAO, MOET, local Boards of Education and Confederation College. Further information may be obtained from Lynda Bachynski

Special Projects

Local chapters running PD sessions now have access to a promotional kit from OAME that includes copies of the *Gazette* and *Focus on Renewal*, the new joint NCTM/OAME application forms, I Love Math buttons... and a large OAME banner with our new logo.

What you've been waiting for is coming soon - the OAME Assessment Resource booklet for the Transition Years. When the Ministry of Education came out with the Provincial Standards, they promised to provide sample assessment activities.

A special group from OAME and OMCA, under the leadership of Judy Crompton, has produced what the Ministry couldn't (didn't). The activities have been field-tested, revised and correlated to the expectations in the Ministry's document. This is a definite MUST for your classroom planning.

Committees

Early/Formative Years

This productive group continues to submit activities for the *ABACUS,* this time on volume and capacity with connections to technology, science and literature. What activities would you like to share? Send them to Jennifer Weiner. You will find her address on the front page of the *ABACUS.*

Transition Years

The suggested parent brochure didn't receive any negative feedback. The next project this committee is considering is an annotated bibliography that will likely be posted on the Electronic Village.

Specialization Years

University representatives met with the committee with spirited responses to the discussion paper. This committee will continue to play a very pivotal role as the future of the diminished high school curriculum is discussed in Ontario in the ensuing months.

Publicity and Membership

Besides working on the promotions boxes for chapter use, the committee is looking into OAME pins and rings. The mock-ups of the pins and rings looked spectacular. Some versions

will be for presentation at special times to special people, and some will be on sale for all of us who are proud to be members of this strong, provincial, mathematics organization.

Publications

Although you may not realize it when you read all the marvellous articles in the *Gazette,* the editors are always looking for interesting classroom activities that you have used, and they are willing to work with you to polish the writing.

Awards Committee

The award winners were announced at Council and presented as part of the major presentations at the conference in Guelph. Congratulations were extended to the following winners:

- **Morley MacGregor** - Judy Finch of Hill Street School in Sarnia.
- **Mona MacGregor** - Carol Attridge (former Executive Director)
- **Life membership** - Dave Davidson, Collingwood
- **K. D. Fryer** - Markville Mathematics Department, York Region Board of Education

Chapters

Each chapter puts on some marvellous, relevant, affordable Professional Development. Keep in touch with your local chapter to be aware of its plans, before they happen. This column can only provide a limited notice of up-coming events.

COMA

The first annual Ontario Mathematics Olympics is being hosted, organized and run by COMA, June 3rd, at Lisgar Collegiate in Ottawa. This is a monumental undertaking and the members of the OMO committee are to be commended for all their hard work. The chapter also planned a regional olympics competition on May 6, an afternoon discussion series on April 25th with a focus on either elementary years or the Specialization Years and published a newsletter. A very busy group.

CHAMP

"Spring into Math" at Erindale Secondary School was held April 11th with the presentation of student awards, a keynote speaker and a wine and cheese celebration. The keynote speaker, Chris Bridge, a superintendent with the Peel Board, addressed the Royal Commission report and the future of schools.

GOLDEN SECTION

The April 27th meeting was of special interest to Intermediate and Senior level teachers. Chester Makischuk, Education Officer with the MET, talked about some of the recent happenings at the Ministry followed by several other excellent workshops. June 1 saw a meeting of the Niagara-Brock Interface group with a visit to one of Brock's Math and Science Camps. In 1994 over 1000 students attended one of the four camps, and in 1995, 1600 were registered in an hour and half with a waiting list of 400 more. The program provides a sound education in math and sciences for teaching at the Junior/Intermediate grades.

GVMA

The success of the annual conference in Guelph was due to the hard work of the members of this chapter. They continue to support the Leadership Conference each fall with a free registration for one lucky teacher.

ISOMA

The student team for the OMO was selected at a math competition held May 6 at Upper Canada College. On May 12th the AGM was held at the University of Guelph as part of the OAME conference. The February issue of the ISOMA newsletter included OMO details, a review of the Mathfinder CD, "My Second Favourite Lesson", Internet Goodies, an article by Ron Lancaster and their own Council Comments. As well, information on PD opportunities from other chapters was shared so teachers could benefit from the greater range of mini-conferences each chapter runs.

NOMA

"Spring Thing 95", at Ecole Secondaire Macdonald Cartier, Sudbury, ran April 28 and included publishers' displays, workshops in French and English, dinner and a social hour. The chapter newsletter for the mini-conference also listed workshops run by other chapters.

NWOAME

Lakehead University participates in an annual math awards day with NWOAME each June. This is just a part of this chapter's work with teachers-to-be, as well as practicing math teachers.

PINE RIDGE

"Mathematics: How to Make it Happen" was held April 12th at Pine Ridge Secondary School in Pickering. Workshops were held for all levels followed by a buffet dinner. The chapter co-sponsored, with the Durham Board, a math olympics competition May 16 to select the two student teams they funded for the OMO in Ottawa.

SAME

On April 27, SAME held two concurrent conferences, each focussing on problem-solving: elementary teachers met at Bellemere PS and transition/specialization years teachers met at Cedarbrae C. I. Their AGM was May 23.

TEY^{2}MS

Two TEY^{2}MS teams will be participating at the OMO in Ottawa. "The Shape of Things to Come" is the theme chosen for the fall conference, Thursday October 26th.

Y^{4}MA

A busy chapter as usual, planning to select and send three teams to the OMO, one each from their three boards. The AGM featured Trevor Brown as guest speaker (who was also seen in Ottawa - he does get around!!)

Aftermath

Recent studies indicate that with calculators, female students perform as well as or better than males. In the US, students will be required to use graphing calculators on the Advanced Placement exams for calculus. Council ended with thanks to retiring councillors, and best wishes to those running for re-election. Special thanks were extended to retiring members who have contributed much to Council over the years: Ron Lancaster, Arnie Carefoote, Jerry Maloney, Barry Scully and Jan Scully

You may send your comments to me on the Electronic Village

OAME Congratulates...

the following Ontario Winners of Prime Minister's Awards for outstanding Mathematics Teaching.

National Winner

- Richard Cornwall
  Sir Ernest MacMillan Senior Public School, Scarborough

Provincial Winners

- Melody Baldin
  E.L. Crossley S.S., Fonthill
- Stewart Craven
  Marc Garneau C.I., Don Mills
- Rodica Motora
  Ecole Secondaire Publique De La Salle, Ottawa
- David Racine
  West Hill C.I., Scarborough

Local Winners

- Enzo Carli
  Forest Heights C.I., Kitchener
- Mia DeLorme
  Gregory A. Hogan School, Sarnia
- Mahendra Deonarain
  Waterdown D.H.S., Waterdown
- Robert Herd & Department
  Westmount S.S., Hamilton
- Susan Layard
  Bishop Strachan School, Toronto
- Ronald Lewis
  Lockerby Composite School, Sudbury
- Robert McRoberts
  Dr. G.W. Williams S.S., Aurora
- Jacquelyn Morgan
  E.L. Crossley S.S., Fonthill
- Ahmed Motiars
  York Centre for Children, Youth & Families, Richmond Hill
- Paul Pogue
  Barrie North Collegiate, Barrie
- Jim Schurter
  Listowel D.H.S., Listowel
- Josephine Vella
  Pope John Paul II S.S., Scarborough

▲ MONA MACGREGOR AWARD: CAROL ATTRIDGE



Reminiscences.....

During the "sixties" I was introduced to and enjoyed the fellowship of O.A.T.M. and its members. Then in `72 -`73 Don, as Past President of the O.A.T.M. was a "midwife" (of sorts) as we celebrated the birth of the Ontario Association for Mathematics Education. Subsequently we saw this Association grow and flourish in its FORMATIVE YEARS, nurtured and guided by Morley and Mona MacGregor, until it reached its adolescence.

Upon the MacGregors' retirement, Council passed the torch of Secretary Treasurers to Don and me. Soon we realized that, as a team, we were facing OAME's personal TRANSITION YEARS. It became a time of working with Council to strengthen the foundation, shore up the policies, automate the office and mailing structures, incorporate the Association, review the Constitution and Bylaws and more. Woven into these projects were the pleasures of becoming more acquainted with "our" members, organizing details for meetings and Leadership Seminars, and promoting Chapter and OAME activities whenever and wherever we were able.

Having retired, these OAME transition years are continuing under the able administration of the new Executive Directors, Bonnie and Dave Alexander, no doubt into the SPECIALIZATION YEARS.

Coming to OAME with some experience in growth development and education in the Health Care field, I "pitched in" to a cause in which I believed. The presentation of this Mona MacGregor Award brings me great pleasure and delight. Today I accept this award and share it with all the partners with whom I have worked in OAME.

To be recognized by one's peers is a great honour. Thank you most sincerely for this tribute!

▲ K.D. FRYER AWARD: MARKVILLE SECONDARY SCHOOL MARKHAM, ONTARIO



Back Row (left to right): *Don Hamilton, Terry Wilkinson, Mayra Barker, George Voumuakis, Kai Deuitch (on his shoulders is Jan Scully), Karen Irving, Ruth McAuoy, Claudius Zujew, Doug Gillespie*
Front Row Kneeling: *Marty Segal, Bina Shaw, Trusha Patel.*

All members of the Markville S.S. Mathematics Department put their hearts and souls into making mathematics enjoyable, meaningful, and understandable for all students.

Beginning the grade 9 destreamed program five years ago has resulted in many positive changes in our 10-OAC courses. Our teacher strategies include investigations using manipulatives, calculators, and computers; cooperative learning; games; application fairs; and alternative assessment techniques.

The department offers daily open door tutoring, peer tutoring, math clubs, activities with our family of schools, and regular contact with parents. In addition, the department members are workshop presenters at the local and provincial level; coaches of swimming, volleyball, basketball, baseball, rugby and track teams; branch OSSTF president and vice-president; and student council advisors.

The members of the department continually support school spirit - they perform skits, decorate doors, dress ridiculously on spirit days, and supervise dances and other activities.

Markville S.S. Mathematics Department would like to thank OAME for the Kenneth D. Fryer Award ... it is very nice to receive recognition for dedication to students.

▲ Morley MacGregor Award: Judi Finch
Hill Street School, Sarnia

In the past we have done our students a disservice, limited their ability to succeed, and made them dependent on the teacher and the text by delivering the math program in the traditional way - the teacher presents today's lesson, assigns the page and question(s), and take the work up the next day. This method teaches math in isolation without real life connection, doesn't promote the exploration of usage beyond the examples given, and doesn't require the child to question or think beyond the lesson. Individualizing the math program takes time on the teacher's part initially, but the benefits for the students make the effort worthwhile. They progress at their own rate which reduces the frustration level for the brighter students and decreases the discipline problems. This system promotes peer tutoring and mentoring. The ability to co-operate and work with a variety of students develops. They learn to respect others' strengths. Self-confidence is built through achieving. The students are empowered to take responsibility for their learning and credit for their successes.

With the pressures of adolescence, there is a need for children to verify for themselves that they are getting real value in return for the time they have spent learning math skills. Once math has importance or "status" to them it will be retained. The question, "When will you even use this?" comes from the teacher, not the child. Students become exposed to a vast number of careers and occupations as they respond to this. At home and throughout the community discussion centres around how math is used on a daily basis. The brainstorming of occupations and situations leads to the development of questions and problems further re-enforcing the link between math and careers. Children need to see the reason, to form a link, and to understand how their new found knowledge and understanding will fit into their lives. "Real life" math is not done in isolation. Once a strategy is learned, connections need to be made to display the relevance. Through problem solving and critical thinking, skills will be learned, refined, and applied in a variety of ways. Posing problems with limitations set on time and materials encourages brainstorming for solutions, techniques, strategies, and applications of knowledge, as well as co-operation, organization and time management - the other "real life" skills.

▲ OAME Life Member: Dave Davidson
Collingwood C.I., Collingwood



I would like to take this opportunity to thank OAME for the honour bestowed upon me as a Life Member in the Association. I sincerely appreciate it and will display my certificate proudly. OAME has become a very influential body in determining the direction of mathematics education in the province. The joint production with OMCA in 1993, "Focus on Renewal", is evidence of that fact. I am proud to have been a part of this organization throughout my teaching career, and I treasure the friendships I have made.

I first became a member of OAME Council as the GVMA representative. I continued as GVMA representative for four years and then was elected to Council at large. In 1981, I became a Director and later President in 1983-84. I returned to Council for another three year term after serving as Past President. During those sixteen years, I met many fine people that have helped me along the way.

The OAME Annual Conference is always a highlight and should be attended as often as possible. The sessions are always first rate but the contacts made and the conversations had during social functions at the conference can prove to be as worthwhile as the formal sessions themselves. I have gained much from both, and am indebted to many mathematician friends around the province for the ideas they have given to me and the help they have provided. They have made me a better teacher and leader in mathematics education.

There have been many changes that have taken place in mathematics education since I began my career 35 years ago and this is going to continue at a more rapid pace. The future of technology-enhanced mathematics teaching and learning will be in inexpensive handheld calculators with powerful integrated software. Very shortly, all students will have handheld calculators that will expand, factor, differentiate, integrate - this list goes on. These little devices will alter greatly what and how we teach and test. All teachers will have to become technologically literate. Textbooks will have to be updated. Imagine, something this great occurring at the same time as destreaming, outcome-based education and integration.

I would be remiss if I did not air my views on destreaming. I am sad to say, but I firmly believe we have taken a step backwards. They say what goes around, comes around. Someday, and I hope sooner than later, we will be able to provide today's learner with something better. Since destreaming was implemented, our grade ten courses, especially the 10 Advanced, had to undergo major adjustments. Many students were entering who did not have the maturity or the skills to be successful. I'm afraid we can't be everything to everybody. Teachers should not have been confronted with an impossible task. Yes, I am aware that changes in education are politically driven, but positive decisions affecting change, can be made. I would suggest that OAME continue to exert whatever influence is possible to ensure that the students in Ontario receive the best mathematics education possible.

I want to leave on a positive note. I sincerely enjoyed all of my years on OAME Council. I have made lasting friendships. My years on executive were even more special. Serving this Association has truly been a pleasure. Thank you all for the honour of a Life Membership.

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