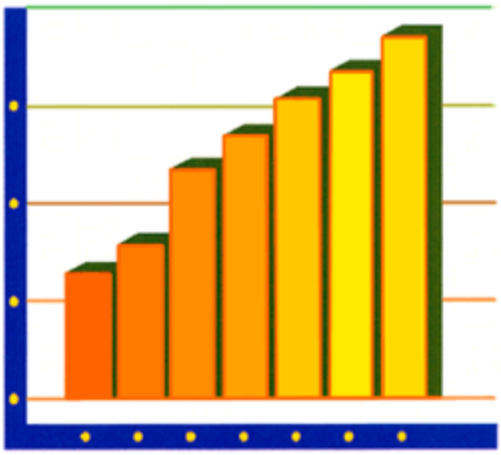
NUMERACY



"Numeracy is a critical awareness which builds bridges between mathematics and the real world, with all its diversity."

Ontario Literacy Coalition

BEST PRACTICES AND INNOVATIONS

A series of bulletins for literacy programs

Issue 1 of 3, Spring 2001

Best Practice and Innovations

A series of bulletins for literacy programs

The goal of this series is to provide important information on three topics of high priority to literacy community and to highlight new, innovative, and successful practice relevant to LBS funded agencies across Ontario. Through 'key informant' interviews with practitioners, administrators, and consultants in Ontario's literacy field, OLC identified *Numeracy, Transitions (from LBS onward)*, and *Learning Disabilities* as three areas of interest for literacy programs. Three highly experienced literacy consultants were hired to research and write each bulletin the guidance of a project committee. We sincerely hope that programs find these bulletins useful and that they spark an interest for further exploration into these three areas.

Susan Toews
Field Development Coordinator, OLC

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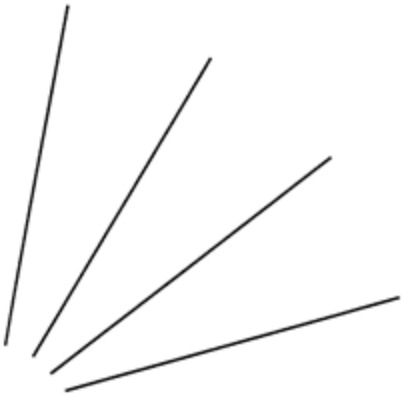
BEST PRACTICES AND INNOVATIONS



Dear LBS practitioners:

The numeracy teaching renaissance in Ontario is young and exciting and offers opportunities for practitioners to learn and contribute through materials development, shaping professional development, and exploring teaching strategies. Interested practitioners will find stimulating ideas and worthwhile resources in other countries as well as in Ontario's own past. In this bulletin, you will find summaries and references to many of these.

Across Ontario, there are programs and instructors doing an excellent job of improving their students' numeracy, while other programs and practitioners are just beginning to investigate what numeracy and numeracy teaching are all about. I urge all interested practitioners, at all levels of expertise, to join the numeracy discussion on AlphaCom or to contact me (contact info below) so that together, we can continue to develop a strong numeracy professional development community within Ontario's Literacy and Basic Skills program.

Lisa

Numeracy Practitioner and Project Consultant

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What Does NUMERACY Mean, Exactly?

You won't find it in most dictionaries, and many people outside math and education circles have never heard the term. The term numeracy is more commonly used in Great Britain than it is in Canada and the United States, but, even in Great Britain, it doesn't have its own entry in most dictionaries. Sometimes it's included in the entry for numerate:

nu'mer |ate *a.* acquainted with basic principles of mathematics and science; hence - ACY *n.* [f. L *numerus* number + -ATE[2], after *literate*]
Concise Oxford Dictionary, 7th edition, 1982

So, a dictionary definition of numeracy is hard to find - but not impossible! You will find it in some very new dictionaries. For example, an American dictionary from 1999 has this entry:

nu· mer a cy *n.* competence in the mathematical skills needed to cope with everyday life and the understanding of information presented in mathematical terms like graphs, charts, or tables [Mid-20thC. Formed from NUMERATE, on the model of LITERACY]
Encarta World English Dictionary, New York, 1999

And, if you look elsewhere, you'll find more definitions than you probably really need. We include a few here:

numeracy is "the knowledge and skills required to effectively manage the mathematical demands of diverse situations" (p. 1) and "Numeracy...is that bridge that links mathematics and the real world." (p. 6)

Adult Literacy and Lifeskills Survey's (ALLS) definition of numeracy, written in 2000

"Numeracy is not just the ability to add or multiply numbers. It's the ability to put numbers together with a minimum of effort and the ability to look at those numbers and see if they make sense."

Ron Dunkley, head of the Centre for Education in Mathematics and Computing at the University of Waterloo, quoted in the Toronto Star, September 2000

"Numeracy not only incorporates the individual's abilities to use and apply mathematical skills efficiently and critically, but also requires the person to be able to interpret and communicate about mathematical information and reasoning processes"

Beth Marr and Dave Tout from Australia and Iddo Gal from Israel, 1997, quoted in ALLS, 2000, p. 10

"To be numerate is more than being able to manipulate numbers, or even being able to 'succeed' in school or university mathematics. Numeracy is a critical awareness which builds bridges between mathematics and the real-world, with all its diversity."

Johnston from Australia, 1994, quoted in ALLS, 2000, p. 10

"Numeracy is the mathematics for effective functioning in one's group and community, and the capacity to use these skills to further one's own skills to further one's own development and that of one's community."

Beazley from Australia, 1994, quoted in ALLS, p. 7

"Most important of all is the need to have sufficient confidence to make effective use of whatever mathematical skill and understanding is possessed."

The Cockroft Report in Britain, 1982, quoted in AILLs, 2000, p. 10

"... there is not a particular level of Mathematics associated with it [numeracy]: it is as important for an engineer to be numerate as it is for a primary school child, a parent, a car driver or a gardener. The different contexts will require different Mathematics to be activated and engaged in."

Betty Johnson, 1994

Why All The Fuss Over Numeracy These Days?

Some LBS practitioners feel that numeracy has come out of nowhere, and they wonder why it's suddenly getting so much attention. On these two pages are samples of the attention that numeracy is getting, from whom, and why.

attention in the form of... a front page article in the Toronto Star last September, "Odds are good you're bad at math"

from... the author, Peter Calamai, and the experts he interviewed

details "Canadians are facing a numeracy crisis, a huge gap in our ability to use and understand numbers." (p. 1)

"Our data-drenched culture demands a sure grasp of more complex math-based concepts such as risk, ratios, proportion, relative size and statistical relevance - in effect, a new numeracy." (p. 6)

from "Odds are good you're bad at math", by Peter Calamai, Toronto Star, September 24, 2000

attention in the form of... more math credits, and at a higher level, required to get a high school diploma

from... the Ontario Ministry of Education

details It became compulsory for students who started grade nine last year (in September 1999) to get three credits in math, with at least one of those credits being in grade 11 or 12 math, in order to earn their diploma. Before that, a student had to get only two math credits to earn a diploma, and neither of them had to be in grade 11 or 12. As well, more college and university programs require OAC-equivalent math.

attention in the form of... profiles of the basic skills required for each of approximately 150 lower-skill entry-level occupations in Canada, which explicitly describe the numeracy skills and knowledge needed.

from... Human Resources Development Canada (HRDC)

details HRDC did this because:

"A complaint frequently heard from Canadian employers is that their workforce or job applicants lack basic skills, such as adequate levels of literacy or numeracy. This problem impacts both on current job performance and on the possibilities of future increases in productivity and competitiveness. A workforce with inadequate basic skills will lack flexibility in adapting to changes in technology in the organization of work and will not have the necessary foundation for future skills enhancement training." (p. 1)

from the newsletter of the Essential Skills Research Project, Spring 1994

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attention in the form of... studies of the math used in everyday life, and advancements in ethnomathematics

from... academics, social justice organizations, development organizations

details Numbers shape our societies and our cultures shape numbers. Numbers are involved in many decisions that affect everyone's lives, and we need to understand them in order to protect ourselves and to make good choices. Also, different cultures use numbers differently, and it is important to understand and appreciate this variety.

How Does A Person Show That He Or She Is Numerate?

The experts who are creating the numeracy questions for the upcoming Adult Literacy and Lifeskills Survey (ALLS) describe it like this:

> He or she manages a situation or solves a problem in a **real context** by **responding** to information about **mathematical ideas** that is **represented in a range of ways** and requires activation of a range of enabling **knowledge, behaviours, and processes**.

real contexts	• everyday life • work • society • further learning
ways of responding	• identifying or locating • acting upon or calculating • interpreting • communicating about
mathematical ideas	• quantity and number • dimension and shape • pattern and relationships • data and chance • change
ways of representing information	• objects and pictures • graphs and tables • numbers and symbols • diagrams and maps • texts • formulae
knowledge, behaviours, and processes	• mathematical knowledge and understanding • mathematical problem-solving skills • literacy skills • beliefs and attitudes

(ALL, 2000, p. 12)

Math Anxiety

Do you experience it?
Do Learners experience it?

Symptoms:

going blank — When math comes up, suddenly you can't reason or remember anything, as though a large curtain has been dropped between the world and your brain.

tension — Your body tightens up, your neck gets stiff, your hands shake.

paranoia — You think everyone can figure this out but you, and they know it.

tuning out — You start thinking about what you're going to have for supper, or you wonder how that coffee stain got on your sleeve.

guilt — You feel that you've been found out. The illusion that you are a functioning adult has been breached, and the little math that you thought you knew is a fraud.

panic — Your pulse races and you perspire.
Disaster looms and you will be destroyed.

avoidance — When math enters the scene, you remember that phone call you have to make, or you remember a colleague who is really good at this sort of thing who would love to take care of it.

Writing a Math Biography

a strategy for coping with math anxiety

Early in a numeracy program, you might ask learners to write narratives describing their experiences with math, and how they feel about it - this is their math biography. Give them this task:

> What have your experiences been with math?
>
> How would you describe these experiences?
>
> You can write about math at school, in your everyday life, and at work.
>
> We'll call this your math biography.

When learners have written their biographies, you can identify and discuss things such as these:

- What did you like about math in the days when you enjoyed it?
- What made you feel negative about math? (a teaching method? a part of math*? an event in your life unconnected with math? something that caused you to fall behind? If you are a woman, is it the idea that math is "a man's subject"?)
- What did you do after you began having difficulty with math, or not liking it?

*Typical items in the math curriculum that mark the beginning of a learner's negative experiences with math are:

- times tables
- finding a common denominator
- the concept that negative times negative equals positive
- long division
- inverting and multiplying to divide fractions
- algebra
- geometry
- calculus

With or without a math biography, many students find studying math as an adult a very good experience...

"Thank you, teacher. I learned a lot and I didn't even feel it."

a learner in Ottawa

Why I Like Math

I like math because it helped me in figuring out word problems.

I wish I could find something good in it so I could do it more effectively and easily.

I find the longer I stay away from the subject the easier it is when I go back for a second try. Now that I am back it is a little easier than before.

by a learner in Brampton

"I had marriage lost and I come to math class to exercise my brain and now my marriage is coming back."

Eva, a learner in Brampton

"Knights, forward!
Knights, run away!"

- Monty Python's King Arthur
(in *Monty Python and the Holy Grail*,
leading a charge on a castle (www.montypython.net))

LBS practitioners may on occasion sympathize with the quote above.

Because, to start, we say to our learners:

> "You can learn math! You can do it! You just haven't had a good learning situation before, or maybe you weren't interested in learning math before. If we work hard now, it will happen!"

But, eventually we have to say to some learners:

> "Okay, we've been trying hard for a long time, and you're still having trouble _____-ing. Let's stop trying to do exactly that; let's find a way around it."

With which skills and concepts does this typically happen?
When do you switch from the first approach to the second?
How can you handle this situation gently?
What are the 'ways around'?

> "I've been trying to do multiplication for 34 years and I still don't get it. I need an easier way to memorize multiplication."
>
> *Sandra, a learner in Ottawa-Carleton*

Learning Disabilities in Math

Many learners have difficulty learning math, but some have more serious learning disabilities that need to be recognized and addressed.

Math learning disabilities range from mild to severe, and are as varied in type as reading disabilities.

Adults with math learning disabilities may have one or more of the following characteristics:

- math skills significantly lower than reading and writing skills
- high anxiety and emotional blocks when trying to learn math
- difficulty mastering the basic counting sequence and math facts in the four basic operations
- difficulty remembering and accessing information
- depends on "counting all" strategy, using fingers, pencil marks or other visible reminders rather than more mature counting strategies
- inability to recall sequences
- appear absent-minded or lost in thought
- confuse operation signs
- confuse part to whole relationships
- good grasp of math concepts but poor skills at doing calculations

Relevant websites:

www.dyscalculia.org/calc.html
www.ldao.on.ca (Learning Disabilities Association of Ontario)

Strategies for Teachers and Learners:

- individualize instruction
- identify learners' strengths and weaknesses, and then help them to use their strengths to learn the things that their weaknesses have kept them from learning in the traditional ways
- read and reason out loud and encourage learners to do the same
- teach from concrete (using real things that can be touched and manipulated), to semi-concrete (using photos and drawings) to abstract (using mathematical symbols)
- take every opportunity for repeated experience with real materials
- work in an uncluttered space with clearly-laid-out materials
- emphasize imagination — encourage learners to form mental pictures

Continued on next page....

An accommodation is:

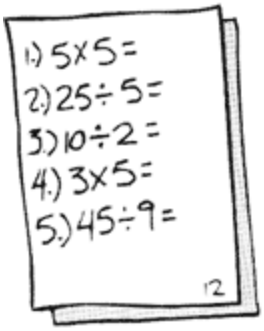
"...any change to a classroom environment or task that permits a qualified individual with a disability to participate in the classroom process, to perform the essential tasks of the class, or to enjoy benefits and privileges of classroom participation equal to those enjoyed by adult learners without disabilities."

Examples of accommodations:

- specialized equipment
- variation in the methods and materials of testing
- allowing more time

Continued from previous page....

- use speaking and listening - discussion - to learn concepts
- have a student try writing on the chalkboard or another spacious, unlined surface that erases easily, rather than on regular looseleaf or, the opposite, try using graph paper
- use drawings (though drawings might only make learning more difficult for students who have visual-spacial disabilities)
- try to work in a stress-free environment
- develop some pocket-size math fact charts
- take extra time
- work to develop a learner's confidence
- relate math to everyday life or to work
- encourage the use of calculators



The definitions of 'accommodation' and most of the characteristics and strategies on these two pages are from "Accommodating Math Students with Learning Disabilities" by Rochelle Kenyon in the September 2000 issue of Focus on Basics (an issue devoted entirely to adult numeracy teaching). Read the entire article online at http://gseweb.harvard.edu/~ncsall/fob/2000/fobv4ib.htm.

Additional strategies from" Mathematics and Learning Disabilities", Literature Kit #14 from the Learning Disabilities Association of Ontario, 365 Bloor Street East, Box 39, Suite 1004, Toronto, Ontario, M4W 3L4, Tel. (416) 929-4311, Fax (416) 929-3905, web site www.ldao.on.ca.

Teaching Learners to Say and Write LARGE Numbers

Tom Kerner, a practitioner at the Valley Opportunity Council in Massachusetts, thinks:

"Instruction in place value is often used to introduce reading and writing of larger numbers. However, place value concepts are not essential to reading and writing numbers, and difficulties with those concepts need not prevent acquisition of the practical vocational skills of reading and writing larger numbers in the hundreds of thousands, millions, and billions."

from a poster presentation at the Seventh Annual Conference of Adults Learning Math at Harvard University Graduate School of Education, July 2000

Tom advocates reading the numbers in clusters, and naming the commas in between.

For example:

Naming the commas is key in Tom Kerner's suggested strategy, but there is more to his technique than we can tell you about here. You can find Tom's paper, "Numeracy Literacy" through the Educational Resources Information Centre (ERIC) under the number ED 444866.

Speaking of LARGE numbers...

How much is a billion, anyway?

In Canada and the U.S., it's:

a thousand million,
which is 1 000 000 000
or 1×10^9.

In England and most of Europe, it's:

a million million,
which is 1 000 000 000 000
or 1×10^{12}.

Why isn't it the same everywhere?

"Until the World War of 1914-1918 taught the world to think in billions, there was not much need for number names beyond millions. Numbers could be expressed in figures, and an astronomer could write a number like 9.15×10^7, or 2.5×10^{20}, anything about the name. Because of this fact there was no uniformity word 'billion.' "

from The History of Mathematics

Overhead in a coffee shop line up:

"The government said it was putting a million, or a billion - whatever - into daycare."

There's a big difference between a million and a billion! Imagine that this line _____ [line 1.4cm long] represents a billion. If you lay a human hair across it, the hair will cover up a million. Try it!

Science Literacy

In 1985, the American Association for the Advancement of Science began working to improve the teaching of science, mathematics and technology in U.S. schools. Since then, their efforts have produced some ideas and documents that may be of interest to adult numeracy educators.

"Without the ability to think critically and independently, citizens are easy prey to dogmatists, flimflam artists, and purveyors of simple solutions to complex problems."

Science for all Americans (1989)

This book outlines what high school graduates should know and be able to do in science, math and technology. It begins with an elaborate definitio n of science literacy, part of which we quote here:

"Science literacy-which encompasses mathematics and technology as well as the natural and social sciences-has many facets."

These include:

- understanding some of the key concepts and principles of science
- having a capacity for scientific ways of thinking
- being able to use scientific knowledge and ways of thinking for personal and social purposes

(from *Science for All Americans* http://www.project2061.org/tools/sfaaol/Intro.htm)

Atlas of Science Literacy (2001)

This book is a collection of 'growth-of- understanding' maps that graphically show educators the knowledge and skills that students need to achieve particular science literacy goals.

"Scientific habits of mind can help people in every walk of life to deal sensibly with problems that often involve evidence, quantitative considerations, logical arguments, and uncertainty."

The people of Project 2061 say they "...will continue to develop innovative yet practical tools educators can use to put science literacy goals to work at every level of the education system".

Math and Science

Math is a science, and an understanding of basic science is included in several dictionary definitions of 'numerate' and 'numeracy'. LBS practitioners can look to math's fellow sciences (that is, the natural sciences, such as biology, chemistry and physics) for content to include in their math courses.

An excellent new Canadian resource is available to help us do this:

Science within Reach
by Rose Strohmaier in Kingston
1998

Rose writes:
"The science book Science Within Reach was finished in 1998. We were funded mainly by *The Canadian Give the Gift of Literacy Foundation*. The idea behind it was to demystify science concepts by explaining them in plain language with everyday examples, in fact to show people that they actually know a lot of it already. The experiments use things you can find around the house, in the supermarket or the drugstore."

Borrow this from AlphaPlus, or get ordering information from Kingston Literacy, 88 Wright Crescent, Kingston, Ontario, K7L 4T9, Tel: (613) 547-2012, Fax: (613) 547-2024, E-mail: kinglit@kos.net. You can buy the book from Literacy Services of Canada (literacyservices.com).

Check it Out

A recent issue of the journal Adult Learning was Devoted to numeracy. Volume 9, Number 2, Winter '97-'98.

Family Math

at the Toronto District School Board

What was it?

It was a program in elementary schools that gave parents and their children an opportunity to experience hands-on math activities together then to talk about the math that was involved in the activity.

Why was it carried out?

It was carried out so that parents would become aware of the math curriculum that their children were studying, and therefore be more supportive of math in school. Specifically, it was initiated as a response to the early 1980s report from the Board's research department, "Math, the Invisible Filter", which identified math anxiety and avoidance in Toronto schools, ; and a reduced number of girls in math courses. (So, you see, its main focus was not on teaching adult numeracy.)

How was it carried out?

First, the Board sent two people to the United States for training in Family Math. Then, twice a year, the Board had these two people offer two-day training sessions for teams of teachers, parents and administrators from elementary schools in the Toronto Board of Education. Then the parents from each team worked with other parents at their school to set up materials for Family Math workshops. Schools set up their workshops differently: some met once a month for four or five months, some met every second week for two or three months; some conducted the workshops by grade, some grouped primary grades together and had separate workshops for the junior grades. Eventually, 80% of elementary schools conducted Family Math workshops.

Points of Interest

- Family math materials were translated into several languages and training was conducted in those languages.
- This program was for all parents, not just parents with low numeracy.
- The adult education department of the school board recruited some students for their LBS math classes through this Family Math program.
- It worked best in K to 6 grades — in grades 7 and 8, the parents didn't come together as well.

And now...?

- The Board has made no system-wide efforts since then, but the EQAO testing for grades 3 and 6 has made this model interesting again.
- For the last twelve years, the Board has been publishing "Calendar Math", as a follow-up to Family Math. "Calendar Math" is a bulletin that contains math activities for parents and kids to do together at home. To order copies ($5 each or $15 for five), call the Board's distribution centre at (416) 397-2595.

*The information on the previous page is from an interview with Peter Saarimaki of the Toronto District School Board. Contact him for more information.

Family Math — the Originators

For details of the activities and philosophy of Family Math, have a look at the book, **Family Math**, by Jean Kerr Stenmark, Virginia Thompson and Ruth Cossey of EQUALS, at the Lawrence Hall of Science in Berkeley, California.

- You can borrow it from AlphaPlus.
- You can read about it or order it from the Family Math web site: **[Website no longer available online]**.
- You can visit the EQUALS web site: http://equals.lhs.berkeley.edu/.

Do Family Math programs sometimes focus more on the **parents'** learning?

Yes.

For example, a program is running now at the David Ellis Elementary School in Boston, Massachusetts. Parents in this school's Family Literacy Program were asked what they wanted or needed to learn. Alice Levine, the Boston Excels Family Literacy Coordinator, can tell the story from here:

"Many parents expressed frustration with their children's math homework: 'Why does it look so different from when we were in school?' Thus, the Parent Math Class was born.

In the Parent Math Class, parents try out the kinds of problems that their children are expected to solve. They learn to *grapple* with open-ended problems (where there may be more than one answer!) and to use math manipulatives or household objects to help solve problems. Classes are loud and energetic as parents work collaboratively, share their math strategies with each other, and discuss how the new teaching/learning approaches differ from those used when they were in school.

I've been teaching adult basic education in a variety of settings for over 20 years and though I had taught a little math here and there, I had never seen myself primarily as a math teacher. In my work at Ellis, I have fallen in love with the new ways that math is being taught and learned in elementary school classrooms and have found it thrilling to share these new approaches with my adult students.

I don't think I've ever worked with adults who are so completely focused on really understanding what they're learning, with no competing or interfering agendas (like preparing to take a standardized test or obtain a credential). The Ellis parents come to class initially because they want to be able to help their kids, but somewhere along the way they get so excited about math "MAKING SENSE" to them for the first time, that they are clearly also learning for themselves. As they spend time working through problems with each other, the parents become excited and animated, and their whole relationship to mathematics begins to change.

Something else that's really special about this class is that parents are really motivated to share their math strategies with each other (especially once they believe that there isn't just one right way to solve a problem!) and to articulate their mathematical thinking. Because they want to be able to EXPLAIN what they've learned in class to their children, they have a natural interest in the communicative aspects of math learning."

For more information, please contact Alice by e-mail at a.levine@att.net

Professional Development for Numeracy Teaching

Sometimes, practitioners who are hired to teach literacy in LBS-funded agencies end up teaching numeracy also. The increased focus on numeracy in recent years has meant increased demands on these practitioners who may feel unprepared for this challenge.

We need to find out what we already know about numeracy teaching and what we want to learn about numeracy teaching. Then we can set out to learn it!

Moves are being made to do this - this bulletin being one of them - and we present others to you on the next few pages...

As part of the project *Survey of Resources for Teachers of Adult Numeracy**, seventeen Ottawa LBS practitioners who are interested in numeracy were asked,

Have you had training in how to teach math?

47% said 'yes'.
53% said 'no'.

How confident do you feel about teaching math?

29% said 'very confident'
41% said 'moderately confident'.
29% said 'not very confident'.

They were also asked to rate their skills in certain areas of math. On average, this is how the teachers rated their skills:

Strong in whole numbers, fractions, decimals.

Between strong and satisfactory in percent and measurement

Satisfactory in geometry, data management and algebra.

*(Though individual teachers did say that they felt they had **rusty** skills in some areas, there weren't enough of them to make the group average **'rusty'**.)*

*Funded by the Ministry of Training, Colleges and Universities and the National Literacy Secretariat, and carried out by Lisa Hagedorn and the Ottawa-Carleton District School Board)

Projects and Resources

Start Date: November 2000 (for publication date, contact Barb Glass)

The Numeracy Best Practices Handbook will be the result of a project whose aim is to produce a Barb manual for numeracy practitioners LBS across all sectors. Barb Glass, the project worker from North Bay, says, "It's my intention to make this practical, readable document that will recognize the good practices currently in place and some of the research around numeracy in other parts of the world."

for more info...

Contact Barb at tel. (705) 474-7601 ext 5320 in (Can adore College) or Glass, by e-mail at glassb@canadorec.on.ca.

Carried out in 2000

Survey of Resources for Teachers of Adult Numeracy

This project produced three documents:

1. a questionnaire about numeracy teaching that could be administered to LBS practitioners in order to assess their need for resources and professional development
2. the compiled results of administering this questionnaire in Ottawa
3. a catalogue of recommended resources aimed at meeting the numeracy teaching needs of Ottawa- Carleton LBS practitioners

for more info...

Contact Lisa Hagedorn at tel. (613) 239-2274 or by e-mail at lisa_hagedorn@ocdsb.edu.on.ca.

Professional Development in Numeracy Teaching for Literacy Practitioners...In New York City

The New York City Math Exchange Group, or MEG for short, is a group of literacy practitioners that has been getting together monthly for eight years, to, as they put it, "discuss the sorry state of math education in our programs and to imagine ways to make it better."

> "What do ABE teachers need? First of all, we need support for intensive professional development in math education."
>
> - MEG Organizers, September, 2000

MEG has two goals:

1. to solve problems together, thereby raising their own level of mathematical content knowledge and problem-solving ability, and,

2. to explore the implications for math Instruction resulting from this process. One teacher wrote in her journal, "Though I moan and groan about doing math problems, it's probably the best part of the meeting for me."

What are the participants like?

"In New York City, literacy education Programs are staffed mainly with non-unionized, part-time moonlighters whose pay and working conditions reflect the socially marginal position of the students they serve; nevertheless, many of these teachers are professional literacy workers with considerable experience and pedagogical sophistication." The organizers sum it up by saying, "We think MEG offers a model of how a small group of motivated teachers can make progress around the edges and in certain well-lighted corners."

From an article about MEG by Charles Brover, Denise Deagun and Solange Farina in the September 2000 issue of Focus on Basics. Read the whole article on-line at www.gse.harvard.edu/~ncsall/fob/2000/fobv4ib.htm

Send e-mail to the organizers of MEG at nycmeg@yahoo.com.

Discussions on AlphaCom

www.alphaplus.ca/mainframe.htm

AlphaCom is the electronic discussion system of AlphaPlus Centre. Anyone can register, and it's free. Here's how AlphaCom is described on its web site (address above):

discuss	inform
debate	converse
network	ask or give advice
post pictures	attach files

On AlphaCom you can participate when convenient. The conversation takes place over time as participants add messages to "threads" of discussion. You post your thoughts as text messages for other people to read on-line. You can check back in a day or so to see anyone has responded.

There are currently over 100 AlphaCom discussions on topics ranging from Board-Staff Relations to Workplace Literacy, to Numeracy, to Deaf Learners' Clubhouse, and if you don't see a debate of interest, you can easily request a new discussion. Many of the private discussions are used by decentralized organizations and workgroups to facilitate their work and information sharing.

To participate in AlphaPlus' on-line community, you must register. You will create a personal user name and password. Once registered, you can browse the lists of discussions and subscribe to the ones that interest you.

Currently, these three discussions related to Numeracy are running:

1. Numeracy
2. Survey of Numeracy Resources
3. Anglo Resources Selection Committee

Watch for new numeracy discussions as the field develops.

"Learning is what most adults will do for a living in the 21st century."

- Bob Perelman,
contemporary American poet, critic and professor

Talking Numeracy on AlphaCom

The following is an exchange that took place on the Numeracy Discussion on AlphaCom last summer (June 2000). Any and all subjects related to adult numeracy are brought up in this discussion - these three messages happen to be about metric and imperial units of measurement.

The message that started it:

Author: Tom Ciancone
Date: 06/16/2000 12:02 AM
Category: Questions
Subject: Metric Imperial conversion

I recently got this message from Susan Sussman:

"Last week I participated in a forum held by Hamilton- Wentworth Training Board. One of the participants in the audience flagged a numeracy problem that he is seeing regularly in the training environments he serves (in business)...specifically the! problem relates to the fact that Canada is using (and presumably teaching) the metric system while some of our major business trading partners and company head offices are in countries where the imperial measurement system is used. His experience has been that many workers are having difficulty because they can't easily handle the conversions from one system to another."

Usually the problem has been for us luddites who were weaned on the imperial system trying to cope with the new metric system.

However, the metric system has been the standard in schools now for over 25 years. So the younger generations are "fluent" in metric. Unfortunately, the US (mainly) refuses to join the rest of the world in using metric.

In teaching metric, I have generally emphasized "immersion" and trying to

A response:

Author: Rose F. Strohmaier
Date: 06/16/2000 12:15 PM
Category: Questions
Subject: Imperial and Metric

Thanks for opening this issue of using both imperial and metric measurements. There's no way around it; we need to and we do it all the time in everyday life.

Construction workers, grocery shoppers, or any shoppers for that matter, are faced with instructions, blueprints, tools, quantities, prices, etc. that may use either measurement system. Just pick up a Canadian Tire flyer and count the number of places where imperial units are used. Order a submarine sandwich and you'll be asked if you want a six-inch or foot-long (and that's Mr. Sub, Canadian-owned, I think). Look at the odd quantities on containers - a 3.78L can of paint, a 355mL can of pop. And it's not only the older age groups that are stuck in limbo; I find a lot I of my students who are under 25 still talk quite comfortably about feet, inches and pounds.

When we're "doing metric" in class, I also teach reference points for making quick conversions between the two systems. (A kilo is about 2 pounds, an inch is about two and a half centimetres, etc.) If we're really making our work in adult numeracy relevant, real-life, goal oriented, learning outcomes-based, then we

become familiar with the metric measurement of everyday objects. However, in the case that Susan describes, the learners may just need a handy way to "convert" using tables or calculators. Only the learner could really identify their specific needs.

Has anyone else encountered and dealt with this issue?

Tom

can't ignore imperial measurement.

Rose Strohmaier

Another response:

Author: Lisa Hagedorn
Date: 06/19/2000 03:03 PM
Category: Questions
Subject: Imperial and Metric

Hi Rose, Hi Tom,
I surveyed some LBS teachers in Ottawa-Carleton about numeracy. One question asked them to choose the units they were most comfortable with in different situations. It turns out that it really depends on the situation. Here are the results:

cooking: 76% prefer imperial, 0% prefer metric, 18% are equally comfortable with both
building with wood: 76% prefer imperial, 0% prefer metric, 18% are equally comfortable with both
traveling: 6% prefer imperial (miles), 41% prefer metric (km), 47% are equally comfortable with both
air temperature: 6% prefer Fahrenheit, 65% prefer Celsius, 23% are equally comfortable with both
sewing: 41% prefer Imperial, 23% prefer metric, 29% are equally comfortable with both
buying by weight: 41% prefer imperial, 12% prefer metric, 47% are equally comfortable with both
measuring curtains, carpets: 59% prefer imperial, 18% prefer metric, 23% are equally comfortable with both

So you can see that teachers, personally, use a mixture of both systems, with imperial winning out in more situations. Most of them are more comfortable with the unit that they are presented with in each situation, e.g. the media always give the temperature in Celsius, so we get used to it.

I think having an idea of the sizes of

What do you think?

Author: You
Date:
Category: Questions
Subject: Imperial and Metric

several common units in each system, and being able to convert between them (as Rose and Tom mentioned), as well as learning to use the units most common in the student's goal area, are best to work on with students. But, most of my students have had high school as their goal — realistically or not. In which case, they need to learn the metric system, the whole system, even though it might not serve them well in the long run.

I think the bottom line is: teach what suits their goal; if their goal doesn't tell you which units they will need, then, hmmm, teach the most common ones of each system, and hope that the students will be able to transfer parts of their learning to later get comfortable with the units they end up needing.

Regards,
Lisa

Thinking Skills and Reasoning Skills

"It would be valuable if we could develop a teaching and learning process (using text, hands-on material, visualisation, oral discussion - whatever it takes) that requires students to think about a word problem, not just rush to get an answer."

- Flora Hood,
a literacy/numeracy
practitioner in Toronto

This text is a step in the right direction:

The Math Problem Solver: reasoning skills for application
by Myrna Manly, USA, 1993
ISBN 0-8092-3764-4, ISBN of the Teacher's Guide 0-8092-3763-6
Published by Contemporary Books, available in Canada through McGraw Hill Ryerson: 1-800-565-5758
Text $19.14, Teacher's Guide $19.14

This text is suitable for students at **numeracy level 3 and higher**, whose **reading skills are quite high**. Parts of the text could be taken out and modified for use with lower level numeracy students or higher level numeracy students who have difficulty reading.

The text is designed to:

- build genuine understanding instead of rote memorization
- allow students to discover mathematical relationships and apply them to a variety of settings
- encourage students to use a range of math tools - including paper and pencil, mental math, and calculators

"The Math Problem Solver ***Teacher's Guide*** has lesson-by-lesson information and guidelines as well as dozens of active classroom activities. The teacher's guide fosters the types of group interactions and critical-thinking activities needed to develop genuine mathematical understanding." (p. vi)

To the student, Myrna Manly writes:
"This book will help you to develop both the mental math and estimation strategies you need to pass tests and in your daily life." (p. viii)

The Level Descriptions Manual

for Adult Literacy in Ontario

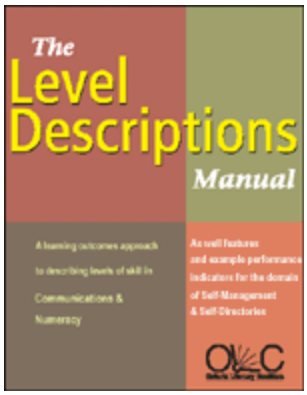
This book contains synthesized descriptions of the skills and knowledge detailed in the matrix of *Working with Learning Outcomes* (1998). It was published in the fall of 2000 by the Ontario Literacy Coalition, and has been found by practitioners to be clear and easy to use.

The Level Descriptions Manual can be useful when you:

- initially assess the numeracy skills of a learner
- develop a training plan with a learner
- create numeracy learning activities
- assess a learner's progress toward his or her goal through demonstrations

Numeracy practitioners can use the level descriptions for numeracy as well as the matrix of *Working with Learning Outcomes* (1998) in their work, deciding which document to use based on the learner and the situation.

How to get this book



LBS-funded program sites in Ontario received two copies of The Level Descriptions Manual. If you would like more copies, you can download and print the manual from the Internet. You'll find a pdf version of the manual on these two websites:
www.nald.ca
alphacom.alphaplus.ca/home

A reminder

Practitioners need focus only on those outcomes, features, and performance indicators that are relevant to a learner and his/her goal.

THE ORGANIZATION
OF THE NUMERACY DOMAIN
OF THE LEVEL DESCRIPTIONS MANUAL

Use Number Sense and Computation

Whole Numbers, Decimals and Integers	1	2	3	4	5
Fractions, Percents and Ratios	1	2	3	4	5

Use Measurement for Various Purposes

Time	1	2	3	4	
Temperature	1	2	3	4	
Length and Perimeter	1	2	3	4	
Area	1	2	3	4	5
Capacity and Volume	1	2	3	4	5
Mass	1	2	3	4	

Solve Geometric Problems

Two and Three-Dimensional Geometry	1	2	3	4	5
Transformal Geometry	1	2	3	4	5
Grids and Coordinate Geometry		2	3	4	5

Manage Data and Probability

Collecting, Organizing and Displaying Data	1	2	3	4	5
Analyzing Data and Drawing Conclusions	1	2	3	4	5
Probability	1	2	3	4	5

Summary Statements for
Use Number Sense and Computation

Level 1 The learner reads and writes **whole numbers to 100, adds and subtracts** single-digit whole numbers, and understands the concept of "**half**". The learner names and states the value of **Canadian coins** and recognizes, describes, and continues **simple number patterns**.

Level 2 The learner reads and writes **whole numbers encountered in everyday life** and handles **money for daily tasks**. The learner adds and subtracts **multi-digit numbers, multiplies and divides numbers**, and uses **common fractions** to measure and describe. The learner recognizes and describes number patterns in which one operation is repeated.

Level 3 The learner adds, subtracts, multiplies, and divides **whole numbers and decimals**; understands the relationship between **decimals and fractions**; and creates and continues number **patterns based on two alternating rules**.

Level 4 The learner **adds, subtracts, multiplies and divides fractions and integers**, and performs simple calculations with **percent, ratio, exponents, and square roots**. The learner **uses a variable** to represent an unknown quantity. The learner creates and continues number patterns based on two alternating operations.

Level 5 The learner performs **a variety of computations** in which fractions, decimals, integers, percent, exponents, and square roots may be integrated. The learner creates and solves **algebraic equations**.

(You will find summary statements for the other three component outcome in the Level Descriptions Manual).

Performance Indicator: uses terms for common fractions (halves, thirds, quarters) to describe and measure quantities in everyday life Examples: measures in half-inch and quarter-inch increments in crafts; explains the mathematical ideas behind saying 'three quarters of an hour' to mean 45 minutes.

Data Management...

Data management involves...

gathering many small pieces of information,	*organizing and displaying them,*	*and analysing the results.*
• conducting a survey • measuring • looking in reference books • tallying • experiments	• sorting and totalling • using tables and charts • graphing • using spreadsheets and databases	• discussing interesting items • comparing • identifying trends • finding averages • interpolating and extrapolating

Finding good data

Once you decide to look for data, you'll find it everywhere. You can start with your learners' own surroundings: You might set them up to survey people nearby, keep track of the weather, look in the newspaper or measure things.

For data on a larger scale (and lots of it!), have a look at:
The Canadian Global Almanac

This book contains information about the Canadian people, land, government and economy, as well as about the world.

- Updated every year
- sells in bookstores for about $20

For example:

Home electronics and appliances owned by Canadians
(percent of households)

	1965	1980	1997
refrigerator	95.8	99.6	99.8
dishwasher	2.7	28.6	48.5
microwave oven	n.a.	8.0	86.2
regular telephone	89.4	97.6	98.6
cell phone	n.a	n.a	18.6
radio	96.1	98.7	98.7
CD player	n.a.	n.a.	58.1
TV	92.6	97.7	99.1
cable connection for TV	n.a.	54.8	73.7
VCR	n.a.	n.a.	84.7
computer	n.a.	n.a.	36.0

This almanac also contains:

- Wayne Gretzky's career statistics
- Canada's food guide to healthy eating
- the winners of the Grammy awards (music) and the Oscars (movies) since 1988
- conversion tables for metric and imperial
- the spring and fall frost dates for Canadian cities
- a chart showing how to recognize and name different kinds of clouds
- the federal government's most recent statement of revenue and expenditure
- laundry care symbols and what they mean
- the results of the most recent Olympics

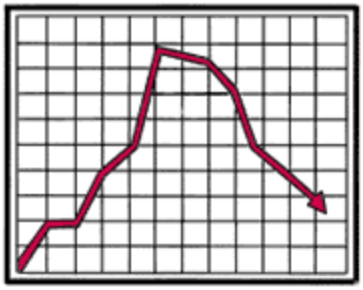
Another good source of Canadian data is
Statistics Canada's web site:
www.statcan.ca

Adult Numeracy in Toronto

From 1985 until about 1997, the Toronto Board of Education operated the **Adult Basic Education Unit**. The ABE Unit did a lot to develop the field of adult numeracy teaching. Several of their publications can be borrowed from AlphaPlus.

Their work included:

- developing and delivering numeracy workshops for practitioners
  e.g., "Making Cents of Decimals", "A Popular Approach to Understanding the GST", "Math in the Language Class", and "Word Problems"



- developing and delivering numeracy training courses for literacy (ABE) instructors
- coordinating with the Family Math program of the larger Board, to reach out to adult participants (parents) and offer them numeracy/literacy classes
- developing and publishing numeracy learning materials
  e.g., "Numbers in our Lives: numeracy methods and materials", "A Sequencing Guide for Numeracy: whole numbers", "Numeracy in the ESL-Literacy Classroom", and "An Annotated Bibliography for Adult Numeracy"
- establishing a "Numeracy Lab", which was a kit of "everyday" found materials that could be borrowed by ABE classes doing instructional units in numeracy, and specifically measurement

Adult Numeracy: Taking Mathematics from the Real World into the Classroom and Back

A Report to the Adult Basic Education Unit, Toronto Board of Education, 1988, by Tom Ciancone.

This is one of several valuable documents produced at the ABE Unit.

Here are some excerpts:

Definition of Numeracy
Penny (1984): "the ability to understand and use mathematics as a means of communication; to interpret a situation given in mathematical terms or to employ mathematics to represent a situation and, if necessary, use mathematical symbols to obtain further information." (p. 24)

The Need for Numeracy Tuition
Is the ability to do mathematics necessary in everyday life? Although there may be differing opinions about the degree to which we need mathematics, few will deny its usefulness. To determine those needs, let us look at the self-expressed motivations of those who seek numeracy tuition. From information gathered at the Adult Literacy Centre in Nottingham, U.K. (Riley, 1984) and Friends' Centre Project in Brighton, U.K. (Traxler & Gabony, 1982), four clear areas of demand may be identified:

1. coming to terms with the math that one encountered unsuccessfully at school (feeling of having "missed out") and thus improving one's self-image;
2. vocational math for nonspecific reasons or for employment entrance exams;
3. social or "survival" maths including the wish to help children with school work;
4. math for enjoyment or for further study.

An important conclusion drawn from these observations is that people seek numeracy tuition for reasons other than assistance with everyday problems and that success in mathematics is a great motivating factor.

A Balanced Approach

Mortiboys (1984) warns against the two extremes: (1) teaching mathematical skills without a context or (2) adopting a purely functional approach with myriads of timetables, menus, advertisements, etc. "We need to adopt a balanced approach: one in which mathematical rules are understood and practiced, and where appropriate, used in situations deemed to be relevant to the student by the student," concludes Riley (1984). The numeracy tutor, then, must establish an open relationship with the learner in order to be aware of the individual's needs and at the same time must be familiar with the learning of mathematical concepts and the structure of the hierarchy of skills in order to determine an appropriate agenda of instruction.

You can read the complete text of Tom's paper (without its diagrams) on the AlphaCom public discussion, *Papers that moved us forward*, which is moderated by Guy Ewing

A letter to practitioners from Maria Moriarty at the resource centre of AlphaPlus

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Dear LBS practitioners,
At AlphaPlus we get requests for a variety of numeracy materials across the full range of LBS levels. For example, practitioners ask for basic math worksheets, resources to support the teaching of linear measurement and resources for prealgebra. What is common to most of these requests is that practitioners want good, Canadian numeracy materials, which, as you no doubt know, pose an interesting challenge to find.

"I see a real need for the development of Canadian adult numeracy resources, both print and software, that incorporate the priorities of numeracy instructors regarding content as well as clear language and design.

There is no shortage of basic math teaching and learning materials on the market, particularly from the United States, Australia and England. Though the resources from the United States are often promoted by publishers as suitable for adult ABE students, upon examination they often turn out to be 'drill and practice' texts, and hence their usefulness is quite limited. There are, of course, other resources available that offer real life contexts and math for everyday life skills such as shopping, budgeting and banking, but these often contain difficulties for Canadian instructors and students because of variations in spelling, vocabulary and currency (examples of this type of problem are the use of 'check' instead of 'cheque', exercises referring to 'state sales tax', and exercises involving travel, where the travel is through unfamiliar territory). These resources often require extensive, time-consuming adaptation by instructors.

We encounter similar problems when selecting numeracy software. While there is a wealth of basic math software available, much of it has been designed for use with children, and although it may be adaptable for use with adults, the additional work required often means that such software is of limited use.

Given these difficulties I see a real need for the development of Canadian adult numeracy resources, both print and software, that incorporate the priorities of numeracy instructors regarding content as well as clear language and design. There is also a need to develop guidelines to help instructors evaluate and adapt existing resources. This is, of course, easier said than done! Perhaps a good first step would be the continuing development of a forum, such as the Numeracy discussion on AlphaCom, as a place where instructors, students, curriculum developers, researchers and librarians can share information and ideas about numeracy resources as well as other aspects of numeracy teaching.

Despite the difficulties I have outlined, at AlphaPlus we have built a substantial and wide-ranging lending collection of adult numeracy and basic math resources. The AlphaPlus Index to Web Resources, accessible through our web site (alphaplus.ca), is a rich and continuously developing source of numeracy-related activities on the Internet, and contains many links to numeracy-related web sites.

If you would like more information about materials in the AlphaPlus collection or numeracy resources on the Internet, contact Centre AlphaPlus Centre at Tel: 416-322-1012/1-800-788-1120, E-mail: info@alphaplus.ca

I look forward to working with you as the field of adult numeracy grows in the future.

Sincerely,

Maria Moriarty
Librarian, Information and Resources Team, Centre AlphaPlus Centre

An Invitation

Dear Practitioners,

Grass Roots Press is a Canadian publishing and distributing company that specializes in adult literacy resources. We currently distribute over 150 books, videos, and CD-ROMS on adult literacy and numeracy. You can view these materials at our website: www.literacyservices.com

We are actively looking for materials on numeracy to publish and/or distribute. If you have numeracy resource materials that you would like us to consider for publication and/or distribution, please send them to:

Pat Campbell
Grass Roots Press
8719 - 50th Street
Edmonton, AB T6B 1E7
Toll-free: 1-888-303-3213

The deadline for submission into our next catalogue is July 30, 2001.

Dr. Pat Campbell

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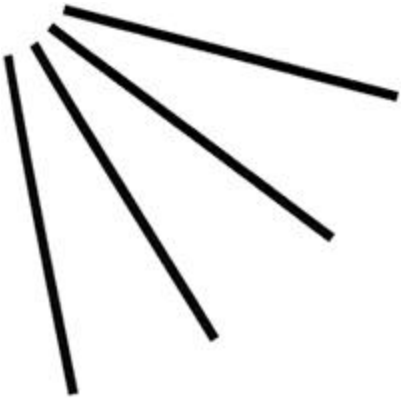

NOTES

To obtain additional copies of Best Practice and Innovations contact:

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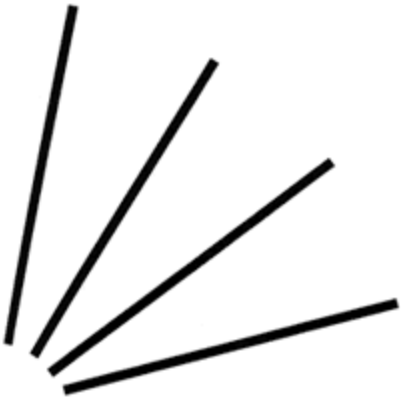
365 Bloor St. E. Suite 1003
Toronto Ontario
M4W 3L3

Phone: 416.963.5787
Fax: 416.963.8102
olc@on.literacy.ca



Ontario Literacy Coalition