

Numeracy Roundtable
Queen's University



March 23 & 24, 2000

Summary of Proceedings

D E N N E R Y
R E S O U R C E S

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Thursday, March 23

Ice-Breakers

Each participant was given a name tag containing symbols representing numbers from different systems, such as binary and Chinese. The object of the exercise was to discover "like" numbers from other systems to determine what participants you were seated with. The exercise also allowed participants to feel a bit of the confusion that people can experience when they encounter mathematical symbols or formulas that they are not familiar with, and it also provided an interesting and fun way to meet others.

Welcoming Remarks

George Hood, Vice-Principal of Queen's University, welcomed participants to the Roundtable, and Christiane Dodge, Director of the National Literacy Secretariat, expressed her desire that participants learn more about the issues, challenges and future directions of numeracy work in order to develop, deliver and promote it across Canada.

Friday, March 24

Organization of the Day

Facilitator Dominique Dennery introduced the agenda for the day's explorations and outlined the selection of topics for group discussions and plenary sessions.

Show and Tell

Participants shared a bit about their background, experience and expectations with regard to numeracy and this Roundtable.

Discussion Groups

Participants formed groups to discuss a number of specific topics of relevance to numeracy work. All groups were asked to first discuss the general concept of numeracy, and then to discuss the main considerations within chosen topics.

Discussion Papers

To stimulate discussion and provide a focus for the Roundtable, two papers were distributed to all participants prior to the gathering. John Dingwall's paper, "Improving Numeracy in Canada", examines the state of numeracy in Canada and gives voice to many numeracy experts. In the second paper, "What Might 'Numeracy' Mean in the 21st Century", Bill Higginson focuses on what he calls "future possibilities" and the path Canada might choose to become a highly numerate nation.

Plenary Presentations

Group # 1 - Factors for Success: Challenges & Problems

What does numeracy mean to us now?

- The ability to do real-life problem-solving and use mathematics in daily life
- Developing connections, synapses
- Process to enable workers to enter the workplace
- Knowing how to interact safely & efficiently in workplace
- A tool that helps workers use new technology
- The ability of people to interpret manuals, diagrams, charts, schematics

What can we anticipate numeracy meaning to us in the future?

- It could determine our whole economic well-being and whether we have a high

"Numeracy is about expanding the lens through which we view the world...it's about thinking mathematically, making connections. A narrow focus on what skills are needed for the workplace now will get you nowhere."

Marian Small

standard of living or not

- Understanding mathematics will be integral to our social, economic and political lives
- The confidence of individuals will depend increasingly on their ability to use mathematical principles in daily life

Numeracy programs are complex enterprises. In general, what can we say about characteristics of successful programs?

- They are similar to the characteristics of successful literacy programs
- They encourage people to be able to figure out answers to questions that relate to the world around us, i.e. the questions from the World's Largest Math Event by the National Council of Teachers of Mathematics, rather than enforcing a formulaic and structured approach
- Excellent teachers
- Flexible modes of instruction and time
- Address economic needs
- Applicable and useful
- Raise awareness of what numeracy and literacy mean and help to develop those skills for use in the workplace
- Quality learning materials
- Opportunity for instructors to get more training
- Developing set markers that demonstrate people's knowledge and ability and give them things to be proud of, such as getting people to write and publish a poem to demonstrate their literacy

What are the challenges and problems that any numeracy program must contend with?

- Getting people to realise that they are in need of numeracy/ literacy programs -- promotion and outreach
- Finding an approach that will encourage

individuals to come to the program

- Needs of the older, working crowd are different from those of the "captive" younger audience
- Establishing programs that offer what people need
- Programs need to be long-term - cannot expect quick turn-around or success
- Negative interventions drive people to programs, rather than positive ones
- The first part of the education continuum - the elementary schools -- is not preparing kids for the world

Group # 2 - Accountability & Testing

What does numeracy mean to us now?

- Historically the emphasis has been on the manipulation of numbers
- Necessary knowledge for assessing and understanding numerical information in our work and lives

What can we anticipate it meaning to us in the future?

- Knowledge and awareness that will let us assess and understand the numerical information that increasingly impacts on our lives
- Emphasis will continue to shift from calculations which are increasingly done by machines to an understanding of the processes and role of theoretical math
- Increased distinctions between the role of practical and theoretical principles

*"Relatively speaking there isn't much research on adult learning in numeracy, but we do know there is low participation in programs and that there are barriers to participation such as gender, so we must determine how to bring people in."
John Dingwall*

This is a period in history when the prevailing conception of education owes much to a corporate perspective. This includes an emphasis on quality control and accountability which in turn necessitates frequent checking/testing. What forms of testing are being used?

- Authentic assessment, such as the Test of Workplace Essential Skills (TOWES)
- Standardized

Problems with testing and accountability

- Method of testing dictates what is being taught and how it's taught
- Assessment needs to be based on actual performance of authentic materials and tasks
- Balancing the need for authentic assessment with the requirement of accountability to funding agencies
- Pressure to report from funding agencies
- Can authentic cases be formulated so that they feed into accountability requirements?

Advantages of authentic assessment

"Many people come to programs under the failure paradigm. If they could be attracted to come for positive reasons we would be getting somewhere."

Nathalie Sinclair

- Promotes experiential learning
- Sensitises learners to the real consequences of errors
- Supports the learning process with meaningful feedback
- Focuses on the positive accomplishments and application of learning principles, i.e. not failures, but strengths and weaknesses within an area
- Supports the principle of lifelong learning
- While focus on a grade mark equates learning achievements with external approval, the authentic assessment encourages the learner to look within and take satisfaction in personal accomplishments and skills-building

Disadvantages/obstacles to authentic assessment

- Difficult to administrate
- Costly
- Time consuming
- May not meet requirements of outside accountability to funding sources

Group #3 - Workplace / Partnerships

What does numeracy mean to us now?

- Often it means a focus on remedial programs
- An ability to decode information increasingly expressed in numerical format
- An understanding of numbering and organising in numerical terms
- Ability to understand wider concepts
- Confidence
- Command of situations
- Pride in doing job
- Ability to take many considerations into account in decision-making

What can we anticipate it meaning to us in the future?

- Necessary to understand all kinds of information expressed in numerical format
- Integrated with decision-making in many situations and contexts
- Much more sophisticated learning than remedial necessary
- Wider, multi-faceted conceptual thinking that is essential to having command of situations

"Your voices could be very influential in changing the paradigms for curriculum development priorities away from volumes of solids and second derivatives to the types of problem-solving we want people to be able to tackle."

Gary Flewelling

Some of the most effective numeracy programs have close links with the workplace. What are the strengths and weaknesses of this approach to numeracy?

Strengths

- Relevant to skills needed in the workplace
- Provides a focal point between the needs in the workplace and education programs
- Overcomes cost difficulties

Weaknesses

- Tends to be too narrow a focus
- Provides only an introduction or entrée to the learning
- Doesn't move employees beyond developing the basic skills to do a job
- Not bridging the increasing gap between knowledge needed to make decisions in many areas of life and the knowledge possessed

How do we move beyond this approach?

- Support the model developed by Syncrude whose mission/vision allows the company to adapt to future needs
- An increased role for government that includes:
 - Acting as a knowledge broker
 - Training trainers
 - Producing materials, resources, technology
 - Promotion of numeracy programs
 - Facilitating change
 - Distributing information
 - Paying more attention to education at early levels in line with the government's children's agenda

"We have a tendency to say I can or cannot read rather than seeing literacy as a constant process of learning whereby one becomes increasingly literate as one investigates poetry, forms of prose, etcetera. Rather than saying 'I'm now literate,' or 'I'm now numerate,' it can be viewed as a lifelong process in which we are 'becoming literate' or 'becoming numerate'."

David Pimm

- Address societal attitudes that imply or assert that those who are bad in math are less intelligent or less motivated than others
- Promoting the idea that people learn at different speeds

Group #4 - Teacher Education

What does numeracy mean to us now?

- A proficiency
- An ability
- An awareness, understanding
- Not an academic distinction
- Implies an either/or question such as are you numerate or innumerate?
- Has meant a logical reasoning
- Often gender-related success
- Ability to problem solve in workplace
- Thinking mathematically, making connections
- More than skills, knowing when to use them
- Ability to independently use information which deals with numbers, measures, etc.

What can we anticipate it meaning to us in the future?

- More than a way to logically reason through things
- Not a state of being numerate or innumerate but a state of constant learning that increases knowledge and awareness of all things numerate
- A way of explaining, measuring or predicting
- Having a larger chunk of information to guide decision-making
- The lens through which we view the world
- A close interrelationship with language

What is the current situation vis-à-vis teacher education in the field of numeracy?

- Numeracy is seen as an outcome rather than an on-going exploration
- Educators are often not as equipped/as far along in becoming numerate as they need to be
- Concentration is often on developing workplace skills - workplace drives curriculum
- Learner's success is often affected/determined by motivation and anxiety - tied up in adult's experience
- Teachers often lack the confidence necessary to teach a holistic approach to all things numerate
- The increasing and encouraged use of mathematical tools such as calculators gives some autonomy to those who know how to use them, but also strips it away as people lose awareness of why a certain answer is the correct one

"Teaching numeracy is not necessarily about having resources. It's about thinking patterns, learning styles, understanding, confidence - these are important skills that can be transferred. This is what we're not articulating and translating into training."

Barbara Moreton

What changes are desirable?

- Research - to understand what helps children and adults at different levels
- Work in literacy and numeracy needs to happen at the same time
- Numeracy should not be linked to certain subject areas - things under mathematics not under numeracy and vice-versa
- Focus on how systems work, sense of probability, data analysis
- Focus on skills that can be transferred - thinking patterns, learning styles, understanding and confidence
- Increase educator's knowledge of "how and why" - why is accessible
- Tie teaching to real-life situations and consequences that illustrate the importance of understanding how and why
- Focus on examples of math embedded in

articles we use - ATM machines, etc. - so people can see systems at work

- Build confidence by stressing that ideas can lead somewhere

International Adult Literacy Survey and International Adult Literacy and Skills Survey

Educational assessment consultant Stan Jones spoke on the outcome of the 1994-1999 International Adult Literacy Survey (IALS) in which Canada participated and which was led, in part, by Statistics Canada. This survey has been successful in influencing policy agendas with regards to literacy, and has led to the International Adult Literacy and Skills Survey (IALSS - also known as the Adult Literacy and Lifeskills survey, or ALL) which is currently being developed in collaboration with a number of countries.

"The country who scored the best in the International Adult Literacy Survey was Sweden, and as a result of the survey they have developed a whole new policy with regards to literacy because they felt there should be no one at the bottom level."

Stan Jones

The IALSS anticipates documenting responses from twenty to twenty-five thousand Canadians, including minority language populations, immigrants, in and out-of-school youth, social assistance recipients, EI recipients and seniors, and will develop profiles of each province.

A framework paper on numeracy that was developed as part of the International Adult Literacy and Skills Survey brings together some of the best thinking from around the world on the subject. Results of the survey are not expected to be available until early in 2004.

Afternoon Discussion Groups

Participants selected subject areas of interest and broke into small groups to discuss future directions and strategies with regard to numeracy work.

Plenary Discussion

Group # 5 - The Role of Technology

The devices of new information technology offer the field of numeracy, as with all other educational endeavours, a glimpse of great but unfulfilled potential. What are the best of existing, computerized numeracy tools?

- There are very few out there

Outstanding concerns about the role of technology with regards to numeracy include:

- More research needs to be done into what types of materials and resources are in the school systems, how effective they are and how they can be modified.
- What kind of numeracy skills would actually benefit from a technology component?
- What are some of the challenges/problems/benefits of having people interface with a computer alone and/or in groups communicating with each other?
- How will that interface with machine/with group affect the learner?
- Numeracy and "technologacy" - what overlaps might there be between the two?
- Both numeracy and "technologacy" should be considered as we develop tools for learning.
- What tools need to be developed?

Next steps with regard to technology's role in numeracy work include:

- Use the Internet to co-ordinate information on what resources and materials are out there
- Use the Internet to distribute resources and materials

Group #6 - Professional Development Networks and Conferences

"What we must not succumb to is a total abdication from efforts to have people understand how systems work. We need to teach those who are interacting in this world a good sense of how systems work - a sense of probability and data analysis."

William Higginson

The support network for numeracy is often very thin. What would be useful with respect to professional development networks and conferences on numeracy?

- Co-ordination of existing materials, resources, research, and knowledge, i.e. [National Adult Literacy Database](#), NLS, public
- Sharing knowledge of resources such as the [National Literacy Secretariat's](#) train-the-trainer program
- Funding commitment to deliver training to teachers and practitioners
- Discussing how to use these resources within courses
- A national venue for sharing information on curriculum development, ways to support tutors
- Databases for sharing information - possibly the [National Literacy Secretariat's](#) database and a specific stream located to numeracy
- Need for pan-national professional development (PD) strategies and techniques. While community colleges and public schools have PD support, community-based support is limited. Linkages are tremendous
- Regional or national institutes on numeracy
- Develop ways to share information between practitioners who work with the young and in adult education and colleagues in the university system. Examples are newsletters and web sites.
- New and current knowledge needs to be collected quickly because trends change
- Direct curriculum development

- Bank of resource experts that could help support the continuity of numeracy training
- Regional summer institutes at varying times and funded nationally

Group #7 - Curriculum Development Priorities

The lack of high-quality support materials is often a barrier to achievement in the field of numeracy. What are the key priorities with respect to developing appropriate tools?

- Examples, models, demonstrations, world events, other countries - e.g. Sweden
- Focus on "bigger problems", i.e. schools may be producing consumers of tomorrow's adult education
- Adult educators should be influencing the tools and resources developed with respect to numeracy - change paradigms
- Research necessary to make a paradigm shift - work such as the International Adult Literacy Survey has done
- Teacher-friendly resources

How can we develop these tools?

- Use authentic activities
- Build on existing pool of resources
- Use Web, technology to link up resources
- Resources that fit existing learning outcomes

"We can't have an academic system in place that bars people from our society."

John Pitcher

Strategic directions for curriculum development include:

- Numeracy instruction that results in purposeful tasks being accomplished
- Paradigm shift to lifelong learning and applications

Concrete strategies to develop curriculum include:

- Exemplars - actual examples for adult situations
- Better links to purposeful activity
- Begin by examining adult activity or needs with regard to numeracy through the "gatekeepers" of higher education and through adult education/workplace educators
- Develop policy and culture of lifelong learning
- Conduct research
- Support professional development, research

Group # 8 - Research Priorities

Our efforts to make changes in numeracy are sometimes hampered by our lack of knowledge about the field. What should our priorities be with regard to research on numeracy?

- More research on adult learning in numeracy
- Identify barriers to successful participation in numeracy programs, i.e. gender
- How do we bring more people into adult education numeracy programs?
- Young people - find out how parents and whole family work with children
- Workplace - identify current needs and those of the future
- Increasing importance of team work, data analysis
- Identify best ways to teach and learn numeracy - a tight structure or more open-ended with links to work and family
- More qualitative research pointing to numeracy success stories
- Pool research being done around the world

"We're at a critical moment at the beginning of this decade."

Tom Ciancone

Wrap-up and Ways Forward

Christiane Dodge, Director of the National Literacy Secretariat, thanked organizers and participants for their contribution to this Numeracy Roundtable. She iterated that the session has provided collective insights on numeracy, the types of skills it entails and how the challenges of teaching, assessing, administering and increasing numeracy can be approached. Ms. Dodge stressed the significance of participants' constant focus on the needs of the learners and urged all to act on the impetus and ideas generated in order to attempt to meet those needs.

Appendix A

Web Sites with Links to Numeracy

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|---|--|
| http://www.nctm.org | - National Council of Teachers of Mathematics |
| http://mathforum.org/about.forum.html | - The Math Forum with online discussion groups |
| http://www.nces.ed.gov | - National Center for Educational Statistics |
| http://www.std.com/Newbury/anpn/ | - The Adult Learning Network - U.S.
- The Adults Learning Maths
- U.K. |

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