

COMMUNITY LITERACY OF ONTARIO NUMERACY INSTRUCTION AND THE UNDERSTAND AND USE NUMBERS COMPETENCY

SEPTEMBER 2014 E-COMMUNIQUE

Community Literacy of Ontario (CLO) is pleased to share our *Numeracy Instruction and the Understand and Use Numbers Competency E-Communique*. Perhaps for a start, we should clarify just what numeracy is and how it relates to math.

MATHEMATICS VERSUS NUMERACY

The terms 'numeracy' and 'mathematics' or 'math' are often used interchangeably. However, although they have a relationship, they are quite unique.

Mathematics

Mathematics, often shortened to math is the study of numbers, quantities, shapes and patterns and the relations between them. Math involves numbers, symbols and specialized operations that make it easier to deal with amounts and manipulate them. In general, math involves computation, which is the act of determining something by processing information. It involves using specific rules and step-by-step procedures (algorithms). The computation of numbers and arithmetic is often called calculation.

Numeracy

Numeracy, although it definitely requires mathematical skills, is more complex and goes beyond the mere act of computation. Numeracy is the ability to reason and apply numerical concepts to our daily lives. It also incorporates problem-solving, decision-making, logical thinking and interpretation of documents such as charts and diagrams. Numeracy skills give us the ability to understand the numbers and data that we all need to live our lives, work effectively and be engaged citizens. Some examples of being numerate are:

- Calculating time to plan activities
- Using spreadsheets to organize and manipulate mathematical information
- Checking invoices
- Measuring ingredients to complete a recipe
- Managing our own finances
- Understanding statistics and their graphical representations
- Making use of financial or economic news reported in the media

Arithmetic is the most elementary branch of mathematics. It generally includes the study of numbers, especially using the operations of addition, subtraction, multiplication and division. Mathematics consists of many specialized subfields that go beyond simple calculation, such as algebra, geometry, trigonometry, calculus, etc.



NUMERACY AND THE OALCF

The Ontario Adult Literacy Curriculum Framework (OALCF) supports the real-life application of skills through the development of task-based programming. It helps practitioners focus on strengthening the learner's ability to integrate skills, knowledge and behaviours to perform authentic, goal-related tasks.

Like the definition of numeracy, the OALCF considers not just mathematical or computational skills but also the understanding, usage and integration of these skills to complete daily activities, whether in home, community, educational or workplace settings. The very title of Competency C, Understand and Use Numbers, reflects its numeracy ties. Each of the Understand and Use Numbers task groups' definitions include numeracy:

- C1. Manage money encompasses the numeracy skills required for making financial transactions.
- C2. Manage time encompasses the numeracy skills related to tracking and calculating numbers representing time.
- C3. Use measures explores the ways in which measurement is performed and used.
- C4. Manage data addresses the ways in which adults use numbers to understand and explain the world around them.

From: *OALCF Curriculum Framework*, Ontario Ministry of Training, Colleges and Universities
www.tcu.gov.on.ca/eng/eopg/publications/OALCF_Curriculum_Framework_Mar_11.pdf

Community Literacy of Ontario has consistently heard from Literacy and Basic Skills agencies that they need “resources articulated to the OALCF competencies, task groups and task level indicators”. They are particularly seeking numeracy resources with real-life applications to help learners with the Understand and Use Numbers Competency C and its four task groups: Manage Money, Manage Time, Use Measures and Manage Data.

These practitioners want help to locate or produce sufficient task-based, life-applicable activities to meet the OALCF resource needs of learners requiring enhanced numeracy skills to attain their individual goals. Numeracy, as captured in the OALCF Competency of Understand and Use Numbers, has relevance for all goal paths.

PIAAC AND NUMERACY

Reinforcing the need to support LBS learners with this particular competency are the Program for the 2012 International Assessment of Adult Competencies (PIAAC) results, which show a strong need to increase Ontarians' numeracy skills. PIAAC was an international assessment of adult skills and competencies initiated by the Organization for Economic Co-operation and Development (OECD). Twenty-four countries were involved in the assessment. PIAAC measured three areas: literacy, numeracy and problem solving in a technology-rich environment (PS-TRE).

Within PIAAC, numeracy was defined as “the ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life” (OECD 2012). PIAAC was designed to evaluate how mathematical concepts are applied in the real world — not whether someone can solve a set of equations in isolation.



This engagement of skills requires understanding mathematical content and ideas (e.g., quantities, numbers, dimensions, relationships) and the representation of that content (e.g., objects, pictures, diagrams, graphs). There are some sample tasks provided on OECD’s website at www.oecd.org/site/piaac/Numeracy%20Sample%20Items.pdf

Like the Ontario Adult Literacy Curriculum Framework (OALCF) and the Essential Skills (ES), PIAAC is based on proficiency at completing contextual tasks of increasing difficulty. PIAAC’s levels, also like OALCF and ES, in numeracy are built over a continuum of ability using a measurement scale ranging from 0 to 500.

As these PIAAC levels correlate to the OALCF levels it may be useful to consider some of the task characteristics in the “PIAAC Numeracy — Description of proficiency levels table” found in *Skills in Canada: First Results from the Programme for the International Assessment of Adult Competencies (PIAAC)* www.statcan.gc.ca/pub/89-555-x/89-555-x2013001-eng.pdf. Considering these features along with the performance and task descriptors of the OALCF may provide greater insight when developing tasks for learners.

PIAAC Key Numeracy Findings

- Canada ranks below the OECD average in numeracy.
- The proportion of Canadians at the lower level is greater than the OECD average.
- Men have higher numeracy skills across all ages.
- Numeracy scores are highest in the 25-to-34 age group and lower in the older age groups.
- Higher education is associated with greater numeracy skills, particularly for those with post-secondary education (PSE) – a bachelor’s degree or higher.
- The employed population displays greater information-processing skills than the unemployed and not in the labour force populations.
- Numeracy skills of unemployed and not in the labour force populations are similar.

NUMERACY RESOURCES

CLO’S UNDERSTAND AND USE NUMBERS CURRICULUM PROJECT

CLO recently announced that we have received funding from the Ministry of Training, Colleges and Universities’ Service Delivery Network Development Fund to create a curriculum and resource list for the OALCF Understand and Use Numbers Competency. The curriculum will address some of the numeracy resource needs of practitioners and learners. It will have four to five sample tasks in each of the three levels of all four task groups: Manage Money, Manage Time, Use Measures and Manage Data. It will be freely downloadable from CLO’s website in English and French. A list of numeracy resources that practitioners can reference for additional support will also be included in this valuable resource.

To ensure that the resource will meet the needs of Ontario’s Literacy and Basic Skills agencies, CLO has conducted a number of key informant interviews, online research, etc. As part of this research process,



resources were shared by diverse community-based literacy agencies around our province. They provide a snapshot of what valuable numeracy resources are currently available and in the following is a sampling that we are happy to share with you.

Math Sense Series (New Readers Press)

Receiving the most recommendations by far was the *Math Sense Series* from New Readers Press. This series is developed for adults, which is its first of many pluses. It covers a wide range of math skills within the books in the series. New Readers Press has just developed a new revised Math Sense 2 with new book names:

- *Focus on Operations* (whole numbers, decimals, fractions, ratio, proportion, percent and measurement) – 208 pages (released in September 2014)
- *Focus on Problem Solving* (numbers and properties, the basics of algebra, solving problems with algebra, geometry basics and connecting algebra and geometry) - 224 pages (Being released in October 2014)
- *Focus on Analysis* (data analysis, counting problems and probability, systems of equations, functions, polynomials and rational expressions and quadratic equations) (Being released in November 2014)

The new series appears to follow the same useable pattern as the initial series. Each book starts with a Skill Preview, which is a survey or assessment of the learner’s abilities in the math concepts covered within that book. This is helpful to define which sections will be beneficial to the learner and which are not needed.

The books continue with:

- Topic Discussions, which provide some awareness of where the math concept applies to life
- Skill lessons, which have step-by-step instruction of the math skill along with computation reviews and word problems built around adult life context
- Tools lessons that introduce the use of tools, such as calculators and estimation, into the math concepts
- Applications and Problem-Solving, which provide realistic, life activities on which to apply the math skills and strengthen reasoning
- Partner and peer group activities to apply math skills
- A Post-test at the end of the book which combines all of the book’s topics. This allows the learner and the practitioner to assess how well the learner has mastered the concepts.

One feature often mentioned by the programs interviewed is how the books connected math to various learner goals and areas of interest. Another talked about feature is the special problems and applications that require more in-depth exploration of math ideas and require activities to demonstrate the learner’s integration of the math.



The new *Math Sense 2 Series* is available for order and pre-order directly from New Readers Press www.newreaderspress.com. Student workbook prices range from US \$13.20 to US \$16.50 each, depending on the number purchased and a set of all three books is US \$35.75. At the time of writing, Frontier Books New Readers Bookstore, www.frontiercollegebooks.ca, was still selling the original *Math Sense Series*, as was the Laubach Bookstore, www.laubach-on.ca/bookstore

Real-Life Math Series (Walch Publishing)

The Real-Life Math series is a seven-book collection of activities designed to put math into the context of real-world settings. The series, which may be bought as a set or individual books, covers: *Algebra; Data Analysis; Decimals and Percents; Fractions, Ratios and Rates; Geometry; Probability; and Tables, Charts and Graphs.*

This series seeks to show learners how the math concepts learned in the classroom affect their everyday lives, rather than replacing instruction of mathematical concepts. There are a significant number of real-world settings in this collection to integrate a real-world, problem-solving focus into all of your math classes. Also, the teaching notes include extension suggestions.

Because this is a series of reproducible teacher books, you may make as many copies of each activity as you wish.

The books are sold on Walch's site (<http://walch.com>), found by doing a search for "real life math". Individual books can be ordered or downloaded at a cost of US \$21.00 and the full set of 7 books for US \$124.00. They are also often available on Amazon.ca for varying Canadian dollar prices.

Kitchen Math (Walch Publishing)

One last little gem from Walch Publishing that comes highly recommended is *Kitchen Math*. This 80-page resource has 38 reproducible activities connecting basic math operations to purchasing, preparing, cooking, and serving different dishes. Learners practise their fundamental math skills while they solve real-life cooking, shopping, and planning scenarios. There are also teacher materials such as lesson objectives, teaching notes, pre- and post-tests, and complete answer keys. Available from Walch (<http://walch.com>) for US \$22.00 or through Amazon.ca.



Get Online!



Have you checked out the **AlphaPlus Web Index's Tag Bundle for Math**? It has more than 150 links to great sites to help you with math and numeracy information and instruction ideas. It's also catalogued by topic.

https://delicious.com/alphapluswebindex/tag_bundle/Math

or,

Grab a ready-to-go task from **Task-based Activities for LBS**. This searchable online database of tasks can be searched by goal path or level. All the tasks are written in clear language and articulated to the OALCF. <http://taskbasedactivitiesforlbs.ca>



Developing Numeracy Worksheets for the Construction Trades (Buildforce Canada)

“Originally created in 2001 as the Construction Sector Council, BuildForce Canada is a national industry-led organization committed to working with the construction industry to provide information and resources to assist with its management of workforce requirements.” (www.buildforce.ca) One of their activities has been encouraging the use of Essential Skills (ES) training throughout the construction trades. This has included producing and distributing ES-based resources. As the OALCF levels relate to ES levels and ES is also a task-based framework, materials developed for ES can be quite useful in OALCF programming.

Developing Numeracy Worksheets for the Construction Trades is a freely downloadable resource, which makes it even more enticing. The guide offers instructors four sections with details for creating appropriate trades-related numeracy worksheets: Identifying an Instructional Goal; Trades-Related Questions and Materials; Developing Worksheets; and Making Answer Keys. These sections are followed by more than 40 pages of examples, complete with answer keys, that can help even those who are not ready to tackle creating their own.

(www.buildforce.ca/en/system/files/products/Developing_Trades_Math_Worksheets_0.pdf)

Sustainable Essential Skills – Instructor’s Guide and Trades Worksheets (Buildforce Canada)

Another resource from Buildforce Canada is their *Sustainable Essential Skills – Instructor’s Guide and Trades Worksheets*. This series includes the following Trades Worksheets books:

1. [*Boilermakers, Bricklayers, Carpenters, Floor Covering Installers, Glaziers*](#)
2. [*Heavy Equipment Operators, Insulators, Ironworkers, Painters and Decorators*](#)
3. [*Refrigeration and Air Conditioning Mechanics, Sheet Metal Workers, Wall and Ceiling Installers*](#)

The purpose of these resources is to provide ready-made materials for instructors to use that integrate Essential Skills into technical training topics. These worksheets assist apprentices who are finding technical training difficult and address the National Occupational Analysis competencies for trades training in every region.

Although not fully downloadable due to some fold-out pages, you may download an extensive preview. Each of the worksheet books is approximately 80 pages and can be purchased for \$27.00. The 86-page Instructor’s Guide sells for \$39.00.



TRY AN APP!



There are 100’s of math and numeracy apps available for Apple ipads or iPhones and Android tablets and phones. Many are free or quite low cost. To help you make selections try:

- <http://appsineducation.blogspot.ca/p/maths-ipad-apps.html>
- www.numeracyapps.co.uk
- www.androidauthority.com/best-android-apps-learning-math-mathematics-number-games-81571
- <https://play.google.com/store/apps/details?id=com.PomegranateSoftware.MathStudio>



Money and Youth (Canadian Foundation for Economic Education)

The [Canadian Foundation for Economic Education \(CFEE\)](http://www.moneyandyouth.cfee.org) has a website that is well worth visiting for its numerous resources, tips and links. If for no other reason, you should visit the website to download the free 220-page book *Money and Youth* (www.moneyandyouth.cfee.org). This resource is not a math textbook. Instead it offers the background material around financial management to integrate with the computational math for true numeracy. The activities in the book and the supporting Teacher Guides available for each chapter provide thought-provoking activities for learners considering their financial goals and how to reach them. The topics are not just for youth, as they cover:

- **Goals, Values and Decisions**, including who is in control, keeping up with the Jones's and effects of advertising
- **In Search of Income**, covering sources of income, careers and entrepreneurship
- **Working with Money**, including budgeting, debt and credit, major expenses, investing and insurance

CONCLUSION

Literacy and Basic Skills (LBS) practitioners are always seeking ways to provide the best training for adult learners. Ensuring that math skills are not just learned in theory, but applied to real-life numeracy applications is critical to ensuring that LBS learners can fully incorporate the Understand and Use Numbers Competency into their lives to meet their goals.

We hope that this e-communicé has inspired you to explore some new resources and try some new task-based learning activities. And, of course, we hope that you will be watching in anticipation for our great, new, Understand and Use Numbers Curriculum resource that will be available at the end of March 2015. It will have a wide variety of activities for learners and more great suggestions for supplementary resources. We are always interested in hearing about and sharing more resources, so if you have a resource to share, please contact us via email, Twitter or Facebook. You can also now follow us on Pinterest.

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www.communityliteracyofontario.ca/resources/e-communicés/

Would you like to know more about Community Literacy of Ontario? Then please visit our website at www.communityliteracyofontario.ca or follow us on Twitter [@Love4Literacy](https://twitter.com/Love4Literacy).



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