

Helping Teachers Use Math to Solve Problems and Communicate

by Donna Curry
Equipped for the Future National Center,
University of Maine

“Use Math to Solve Problems and Communicate” is one of the 16 content standards developed by the *Equipped for the Future* project to broaden the range of knowledge and skills that are currently addressed in federally funded adult education programs in the United States. Derived from what adults need to know and be able to do in their everyday lives as parents, workers and members of communities, these standards expand the traditional definition of literacy from a set of communication skills to include decision making, interpersonal and lifelong learning skills. The focus of the standards, as seen in the math standard [see Box], is on application of skills in a specific context, to achieve one’s purposes for learning.

Equipped for the Future is the national standards-based system reform initiative of the U.S. National Institute for Literacy (NIFL), an independent federal agency. NIFL launched *Equipped for the Future* in 1994 to develop this new definition of results – and a new approach to measuring results – that aligns adult goals with state and federal policy goals.¹ EFF proposes that the expanded set of 16 skills standards defines the domain of adult education and literacy programs, so that teaching and learning, assessment and reporting on results will focus not just on what adults know – but whether and how well adult students can use what they know to achieve purposes in their lives. This means that teachers must focus much more on whether students know when to use a particular operation, e.g., when to round and to what degree, what data to select and use in order to solve a problem or make a decision, and how to communicate the results.

The EFF Framework for adult literacy focuses the delivery system on helping adults achieve their purposes for learning by providing:

- a clear set of standards of what adults need to know and be able to do to achieve their goals;
- a common framework that adult education teachers and programs can use to link curriculum and instruction, assessment, and program improvement;
- a common language that can align all parts of the lifelong learning system; and
- a common definition of results that can be used to support program and system accountability.²

EFF’s current field research is focused on the development of assessment tools that will enable this alignment and can be used for accountability purposes. Drawing on cognitive science research on expertise, we are mapping real descriptions of adult learner

performance on each standard onto an adult continuum of performance from novice to increasingly expert. The performance continuum focuses on the depth and structure of the knowledge base, the independence and fluency of performance, and the range of conditions for performance. This work of building developmental models is being carried out with the help of practitioners and programs in five partner states – Maine, Ohio, Oregon, Tennessee, and Washington.

For example, teachers in some of the field research sites have used the Math standard to develop EFF performance tasks instruction with imbedded assessment) and document what students know and are able to do as they carry out the task.

the Use Math to Solve Problems and Communicate:

- Understand, interpret, and work with pictures, numbers, and symbolic information.
- Apply knowledge of mathematical concepts and procedures to figure out how to answer a question, solve a problem, make a prediction, or carry out a task that has a mathematical dimension.
- Define and select data to be used in solving the problem.
- Determine the degree of precision required by the situation.
- Solve the problem using appropriate quantitative procedures and verify that the results are reasonable.
- Communicate results using a variety of

Each EFF performance task:

- explicitly addresses all of the components of performance of the standard;
- has a clearly defined purpose;
- has clearly defined roles for the learner and the teacher;
- represents a meaningful, real-world application of the standard.

mathematical representations, including graphs, charts, tables, and algebraic models.

When completed, the EFF Assessment Framework will include:

- a developmental sequence of descriptions of learner performance for each of the 16 Standards that can be used to guide learning and instruction;
- model performance-based assessments and scoring guidelines (rubrics) for each Standard that can be used to mark transitions from one level of performance to the next (for at least six specified levels to correspond to the current six adult basic education and six English as a Second Language Educational Functioning Levels of the National Reporting System); and
- materials, training, and technical assistance to support the implementation of these EFF-based curriculum and instructional resources and assessment tools.

Need for staff development

With the development of a new system for adult education well underway in the United States, we need to examine what this means for adult educators who will use the tools and language of this new system. Clearly, extensive staff development will be required. How do we help practitioners move from the traditional view of literacy and “math”? How do we help math teachers understand that teaching and assessing is about the application of math concepts? How do we help them understand how to teach math concepts in the context of their learners’ lives? How do we help them learn how to develop and use learning activities that include continuous assessment? And how do we help them learn how to document learner progress in terms not just of knowledge but of increasing independence, fluency, and range?

Part of the challenge for the EFF initiative is to help teachers understand that teaching math is much more than teaching computation. It is about using all the components of performance for the standard in developing activities so that the math is applied in contexts meaningful for learners. This is a change from teaching for a test or focusing on word problems as the only “real life” math that learners are currently exposed to. Another part of the challenge is to provide training for teachers so that they understand the math concepts they are teaching. So, even though our standards are in place and the assessment framework is progressing well, we still have a long road ahead if we are truly to create a new adult education system.



Sample Performance Task:

Learners are asked to total a restaurant bill and to determine an appropriate amount for the tip. Learners may choose one of several methods for calculating the tip (tip table, estimating, or calculator). Learners must also decide whether the tip should be 15% to 20% or higher and must justify their decision for the amount of the tip with an explanation of how the quality of the service and cost of the meal influenced the amount of the tip. The task takes approximately four hours to complete. The task is relatively structured. The teacher provides a tip table and instructions on how to use it as well as instruction on other strategies for calculating a tip (estimation, using a calculator). Learners prepare bills to be calculated by themselves and other learners and also choose a tip calculation strategy. Learners are evaluated on their choice of strategies for completing the task, on their use of strategies to complete the task accurately, and on their explanations of the tip amount.

Other Key Web Sites for Adult Numeracy

Adult Numeracy Network

<http://www.std.com/anpn/>

Adult Learning Mathematics - A Research Forum

<http://www.alm-online.org/>

See http://novel.nifl.gov/lincs/collections/eff/about_eff.html

1. EFF has been in development for 8 years. For an overview of its development history, see *Equipped for the Future Content Standards: What Adults Need to Know and Be Able to Do in the 21st Century*.
2. Bingman, B. & Stein, S. (2001). *Results that matter: An EFF approach to quality*. Washington, DC: National Institute for Literacy