Developing Adults’ Numerate Thinking: Getting Out From Under the Workbooks

The author makes a case for substantive change in how and what we teach in mathematics.

by Mary Jane Schmitt

The standard-bearer of basic math instruction in adult basic education (ABE) and preparation for the tests of General Educational Development (GED) has long been the consumable student workbook. It is not hard to understand why. Workbooks are relatively inexpensive. They are logically incremental and modular, usually with one or two pages devoted to a narrow topic. They place minimal demand on teachers by posing no open-ended questions or investigations; rather, each problem has one and only one right answer, which can be readily checked by the student in the back of the book. For the most part, the mathematics content focuses on standard computational rules (algorithms) with whole numbers, fractions, decimals, percentages, and prealgebra. Adults learn paper and pencil computational processes and symbol manipulation on routine repetitive problems. These problems are then followed by “real-life applications” or word problems whose reason for being seems to be that they provide more opportunities to practice the algorithm. As a result, success in the adult education math class is defined as the ability to follow successfully a sequence of rule-based instructions that can be matched to one-step or two-step word problems.

Some may think this affords a benign and reasonable way for adults returning to school to learn math at their own pace, to keep track of where they are, and to feel a sense accomplishment from plowing through pages of a workbook. I disagree. Used as the primary resource, workbooks are anything but benign: they promote not a second chance but a second-rate education for students wanting to learn math. It is second rate because the mathematical demands of the world inhabited by adults are not sufficiently emphasized. Nor do the workbooks take into account the diverse characteristics of learners and how their rich understandings and usable skills develop. And finally, they put forth a restricted view of the learning process itself. Most workbooks implicitly promote a myth that rule-based math is most important, that adults all learn the same way, and that learning happens by transmission. It is a simplistic and erroneous view of the way in which mathematical thinking develops. To improve adult math education in ABE, these three myths need to be seriously challenged.

Challenging the Math Status Quo

A growing body of work emphatically challenges the ABE/GED math status quo. A group of seven recently published and/or released policy and research documents has the potential of moving us beyond the basics toward a more realistic, flexible, and adult-centered mathematics curriculum. Taken together, these seven serve as a rich resource for updating the mathematical content of adult basic education. None of these documents abandons the “basics” but they do redirect the emphasis on what the basics are. And while their underlying messages are similar, each document contributes uniquely to a new mission for ABE/GED mathematics instruction.

Some of the documents put an emphasis on “adult” in the “lived-in world.” The SCANS Report (1991) and Equipped for the Future Content Standards: What Adults Need to Know and Be Able to Do for the 21st Century (2000) are grounded in data gathered from the workplace and from adults in their roles as workers, parents, and community members. They emphasize mathematics as a tool for decision-making and problem-solving. In these documents, mathematics is the subtext that weaves through the larger picture of adults (as Equipped for the Future would put it) gaining access to information, expressing ideas, acting independently, and bridging to the future. Curricula developed within these
demands of the lived-in world: the demands that adults meet in their roles as concerned with school mathematics and more concerned with the mathematical

Taken together, the message that comes through can be summarized as follows: to help us improve service delivery radically.

authentic, real-world mathematical demands.

participating countries. This treatment of numeracy has the potential to redirect the one - have attempted to turn this multifaceted definition into test items to be used about this mathematical information in various ways. The authors - of whom I am mathematics of change. People identify, interpret, act upon, and communicate with dimension and shape, patterns and relationships, data and chance, and the Numeracy, in this framework, has to do not only with quantity and number but also of coordinated guidance can these documents, taken together, offer adult basic

What About the GED?

That is all well and good, but what about the GED? After all, passing the GED is a major goal of students and thus drives much of mathematics curricula. Adult educators should note that the new GED 2002-Test Series is strongly influenced by the NCTM Standards. The content of the upcoming test will be aligned, and appropriately so, with the emphasis on algebra and patterns, data analysis and statistics, geometry and measurement, as well as number sense. The inclusion of a scientific calculator as a tool on part of the test symbolically releases ABE from the "kill-it-and-kill" of workbooks to more of an emphasis on the importance of estimation and problem-solving. We can look at the new GED as an opportunity for ABE/GED programs to rethink the mathematics curriculum in a way that is not inconsistent with any of the aforementioned documents.

Finally, I will include a document that adds a new wrinkle to the discussion and suggests that the focus for adults should not be on "school math" but on "numercy." A recent working paper conceptualizing the assessment of numeracy skills in the adult population is part of the international Adult Literacy and Lifeskills Survey Numeracy Framework Working Draft (Gal, van Groenestijn, Manly, Schmitt, & Tout, 1999). The paper says that numeracy is the bridge between mathematics and the real world. In considering the mathematical demands that adults are faced with and the skills needed to meet those demands effectively, the authors have arrived at a definition for adult "numerate behavior." Numerate behavior, they posit, is observed when people manage a situation or solve a problem in a real context; it involves responding to information about mathematical ideas that may be represented in a range of ways; it requires the activation of a range of enabling knowledge, behaviors, and processes" (p. 11).

Numeracy, in this framework, has to do not only with quantity and number but also with dimension and shape, patterns and relationships, data and chance, and the mathematics of change. People identify, interpret, act upon, and communicate about this mathematical information in various ways. The authors - of whom I am one - have attempted to turn this multifaceted definition into test items to be used in a household survey to assess the distribution of skills in the adult populations of participating countries. This treatment of numeracy has the potential to redirect the ABE/GED emphasis from school math to a subject more closely connected to authentic, real-world mathematical demands.

In these seven documents, is there one message or many messages? What kind of coordinated guidance can these documents, taken together, offer adult basic education mathematics instruction? None of them has the full message. Each provides an essential component to help us improve service delivery radically. Taken together, the message that comes through can be summarized as follows: 1. Adult basic education and GED mathematics instruction should be less concerned with school mathematics and more concerned with the mathematical demands of the lived-in world: the demands that adults meet in their roles as
workers, family members, and community members. Therefore we need to view this new term numeracy not as a synonym for mathematics but as a new discipline defined as the bridge that links mathematics and the real world.

2. Adult basic education and GED mathematics instruction need to draw upon what is known about the development of children’s mathematical thinking and extend that research to address the development of adults’ numerate thinking and practice.

Putting these two messages together, I propose their summary into a major mission statement for adult basic education: the development of adult numerate thinking.

And so . . .

This brings me back to my opening volley. The ideas represented in these seven documents and the development of adult numerate thinking are systemically under-represented in our instructional materials. They are missing as well in our methods, assessments, teacher development, research agenda, and program and national policies. It is going to take much more than replacing the word math with the word numeracy. It is heartening that the newly proposed National Reporting System (Pelavin Research, 2000) includes a list of numeracy skills, but disappointing that the list looks more like the table of contents of a traditional workbook than any of the seven documents. As the workbooks do, the April 2000 draft of the NRS holds adult education accountable for a very limited set of numeracy skills. Adults who come to our programs deserve and need much more. It is my hope that the ABE delivery system can heed their own documents and put the principles into practice. Otherwise the math curriculum in ABE will remain as uninspiring as the table of contents of the nearest workbook.

References


About the Author

Mary Jane Schmitt is a National Center for the Study of Adult Learning and Literacy (NCSALL) fellow at the Harvard University Graduate School of Education. She is a member of the Adult Literacy and Lifeskills Survey’s Numeracy Team and co-director of the (Extending Mathematical Power (EMPower) Project at TERC, Cambridge, MA.

Further Reading

The seven documents discussed in this article can be found at these web sites.


To improve adult math education in ABE, the author discusses myths that need to be seriously challenged. The article is developed with discussion of the way that research and policy is challenging the math status quo, the need to view the focus for adults on “numeracy” rather than “school math,” and the need for the adult basic education field to make changes in the teaching of mathematics. Note: The links to various web-based documents listed at the end of the article are no longer valid links. Unfortunately the field of adult education math teachers is in constant flux, due no doubt to poor funding for programs and staff, and many of the new math teachers are not trained specifically for teaching math.

What has this got to do with numeracy? In this rapidly evolving information age, numbers mostly come in form of figures, graphs and statistics. Developing such skills could be understood in terms of both numeracy and data literacy. While the semantics implicit in data literacy can be readily inferred or understood (Vahey, Yarnall, Patton, Zalles, & Swan, 2006) and as common within STEM education (Qin, J., & D'Ignazio, 2010) we think the numeracy aspect is somehow masked or rendered subservient. Being numerate, however, does not encapsulate the core of mathematical thinking. In contemporary global settings the development of mathematical thinking also implies reasoning and processing skills that involve precision while also enhancing intuition and problem solving abilities.