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Handbook

How Adults Learn Basic Math

by Ellen McDevitt

Abstract

Most adult math practitioners are not math teachers but rather reading teachers who have inherited the math classes. Or they are volunteer tutors whose math anxiety may be nearly as high as their learners'. Both groups may find themselves wondering how best to teach adults and may be finding that the methods by which they learned are not working as well as expected with adult learners. This article provides some suggestions on how adults learn math that practitioners can employ to increase the success of their learners.

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"You can count on me." "Count me in." "A day late and a dollar short." "Penny wise and pound foolish." Our language is rich with references to numbers and math. Isn't it interesting, then, that so many of us are afraid of math? Isn't it even more interesting that so many of our learners actually believe that they never use math, as if all the numbers and number concepts they encounter in daily life don't exist? What we know about how adults learn math is anchored in the answers to the above two questions as well as in the principles of adult learning theory.

Adults learn math: under protest, with a great deal of anxiety, more easily when it has meaning for them right now, when they can apply it, when they can use their own learning style, and when they have examples to learn from.

When am I gonna use this stuff?

We've all heard our learners ask some version of that question. They frequently save the math subtest of the GED until last, postponing the inevitable in the hope that either it will all make sense in some miraculous cosmic math osmosis or that the GED gods will absolve them of the need to do it! Sometimes learners can't get beyond their fear of math and they drop out of sight, sacrificing their goal of getting a GED. Most learners try, under protest and with a great deal of fear, to understand concepts that have eluded them most of their lives. They don't see the relevance of the math they've learned in class to anything in real life because they don't have any familiar contexts on which to "hook" their understanding.

So my first suggestion is that adults learn basic math in an environment that is as different as possible from the one they remember so unhappily from their school days. For one thing, adults don't have a lot of time to spend in learning—you and they have to make the time count. If you teach math the way you were taught, you are using a model that is based on the idea of 180 class days with little else to occupy a learner's thoughts. If they didn't get it under those circumstances, they are not likely to get it under the restricted circumstances of adult literacy classes. Also, the lecture model of teaching works well for those who learn by hearing but not as well for those with other learning needs. According to Dunn (1994) less than 30% of adults learn aurally. Further, underachievers "tend to be tactual/kinesthetic learners … often are

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peer motivated or motivated only when interested in what they are learning." If we accept that many of our learners are underachievers, we can make the case for restructuring our teaching. A suggestion, then, is to include the use of manipulatives, group work, and other hands-on activities in learning experiences.

Another suggestion is to ask a different question than "How do adults learn basic math?" When you read that question, what do you think of? I think of multiplication tables and theorems, and computation. The more productive question might be, "Why do adults want to learn basic math?" As soon as we reframe the question in such a way we do two things: we acknowledge the learner's goal, validating it as a context for instruction, and we shift the emphasis from mere number operations, implied by the term "math," to the rich tapestry of experience and understanding known as "numeracy."

Teaching in context

In a typical classroom, the instructor provides both the content and the context of the instruction, with every learner being fed the same number stew. But contexts—why a learner wants to learn math—differ from learner to learner. Effective instruction takes advantage of these contexts to help learners recognize the characteristics of generalized math instruction in their own lives. My next suggestion is that you use learner goals to identify contexts for instruction. By using familiar contexts to frame our instruction we may make math more understandable to those who haven't been able to "get it" in the past—we may help the transference of learning. For a long time we have taught skills in general terms and have assumed that they will transfer to the more specific situations in which adults need to use them. In reality, transference has not been well documented. Another suggestion, then, is that you use the following strategies to help a learner transfer knowledge: using the skill in several contexts; teaching when to use a skill, not just how to use it; teaching for understanding; and teaching through patterns (NIFL, 2000).

Teaching in context also gives instructors the freedom to work beyond the ubiquitous workbooks. By asking the learner why she wants to learn math we get some idea of other ways for her to learn. The instructor no longer has to be the source of all knowledge but can ask the learner to supply authentic materials to supplement the standard materials. The Equipped for the Future initiative asks learners to select a role that's important to them—worker, parent, or citizen—and uses that context as the "hook" for instruction. You don't have to use the EFF roles, but you can still find the "hook" with your learner. In doing so, you increase the likelihood that your learner will learn and retain what she learns. Multiplication for a carpenter, for example, looks very different than

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multiplication for a cook. The basics are the same, but the application is different. Why make up "real-life" contexts when the genuine article is at your fingertips? Use building blueprints, work orders, lumber dimensions, or metric weights, cups, and gallons when teaching multiplication, measurement, volume, or geometry. Another suggestion is that you use authentic materials, supplied by the learner if possible, to enhance your instruction and increase the learner's understanding.

One of the shortcomings of traditional math instruction is that students learn enough to pass a test but then can't remember how to do the math when they need it to help a child with simple geometry or figure whether the car salesman is ripping them off. The Third International Math and Science Survey (TIMSS) tested over half a million students from 40 countries. American students scored below the international average on math and science literacy—a position shared with students from Hungary, the Russian Federation, Italy, Lithuania, Cyprus, and South Africa. Part of the assessment dealt with performance expectations, defined as knowing, using routine procedures, investigating and problem solving, mathematical reasoning, and communicating. According to Willard R. Daggett, American students are the most tested but least evaluated students in the world. We do very well in testing content knowledge, but do little to assess whether students can use their knowledge in a variety of real-world situations. And according to the TIMSS, we don't do very well when it comes to using the math we learn so well for tests. Of course, both the TIMSS and Daggett are referring to learners in the K-12 system. But students who can't make it there eventually find our programs and we inherit the performance shortfall. The traditional method of teaching math to adults does little to improve the situation. Our learners just want to know what they have to know to take the test, so we oblige them and send them on their way, with the result that they still may not remember the math when they need it. So another suggestion is that you teach math as problem solving so that learners will develop an understanding of the math processes that will enable them to figure out what they don't know. When learners can do that, they're on the way to being numerate.

Numeracy is making sense of math

If we begin by asking why the learner wants to learn math, we not only establish a new context but we also begin to reframe our instruction as numeracy rather than simple math. Just as literacy is more than letters, numeracy is more than numbers. Numeracy has been defined as the kinds of math skills needed to function in everyday life; not one fixed set of skills but rather a continuum

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of skills that an adult draws from to meet different needs. And it's numeracy that we want for our learners, not just math. It's because they haven't been educated in numeracy that our learners don't get the connections between what they learn in class—school math—and what they use every day—real-life math.

For example, in real life, math problems are complicated; they use real numbers that can be messy, and there is rarely only "one way" to the answer. Yet our classrooms rely on the "I'll teach you the rule and you'll practice this skill over and over until you get it" method of instruction that perpetuates the gap in understanding. This reliance on algorithms creates a situation in which learners believe they have to memorize the rules if they're going to be good at math. When they can't remember the rules, they give up because they never learned how to actually engage in problem solving. Sometimes I think the start of a solution is as simple as shifting our thinking from "How will I teach this?" to "How will she learn this?" In shifting from teaching to learning we place the emphasis where it should be—on what the learner needs to be able to do.

So another suggestion is that you conduct your classes to encourage development of problem-solving skills that will be useful beyond the classroom walls. Encourage learners to wonder why things are, to practice solving problems even where they're not familiar with or aware of procedures, to solve problems in a variety of different settings, and to use what is familiar to them to explain what is not. Problem solving may not be a short-term process because learners engage in math at multiple levels. So learners don't work on multiplication and then practice it over and over again on different problems. They may learn about multiplication and then have a real-life learning situation that will take several class sessions to solve. For example, at the April 2001 Making Math Real Institute held in Pittsburgh, the final activity asked teams of practitioners to create a math learning activity based on what they had learned during the institute. One team set up a learning activity that would use a grocery shopping trip that the student makes every week as the context for demonstrating an understanding of map reading, operations with whole numbers and decimals, the use of time and scheduling, budgeting and the use of money, and making good decisions. Such a learning activity will provide a mental model for the learner to use when he needs to solve problems in similar situations. The National Council of Teachers of Mathematics (NCTM) in the *Professional Standards for Teaching Mathematics* (NCTM 1991) offers suggestions for incorporating problem solving in math class.

Adults who are numerate have a full toolkit of problem-solving strategies

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that they can draw from in different situations. So another suggestion is that you help your learners identify different problem-solving strategies and encourage them to use different strategies as they need to. One good idea is to keep a class strategy list posted on the wall or bulletin board. As learners identify strategies, write them on the list for everyone to see. The goal is for learners to understand that not all strategies work all the time, but that success comes from knowing which strategy to select and when. As learners experience success they begin to believe that they can be successful in other math situations. And when that happens, well, your work is done.

List of suggestions for helping adults learn math

1. Don't teach the way you were taught.
2. Use manipulatives, hands on activities, group work, and other different modalities for delivering instruction.
3. Ask, "Why do you want to learn math?" in order to discover the learner's goals and to establish a context for instruction.
4. In order to enhance transfer of knowledge, provide practice in: using the skill in several contexts; when to use a skill not just how to use it; recognizing patterns; understanding.
5. Use authentic materials, supplied by the learner if possible, to supplement your instruction.
6. Teach math as problem solving in order to increase understanding.
7. Help learners identify problem-solving strategies that they can use in different situations.
8. Shift the emphasis from teaching to learning.

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