Volume 11
Number 2

FIELD NOTES

by and for the Massachusetts Adult Education Community

funded by the Massachusetts Department of Education

fall 2001

TABLE OF CONTENTS

Massachusetts Department of Education

When to Hold, When To Fold: Looking at Math Differently

by Joan Fournier and Jenifer Mullen

Math phobia. Math anxiety. Fear of math. Whatever you call it, many of our learners have it. Many educa tors, too! In fact, chances are there is an official psychiatric diagnosis for math loathing!

What is it about mathematics that strikes fear in so many people? This question forged the backdrop for our motivation to attend the Teaching Adult Numeracy Certification pilot course (offered through SABES and the Adult and Community Learning Services at the Massachusetts Department of Education.) As instructors we aren't much different from our students; we bring our own academic history with us, and in our case, we also had two totally different perspectives, sonalities, age perspectives, degrees of enthusiasm, and levels of numeric comfort. We soon learned that the only factor we needed to have in common was the willingness to look at math in a new way—to view it as FUN.

Under the guidance of coordinator Esther Leonelli, with assistance by Marilyn Moses, Barbara Goodridge, and Mary Jane Schmitt, we actually did learn to look at math differently and we did have fun. Each week we were presented with a new learning technique. Early feelings of intimidation were

Continued on page 4

Foreword

In the three years since I've been editing Field Notes *(and its predecessor,* Bright Ideas*), I have successfully avoided an issue on math. Like many of us, I have suffered from math anxiety most of my life. I agreed with other SABES staff that it was time to do a math issue. But unlike other topics in adult basic education where I had interest, experience, and confidence, I had little idea of how to begin with math. So, I decided to enroll in the "Teaching Math in ABE/ESOL for Non-Math Teachers" mini-course at the ALRI, taught by Esther Leonelli and Roberta Froelich and to enlist the help of some ABE math experts along the way. As a result of the mini-course, of engaging in discussions about the "math wars," and of researching and compiling material for this issue, I have a new found appreciation of and curiosity about math—and numeracy—and a little more confidence in my abilities to solve problems involving numbers.*

Exciting changes are happening in math education, largely as a result of constructivist learning theory. The math course at the ALRI reflected many of these changes: using a discovery method of learning; articulating a line of reasoning; working in pairs and groups, using manipulatives to reach understanding of principles and processes. Learning about "friendly numbers," exploring a variety of estimation strategies, and trying out a number of ways to solve problems (drawing pictures, using manipulatives), all helped to liberate us from the rigidity and abstraction of traditional math and its attending anxieties.

This issue of Field Notes *offers stories and lesson plans by creative math teachers. It also offers math activities and resources for further exploration. Esther Leonelli and Mary Jane Schmitt summarize the history of math reform in Massachusetts adult basic education within a regional, national, and international context. Their article reminds us how math practitioners in Massachusetts have been in the foreground of major math reform over the past several years—reform grounded in theory, research, and practice. Zanna Ebanks illustrates how math is done in her homeland, teaching us that the North American approach to computation is not universal. Alice Levine recounts her positive experiences teaching math to parents of public school students in Boston. Veronica Kell offers footprints as a way to teach perimeter and area. Joan Reissman encourages bargain basement hunting to teach percentages. Ruth Schwendeman clarifies some of the changes in the new math GED test; she also makes links to the math curriculum frameworks in Massachusetts. Bob Bickerton reflects on his years as a math teacher in Cambridge, and Sally Waldron reviews a seminal book for adult basic education math teachers. Finally, Michelle Erde talks about "Fast Math." I hope this issue helps those of you who are math-phobic to relax a bit and those of you who are math-competent to discover new possibilities.*

Lenore Balliro, editor

Field Notes is a quarterly newsletter that provides a place to share innovative practices, new resources, and information within the field of adult basic education. It is published by SABES, the System for Adult Basic Education Support, and funded by Adult and Community Learning Services (ACLS), Massachusetts Department of Education.

The Central Resource Center of SABES is located at World Education, 44 Farnsworth Street, Boston, MA 02210.

Subscriptions are free to Massachusetts ABE practitioners. All others may subscribe for an annual fee of $8.00. To subscribe, contact Heather Brack, 44 Farnsworth Street, Boston, MA 02210. Make checks payable to World Education.

Submissions are welcome. If you have an idea for an article or wish to submit a letter to the editor, call Lenore Balliro at 617-482-9485.

We do reserve the right to decline publication.

Editor: *Lenore Balliro*
Layout: *Lenore Balliro*
Production Assistant: *Heather Brack*
Subscriptions: *Heather Brack*

Advisory Board for 2000/2001:
Bruce Dahlquist, Lee Haller, Marilyn Monteiro, Bonniebelle O'Neal, Susan Peltier, Nancy Tariot

Special thanks to Esther Leonelli for her substantial contributions to this issue of *Field Notes* and to Lou Wollrab and Heather Brack for their valuable assistance.

Doing Math the Latin American Way

By Zanna Ebanks

My first experience with doing math "the American way" was when I had to help my daughter with her homework. I am from Honduras, where I learned to divide one way while my daughter was taught another way. It was a very frustrating time. I decided to take the time to learn to divide the way she was doing it at school, here in the United States.

For example:

397680 ÷ 41

U.S.A. Manner

```
      9699
41 | 397680
   -369
    0286
    -246
     0408
     -369
      0390
      -369
       021
```

Latin American Manner

```
397680 | 41
  286    9699
   408
    390
     21
```

The reason for dividing the way I did is because in my country, students are trained to subtract mentally while dividing. During the first and second grades, students learn to divide using subtractions. For example:

```
 397680     | 41
-  369     |  9
  028
```

From third grade onward, students are required to do exercises where they practice division using mental subtraction. Once they have mastered the mechanics of division it is easier to do it mentally and very quickly. Another difference appears in subtracting and adding fractions. In Honduras, we do it this way:

$$\frac{1}{2}+\frac{3}{5}+\frac{5}{3}=\frac{15+18+50}{30}=\frac{83}{30}=2\,\frac{23}{30}$$

1.Multiply the denominators among themselves to find the common denominator.
2.Divide the common denominator by each denominator and multiply the result by each numerator. For example:

30 [divided by] 2 [times] 1 = 15
30 [divided by] 5 [times] 3 = 18
30 [divided by] 3 [times] 5 = 50

$$\frac{15+18+50}{30}=\frac{83}{30}=2\,\frac{23}{30}$$

The same is done when subtracting fractions. This is just a small sample of how you can obtain the same results in math by operating different ways.

Zanna Ebanks was an EFL teacher in Honduras, Central America, for 25 years, teaching Basic English, Business Correspondence, and TOEFEL Preparation Classes. She now teaches Spanish GED at Concilio Hispano, Inc. in Chelsea. *She can be reached at 617-889-0888.*

See also: Schmitt, M. J. (1991). *The Answer is Still the Same: It Doesn't Matter How You Got It: A Booklet for Math Teachers and Math Students Who Come from Multicultural Backgrounds.*1991. Find this booklet in *Number Sense* curriculum distributed by the Massachusetts DOE/ACLS. Call 617-338-3850.

When to Hold...

Continued from page 1

quickly replaced by simple successes, and self-doubts gave way to confidence inspired by the bonds of camaraderie within our little class of five adult learners. The social "ice" was broken in the first class when we shared our math autobiographies. My c0worker, Jen, the younger and more positively energized of our learning duo, wrote of numerous constructive mathematical experiences.

I, on the other hand, had retrieved memories of being taught to play poker at an early age and encouraged to compute odds — to know literally when to hold and when to fold. Esther placed equal enthusiasm on each of our experiences and proceeded to predict numeric "greatness" for all of us. I was a little less sure of this than my bubbly coworker but gamely hung in there.

Each week we extensively studied personal conceptions of knowledge in regards to mathematical functions—that is, multiplication, division, fractions, percents, etc.— while never losing sight of individual learning styles. We were also required to take the GED math to explore our own anxiety levels and shortcomings. Taking the math test also helped us reflect on our teaching expectations and our use of teaching strategies.

Applications

This is where the "fun" began. Each of our weekly lessons also incorporated an "application problems" assignment. These sheets were usually twelve problems long and the course required us to choose two or three different problems, introduce them to our students, and document our experience in our weekly numeric journals. (These diary-type notations provided each of us with a written commentary on our readings and our experiences: what we wanted to try, what we did try, what worked, what didn't, and suggestions of how we could improve our future performance. These notations were time consuming yet proved to be a valuable tool in reflecting on and improving our practice. To help us effectively present these problems to our students, we were required to tackle a similar exercise in our numeracy class while utilizing a variety of manipulatives.

I'd rather clean bathrooms than teach anything resembling geometry...

Hands On

My educational background had not included this hands-on approach, so as coworker Jen gleefully played, placed, designed, organized, and, seemingly, mastered blocks, dots, plastic chips, beans, cards, and fractional slices of almost everything imaginable, I wondered how I was to introduce all of these techniques while still remaining within my realm of comfort. That answer came as a very pleasant surprise to me. After admitting that I'd rather clean bathrooms than teach anything resembling geometry, I was soon shown how to feel confident enough to say to my class, "I'm not exactly sure what the answer is. Let's see if we can find it together." What the best teachers already knew is what we learned: relinquishing the belief that as an educator one must "know" all of the answers has its rewards. Our students didn't look at us as being less of a teacher, but as being more of a modeler. And following that statement with an exploration of what tangible items we could use for our learning process resulted in a "win-win" situation for all of us. Each week in the pilot class we shared strategies, documented feedback from our students, encouraged each other, and were encouraged in return. We tried it all: blocks, graphs, labels, diagrams, magnified rulers, sand, coupons, water, and more. But mainly we battled against the staleness and futility of the "drill and kill" method of teaching math. We recognized that life-skill relevancy expands beyond the confines of comfort. When a student needs to know how many square feet of floor tiles she should purchase or has the need to find the congruent angles for the stability of a backyard fence, then tidy little worksheets go out the window.

The Teaching Adult Numeracy Certification pilot course encouraged honesty in mathematics. If we accept the fact that there are numerous ways in which we learn, it is logical to support the idea that there is more than one way to teach.

Joan Fournier and Jenifer Mullen are ABE and ESOL teachers at the Taunton Public Schools/Bristol Community College Adult Education Partnership. The two have combined experiences in family literacy, curriculum frameworks, and workplace education. Jenifer can be reached by email at <rcmullster@cs.com>. Joan can be reached by phone at 508-977-9565.

Mock Elections and Math Class: An Experiment in Politics

By Pat Fina, Errol Allen, Errol Bannister, T. Campbell, Jean Estivil, Joseph Guerrier, Janetta Quinn, O. Ramsaran, Taysha Rivera, *et al.*

In ABE classes, lack of time is always the enemy. For the data analysis, statistics, and probability strand of the math curriculum frameworks, we tend to emphasize graph reading, because graphs can appear in three of the GED exams; we do a class or two on means, medians, and modes, and then it's on to the next unit of study. Since our class examples tend to be problems from a textbook, our students learn data analysis, but they don't really get a feel for data collection and organization as it occurs in the real world.

One simple, clean, real- life data project manageable in an ABE setting is to have an upper level math class run a school-wide mock election and report the results of their experiment to the public in writing. This lets students see the entire experimental process from design through data collection, organization,and analysis; moreover, the written report allows them to hone their math as communication skills. The only unusual class materials are a ballot box (which can be as simple as a recycled photocopier paper box wrapped in colored paper) and enough crepe paper streamers to attract attention to the polling place.

My pre-GED math class at the Community Learning Center in Cambridge ran a mock election in the fall of 2000 and published the results in the school newspaper. With permission of the authors, the class essay is reprinted below.

Mock Election

The evening pre-GED math class did an experiment on presidential elections. We held a mock election for the whole school so that we could compare the results for the Community Learning Center (CLC), Cambridge, Massachusetts, and the United States. We thought this would be an easy experiment, but it didn't turn out that way.

Design of the Experiment

First, we made up the ballots. We decided to focus only on the president and vice president. We decided to use the honor system and allow students to vote without our class needing to be at the polling place, in the CLC lobby, to oversee the voting. We also allowed absentee ballots for students who would not normally come to the CLC on Monday, November 6, 2000.

Results of the Experiment

That night in class we counted the votes three times to make sure that they were correct. One hundred seventy -six people voted, but one ballot was disqualified because the voter had marked two X's. There were three write-in votes: one for Bill Bradley, one for Dr. Maya Angelou, and one for Teletubby Tinky Winky. At the end of class we posted the results on the door of our classroom, expecting to be able to compare them with the national results in our Wednesday class.

Then we waited … and waited … and waited … for six weeks to learn the results of the real election. We had to wait until Monday, December 18, 2000, to complete our project.

We organized the results into the chart below.

2000 US Presidential Election Results

CANDIDATE	CLC	CITY	STATE	U.S. POPULAR VOTE	U.S. ELECTORAL COLLEGE
Bush	6%	13.1%	33%	47.99%	271
Gore	83%	72.9%	60%	48.32%	267
Nader	7%	13.8%	6%	2.68%	0
All others	4%	0.2%	1%	1.01%	0

Continued on page 6

Mock Elections...

continued from page 6

Vice President Al Gore won the CLC, city, state, and US popular vote. However, Governor George W. Bush won the Electoral College vote, so he won the presidency.

Conclusions

The 2000 presidential election was historical because it took so long to decide and because the winner of the election did not win the majority of US votes.

We are left with some questions about the fairness of the election system. We suggest that anyone who is upset about the election write to his or her senators and representatives to ask them to change the voting system. Finally, we congratulate George W. Bush, the forty- third president of the United States.

Pat Fina teaches pre-GED math at the Community Learning Center in Cambridge, MA. She can be reached at 617-349-6363.

In Everyone's Good Health

by Lenore Balliro

Special thanks to James MacNeil of World Education for his translations.

In the spring 2001 issue of *Field Notes*, the Foreword used a graphic of Chinese characters for "Good Health" as an illustration for an article about cross-cultural health issues. A reader, Amy Park, pointed out that because the foreword included an anecdote about Cambodians, the Chinese characters might be misleading to some readers, who might think Khmer (the Cambodian language) is written the same as Chinese. As a result, Amy and I talked about how much stereotyping and misinformation exists in our country about the various Asian communities and languages. We thought this would be a good idea to address this concern further in *Field Notes.*

I invited Amy, an Asian American who has experienced stereotyping and racism first hand,to contribute a piece about her perspectives. See her article, "An Abbreviated Response to Stereotypes," on page ten.

In addition, we thought it would be instructive to include an examination of different Asian writing systems using the phrase "Good Health." We have chosen Asian languages in the East and Southeast regions as examples of writing systems often represented by students in ESOL classrooms in Massachusetts.

Look at the samples below and see if you can match them to the correct writing system. Don't worry if you can't match all of them up; the answers on page ten will help fill in your gaps. Now, if we could only include an audio component ...

Find answers to the quiz on page ten.

1. 건강
2. 健康
3. សុខភាពល្អ
4. 健康
5. **Noj qab nyob zoo**
6. สุขะพาปติ
7. สุขภาพดี
8. Sức khỏe tốt

_____Korean

_____Lao

_____Hmong

_____Cambodian (Khmer)

_____Chinese

_____Japanese

_____Vietnamese

_____Thai

A Footprint for Learning

By Veronica Kell

When I am learning something new, whether it's color theory, weaving, or adult education curriculum planning, doing something visual or manipulative is important to me. I have found that the same is true for my adult learners of mathematics. Traditional paper/pencil/problem/practice methods of teaching mathematics have a place, but there must be something more for the ideas to sink in.

Perimeter and Area

The concept of perimeter and area was exceedingly difficult for my students, a class of pre-GED and GED level learners who meet with me three mornings a week at the MWCC/Devens Learning Center satellite at the Page Hilltop School in Ayer, Massachusetts. All of the students are either focused on passing the GED exam or are attending classes to improve basic math and language arts skills. We reviewed the formulas for rectangles ($A=s^2$, $A=lw$, $P=4s$, $P=2l+2w$) and worked some standard problems. I found that my students weren't really grasping the concept that perimeter is the distance around an object, andarea is the object's footprint. There was great confusion around when to use the perimeter formulas vs. the area formulas.

I decided to explore the footprint concept. Each student received two sheets of centimeter (cm) square graph paper, a length of string, and a ruler with both English and metric measures. Colored pencils, scissors, and tape were in the center of the table. Each of us taped two sheets of graph paper together end to end. We then placed our foot on the graph paper and traced around it. (Keeping shoes on provides for a smoother line and, consequently, an easier estimation task.)

Tracing Footprints

The first task was to find the perimeter of their footprint (in cm) using the available tools. (I made it clear that the measure they were finding was an estimate.) The first reaction was to try measuring the distance around the footprint with the ruler. Some students puzzled over the formulas. Someone soon saw that the string might be helpful. Before long they were all fitting the string around the outline of their foot, marking the distance on the string, and measuring this distance. We recorded these measurements.

The next task was to find the area of their footprint (in square cm). Two methods were suggested:

1. Try to find a length and width for the footprint and apply the formula.
2. Count each block inside the tracing.

We discussed the advantages and disadvantages of each. For the first method, if you find a length and width, you can use the formula. But do you draw the rectangle on the outside or the inside of the tracing? We agreed that you would probably do both and take the average of the two as the estimate of the area.

The second method would yield a pretty accurate answer, but would take forever. Through this discussion we came up with a third method: "rectangle up" the inside of the footprint (i.e., draw large rectangles within the tracing of the foot, enough to fill up the tracing), then, count the length and width of each rectangle, use the formula to find the area of each rectangle, and sum the areas. We decided that partial squares in the tracing would be ignored when drawing the rectangles since this was an estimate. Each student chose his or her favorite method of finding the area, and we recorded these next to the perimeters. We wound up with a table that looked like the following:

Footprints

Name	Perimeter	Area

A Footprint , , ,

continued from page 7

We compared the perimeter and area for each foot. We had a grand time looking at our feet and comparing their shapes (short, fat feet; long, skinny feet; etc.) and the resulting perimeter and area of each. Someone even noted that her total footprint (both feet) would be double the area of her single foot.

After this activity, we went on to find the perimeter and area of odd-shaped rectangular figures (those with rectangular cut-outs and add-ons), with much greater success.

The class was lively, and participatory. When my students take the GED exam and encounter a problem dealing with perimeter or area, I hope they will look to their feet and get to work.

Curriculum Frameworks and Equipped for the Future (EFF) Connections:

Math Curriculum Frameworks:
Strand 1: Number Sense
Standards 4, 5, and 6 (Estimation)
Strand 2: Geometry and Measurement
Standards 1, 2, 3, 4, 5, 7, 9

Equipped for the Future (EFF)
Strand 1: Communication Skills
Standards 3, 4, and 5
Strand 2: Decision-Making Skills.
Standards 1, 2, and 3
Strand 3: Interpersonal Skills.
Standards 1, 3, and 4.
Strand 4: Lifelong Learning Skills
Standard 2

Basic Equipment to Keep on Hand for An Active Math Classroom:

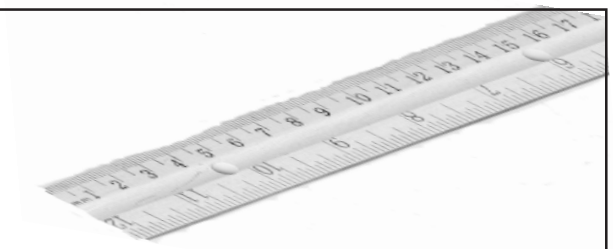
- Scissors
- Glue sticks
- Blank 3x5 cards
- Straight edges (the separators in Lipton tea boxes are good)
- Rulers (with both English and metric measures)
- Construction paper (or colored copier paper)
- Markers
- String
- Cups
- Slinkys ™
- Pennies
- Protractors
- Colored pencils
- Unifix cubes

Veronica Kell is an Adult Secondary Education (ASE) instructor and a computer literacy instructor at the MWCC/Devens Learning Center. She can be reached by email at<vkell@ma.ultranet.com>.

Math Activity

How Big Is a Million?

From <www.literacytech.org / users / estabrook / >

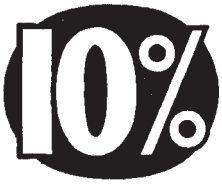


1. Have students work in pairs.
2. Each pair will be measuring a million of something. They can decide together what to measure. For example:
   - How many liters / cups is a million drops of water?
   - How many days would it take to count to a million if you say one number each second?
   - If you lived a million days, how old would you be?
   - If you line up a million pens end to end, how many miles would this be?
   - How much would a million pennies weigh?

3. After making a guess as to what the answer to their question will be, students conduct experiments and calculations to find out. For example, if they want to figure out how many liters will be filled by a million drops of water, they can use an eye dropper and count the number of drops in a centiliter; for example, multiply by 100 to get the number of drops in one liter, and divide 1,000,000 by this number to calculate the number of liters. Encourage them to work together to come up with a plan for solving their problem before they begin.

4. Have each pair make a poster of their results, with their question on the top, an explanation of how they figured it out (along with illustrations), and the answer. They can share / present to the rest of the class.

Math in the Basement



By Joan Reissman

When an instructor incorporates practical math into the curriculum, students begin to understand how math skills can help them in their daily lives. This understanding helps reduce math resistance and anxiety.

Practical math instruction can start at the ABE level. Although many areas of math serve as a basis for practical lessons (using recipes, for example), I have found that percents are particularly easy to work with because students need percent skills for many everyday situations such as department store sales and car buying. Everybody goes to sales, so students will be anxious to learn how to calculate percent discounts. A teacher can use newspaper coupons and sale discounts to teach both simple and successive percents. Boston has a particularly good resource for teaching percents: Filene's Basement. Filene's has an automatic markdown system, so the clothes become increasingly cheaper the longer they remain unsold. This system provides an easy way for students to compare prices by using percents to compute markdowns.

Here is a sample lesson plan for students who have been studying percents at the GED or pre-GED level.

Joan Reissman has been teaching GED for 20 years. She works at Jobs for Youth (JFY)Boston as a math and science instructor. She can be reached at <JReissman@JFYnet.org>

Math Activity

1. **Background Preparation:** Prepare students ahead of time by practicing how to calculate discounts and sale prices so they can use the automatic mark down system to understand percent discount calculations.

2. **Prepare a Worksheet**: (See sample below.)

3. **Field Trip:** Take your students to Filene's Basement or another store that has a similar type of markdown system.

4. **Activity:** Tell students to choose several items of clothing they would like to buy. Have them calculate the discount according to the posted dates. Then have them subtract the amount of discount from the marked price. Students will see how the difference in percent disount changes the sale price.

5. **Materials**: Provide worksheets where students will fill out information that includes original price, amount of discount, amount saved, and new price.

Example

- Original price: $100
- Discount: 25%
  - Method 1:
    100 x .25=$25.00
  - Method 2:
    $\frac{X}{100} = \frac{25}{100}$

    100x=2500
    x=25
- New price:
  $100.00 - $25.00 = $75

Worksheet

- Original price: _____
- Amount of discount: _____
- How much saved: _____
- New price: _____

An Abbreviated Response to Stereotypes

By Amy Park

The stereotype that "all Asians are the same" has damaged the identity of Asian Americans and resulted in the injuries and, in some cases, the deaths of Asian Americans. One example of mistaken identity occurred in 1982 when a Chinese American man named Vincent Chin was beaten on the head with a baseball bat. Witnesses recalled that the assailant, a white male who worked in an American autoplant in Detroit, verbally blamed Chin for the ailing auto industry, assuming that Chin was Japanese. During the height of anti-Japanese sentiment in Detroit when many workers lost their jobs due to the economic recession and competition from Japanese automakers, Vincent Chin was attacked and died because he looked Japanese.

I speak from my personal experience as a Korean American. My Asian American friends and I were physically assaulted by a group of teenagers who kept calling us "Nomo" (the new Boston Red Sox pitcher who at the time pitched for the LA Dodgers). They punched two of my friends in the face, kicked the side of my car, and smashed the back seat window, which shattered over three of my friends who were seated in the back. None of us was Japanese. At another time, a not-so-sober man approached me saying that he fought in Vietnam to save "my people." Thinking I was Vietnamese, he targeted me out of a crowd while waiting for a bus.

The reason for revisiting these painful experiences is to portray a piece of the immigrant ex - experience, which reflects a large population of adult learners in Massachusetts. Immigrants who come to ESOL and citizenship classes may have questions like, "Why do store workers ignore me, but pay attention to white customers," or "What is a 'chink'?" How do adult learners grapple with feelings of being victimized from subtle and blatant forms of discrimination? How should adult educators discuss issues of diversity and racism?

At another time, a not-so-sober man approached me saying that he fought in Vietnam to save "my people."

Asians in the United States

We are fortunate to have adult educators who have spent time in foreign countries learning the native language and culture, yet there is a distinction between learning about an ethnic group in its native country versus understanding ethnic groups living in the US. The lack of an institutionalized system for learning about Asians in America nurtures generations of ignorant Americans and places a burden on the individual to learn on one's own time and interest. If we dig deep into American history, we will find policies driven by economic and political factors that promoted the 1882 Chinese Exclusion Act and the internment camps of Japanese Americans, who were American-born citizens, during World War II. Both policies reinforced the stereotype that Asians are not Americans, but foreigners, no matter how long they live in the US or what contributions they make to American society.

One way of preventing the perpetuation of these stereotypes is writing this article for *Field Notes* which provides background for how a reader could unintentionally internalize stereotypes about Asians. I hope this article has helped to expand your understanding of the Asian American immigrant experience and will assist your work in the adult education community. (Note: See "In Everybody's Good Health" on page 6 for examples of the differences among Asian languages.)

Amy Park is assistant coordinator of the Massachusetts Family Literacy Consortium at Adult and Community Learning Services, Massachusetts Department of Education. She can be reached by email at <apark@doe.mass.edu>

Answer to quiz on p.6

1. Korean
2. Chinese or Japanese*
3. Khmer (Cambodian)
4. Chinese or Japanese*
5. Hmong
6. Lao
7. Thai
8. Vietnamese

*Some characters in Japanese are the same as Chinese, as in the case of "Good Health." However, the Japanese language is not identical to Chinese.

Bringing Reform to Adult Education Numeracy Instruction

By Esther D. Leonelli and Mary Jane Schmitt

This year, Massachusetts adult basic education practitioners are engaged in bringing reform to adult numeracy and math instruction on two fronts. Within Massachusetts, revision of the ABE Massachusetts Mathematics Curriculum Frameworks is underway based on recent research and prevailing thinking in the field. Nationally, strategic planning to raise awareness of adult numeracy instruction is ongoing through the Adult Numeracy Network (ANN). Both efforts cap a decade-long struggle by Massachusetts ABE math teachers to change how we teach math to adult learners in our programs. Both efforts aim to bring numeracy out of the shadows of adult education and raise it to the same level as adult literacy and language learning in the national consciousness, policy, planning, and funding.

Math reform and numeracy instruction in ABE is almost invisible in the national debate. In current literacy campaigns like the National Literacy Summit, numeracy, or adult mathematics literacy, merits barely a mention.[1] In contrast to the US, similar literacy campaigns in other English-speaking countries, such as the United Kingdom and Australia, speak of an adult literacy *and numeracy* educational system of learning.

The Development of the ABE Massachusetts Curriculum Frameworks

Over the past decade, several initiatives set the stage for the Massachusetts ABE Curriculum Frameworks that are currently under revision.

The First Version

In 1989, the National Council of Teachers of Mathematics (NCTM) published the *Curriculum and Evaluation Standards for School Mathematics*, a document that served as a template for reforming and improving K-12 mathematics education across the nation. In 1994, sixteen Massachusetts ABE/GED teachers formed the ABE Math Team and studied the K-12 standards to see how some of the ideas might play out in their adult education classrooms. After a year of action research in their classes, these teachers published two documents, a set of "adult education math standards" and stories of what changes looked like in their classrooms. Their adult math standards were incorporated into the *Massachusetts ABE Math Standards* (1995) and were the first set of ABE frameworks to hit the press. As such, they served as an early template for the ABE Frameworks in other subjects in Massachusetts that were subsequently developed. These early Frameworks also served as a model for other states. In 1996, in the wake of education reform and a national science and math initiative in the state (which included ABE), the Massachusetts ABE Math Standards were subsumed under the *Massachusetts Curriculum Frameworks: Achieving Mathematical Power* (January 1996). It was the only adult education subject included in the state curriculum frameworks for K-12. In 2000, the adult ed math frameworks were revised outside of the K-12 framework. The current revision of the *Massachusetts ABE Mathematics Curriculum Frameworks* is a revision of that first framework, but heavily influenced by developments in the adult education field since then, both nationally and internationally.

National Influences

In 1990, three Massachusetts teachers joined several others in approaching the NCTM with a paper, *A Call to Action,* asking that the NCTM include adult learners in their reform agenda. NCTM responded by forming a task force on adult learners and subsequently hosted the first national Conference on Adult Mathematical Literacy (March 1994). This conference brought policymakers, researchers, and practitioners together to discuss the status of adult numeracy education and to determine future directions.[2] Out of this conference came at least two significant events: the formation of a national network of practitioners and the development of the "honest list: what math we should be teaching adults."

The Adult Numeracy Network

The Adult Numeracy Practitioners Network was formed by the adult education practitioners at this 1994 Conference on Adult Mathematical Learning. In 1997, the ANPN board voted to change the

Continued on page 12

Bringing Reform ...

continued from page 11

name of the Network to the Adult Numeracy Network (ANN) after it became officially affiliated with NCTM. The ANN has since held a national conference for adult education practitioners in conjunction with the national meeting of the NCTM ; this year, ANN held its annual meeting at COABE 2000 in Memphis, Tennessee. In addition to publishing a newsletter for its members three times a year, ANN sponsors an electronic discussion list that has an international reach.[3]

The Adult Numeracy Frameworks

In 1995, the ANN was granted one of eight planning grants for system reform and improvement funded by the National Institute for Literacy (NIFL) as part of the Equipped for the Future (EFF) project. World Education, in cooperation with five state literacy resource centers, accepted the grant on behalf of the Adult Numeracy Practitioners Network (ANPN). Over the course of a year, through teacher-led focus groups, and an online virtual study group, the ANN expanded upon the "honest list" developed from the conference. See: *A Framework for Adult Numeracy Standards: The Mathematical Skills and Abilities Adults Need to be Equipped for the Future(*1996).[4] The teacher teams studied and discussed other documents and developed seven themes that serve as the foundation for adult numeracy standards: Relevance/Connections; Problem-Solving/Reasoning/Decision-Making; Communication; Number and Number Sense; Data; Geometry: Spatial Sense and Measurement; and Algebra: Patterns and Functions.

As a result of this work, mathematics was included in the *Equipped for the Future Content Standards: What Adults Need to Know for the 21st Century* (Stein, 2000).However, of the 16 EFF standards, only one specifically addresses numeracy or mathematics; listed under Decision-Making Skills, it is *Use Math to Solve Problems and Communicate*.

International Influences: Defining Numeracy

International influences have begun to find their way into US numeracy practice through frameworks from other countries, including Australia, the United Kingdom, and the Netherlands.

> See the following Web sites for a definition of "numerate behavior:"
>
> <www.nces.ed.gov/surveys/all/resources.asp>
>
> <www.nces.ed.gov/surveys/all/documents/num.pdf>

Since the 1980s, work by adult educators in Australia, the United Kingdom, and other countries has expanded the definition of numeracy. Current thinking suggests that *numeracy* includes more than the ability to perform basic calculations. In the Australian curriculum frameworks, *numeracy* denotes the ability to perform a wider range of math skills, such as measuring and designing, interpreting statistical information, giving and following directions, and using formulas. Moreover, numeracy and literacy are presented as interconnected and on an equal footing. The Australian frameworks are written to address the *purposes* for learning mathematics and do not proceed from a school-based mathematics curriculum model. Rather, the frameworks look at the mathematics that is used in the context of adult lives.

The numeracy framework in the United Kingdom is organized by mathematical topic rather than by function. The UK framework also shows examples of where adults use numeracy skills, and includes, at every level, number work, geometry, measurement, and data and statistics.

Many countries now participate in an international research forum called Adults Learning Mathematics (ALM). The National Center for the Study of Adult Learning and Literacy (NCSALL) hosted their conference in July 2000. Several US practitioners participated.

An international survey of the numeracy abilities of adults will be part of the Adult Literacy and Lifeskills (ALL) Project in 2002. The framework created in the development of the survey defines and describes the complex nature of numeracy. The revised Massachusetts ABE Curriculum Frameworks for Mathematics and Numeracy incorporate some of these ideas in the current revision. (Source: Gal, I., van Groenestijn, M., Manly, M., Schmitt, M. J., & Tout, D. (1999). Adult Literacy and Lifeskills Survey Numeracy Framework Working Draft. Ottawa: Statistics Canada)

Influencing National Policy

In April 2001, ANN held a strategic planning meeting to consider recent developments in national literacy policy through the lens of numeracy practitioners.

Continued on page 24

Seeing the Link: GED 2002 Math and the Math Curriculum Frameworks

By Ruth Schwendeman

As most ABE practitioners know, the GED Testing Service rolls out its latest version of the new test in January of 2002. The last version of the test was famous for one very major change: the addition of the essay. The newest form has its own drama: the use of the scientific calculator. But that's not the whole math story, and it might be useful for GED practitioners to see the broader climate change in both math testing and instruction. This shift is not only profiled in the GED test but also in another developing document, the ABE Mathematics Curriculum Frameworks.

Basic Test Facts

First, some basic facts about the 2002 math test itself. According to press announcements from the GED Testing Service, here's some of what's new:

- Increased emphasis on graphic stimuli.
- More attention to data analysis, statistics, and probability.
- A two-part test, equally weighted; one part will allow use of a scientific calculator, one part will not.

Calculators

The general rationale for the use of the calculator is that graduating high school seniors are expected to have experience with it, and employers count on competence in that area. Obviously, what this means for us as instructors is that we, too, must upgrade or even develop our own scientific calculator skills.

Beyond the teaching and learning implications of the calculator in our classrooms, other changes are in the wind. Test questions will be "reality-based," with emphasis placed on natural mathematical tasks rather than purely academic problems. The context of math questions will involve more situations found in the world of work, consumer issues, and the family. The use of more than one math concept per test item will be stressed, which seems appropriate considering that many real life math situations usually do involve a range of these concepts. Higher order thinking skills will be required.

Math Curriculum Frameworks

In the face of these imminent changes, some math practitioners I have spoken with in my role as GED liaison for SABES express real concern about how and what they must teach. Fortunately, a concurrent focus on these areas is underway in the developing ABE Math Curriculum Frameworks, which should give professionals some needed guidance and concrete instructional ideas. Here's an excerpt from the document's "Guiding Principles" (currently in DRAFT form):

- [In the ABE classroom] real-life context for mathematical concepts and skills across mathematical content areas ... [should] drive curriculum development.
- Mathematics instruction [should] mirror real-life activity through the use of hands-on as well as printed instructional materials… [and] experience with a broad range of technological tools….
- Adult mathematics instruction [should be] more than textbook-driven computation practice…it[should] include experience in understanding and communicating ideas mathematically, clarifying one's thinking, making convincing arguments and reaching decisions individually and as part of a group.

Once completed, the ABE Math Frameworks will connect teachers to substantive ways for addressing the "sea change" reflected in the new test. And beyond the exam, students, too, will be the winners as they gain real-life mathematics skills essential to moving forward.

Ruth Schwendeman is the GED Liaison at the SABES Central Region and a writer/researcher for the ABE Mathematics Curriculum Frameworks 2001 Revision Team. She can be reached at 508- 885 -6255 or by email at

Math Activities

Student Centered Algebra

Ruth Estabrook (See Ruth's Web page: <www.literacytech.org/users/estabrook>.)

Writing Algebraic Expressions

An alternative approach to teaching the concept of algebraic expressions is through the use of paper bags or paper cups. This makes the lesson visual and hands-on, and it involves a degree of critical thinking. (The following activity is based on a lesson in *Impact Mathematics* published by Everyday Learning, 2000.)

Tell the students that each bag contains the same number of blocks, but you don't know how many, so they can call it x. If they have two bags containing the same number of blocks, plus 4 additional blocks, how many blocks would they have? This can be written as 2x + 4. Then when you tell them how many are in the bags, they can evaluate their expression. After this brief discussion, have your students work in groups of two or three to discuss and answer the following questions.

1. Suppose you had three bags, each containing the same number of blocks, plus two extra blocks. Write an algebraic expression for this situation. Use n for the number of blocks in each bag.

2. If n = 2, what is the total number of blocks? If n = 0, what is the total number of blocks? If n = 25, what is the total number of blocks?

3. Complete this table.

n	10	5	40	25	100	?	?	22	?
$3n + 2$	?	17	?	77	?	23	92	?	3143

4. Could the total number of blocks in this situation be 18? Explain.

5. To represent this situation with the expression 3n + 2, you need to assume all the bags contain the same number of blocks. Why?

6. Now suppose you have 5 bags and 4 extra blocks.

   a. What is the total number of blocks if each bag contains 3 blocks? If each bag contains 10 blocks
   b. Using n to represent the total number of blocks in each bag, write an algebraic expression for the total number of blocks
   c. Find the value of your expression for n = 3 and n = 10. Do you get the same answers you found in part a?

7. Write an expression to represent 7 bags each with the same number of blocks, plus 5 extra blocks.

8. Rebecca wrote the expression 3b + 1 to describe the total number of blocks represented in this picture.

   a. What does the variable b stand for in her expression?
   b. What does the 3 stand for?
   c. What does the 1 stand for?

Math Activities

Solving Problems

By B.Goodridge, E. Leonelli, M. Moses, M. J. Schmitt, from the Math / Numeracy Pilot, April 2000

Problem Solving Strategies

- Guess and check
- Draw a picture or diagram
- Use logic and arithmatic computation
- Make an organized list or table
- Look for a pattern
- Write an equation
- Use a system of equations
- Relate to real-life experience
- Make a model and act it out
- Work backwards

Guess and check
Corey watches TV from 4:30pm to 8:00pm with a short break of 20 minutes. How long does Corey watch TV?

(a) 2 hrs and 20 minutes
(b) 3 hours and 20 minutes
(3) 3 hours and 10 minutes
(d) none of these
Answer: _____

Draw a picture or diagram
Mike wants to paint his bedroom, which is15 ft by12 ft. The walls are 8 ft high. How many square feet will he paint if he paints the walls and the ceiling? (Ignore the window and door.)

Make an organized list
How many sheets of paper will you have if you tear the paper in half six times?

Make a table or chart
What possible combinations of coins equals 25 cents?

Draw a Picture
Read the problem all the way through before starting to work it out!

1. Eva spends 1 / 2 of her income on food and rent, 1 / 4 of her income on clothing, 1 / 12 on entertainment, and saves $1,200 per year. What is her yearly income?

2. Maria spends 1 / 2 of her income on food and rent, 1 / 3 of her income on clothing, 1 / 2 of her income on entertainment, and saves $1,200 per year. What is her yearly income?

   After you read #2 but before you solve the problem, ask yourself the following questions:
   - What changed from #1 to #2?
   - Do you think Maria earns more or less money than Eva? Why?
   - Now solve the problem,using pictures.

The turkey diet problem
You're on a diet and can only eat 1 / 4 lb turkey breast for dinner. The butcher gives you three slices and marks the package 1 / 3 lb. How many slices can you eat? What strategies did you use?

Remembering A Math Teacher

By Bob Bickerton

I was cleaning out a corner of the attic and came across a box that hadn't been opened in years. Out came papers and notes that instantly brought students back to life. I remembered Roberta, who kept mumbling "I'm dumb at math" as we tried to relearn subtraction with borrowing. I bumped into Roberta several years later— teaching math at a community college! There was Marie, who took one look at fractions and moaned, "Oh no, not those again." She desperately wanted to stop emptying bed pans and become a nurse. I also recalled Miguel, who was doing a little carpentry on the side, but wanted to be a computer programmer. Finally, there was Brian, who dropped out of high school and needed a quick brush up before taking the GED and moving on to the stage. A few years later I would attend his wake after an overdose.

There were more, many more. Each of their lives is woven throughout the journal I kept for my second and third years as a full-time math teacher. I'd already taught math as a part-time teacher during the prior three years. Did I say "part time?" Actually, it was three part-time jobs. I'd made the mistake of taking on a total of 36 hours of teaching at three different programs in the Boston area and with all the preparation I had to do, there was nothing that felt part-time about it. Now I had a full- time job in Cambridge, twelve hours of classes in the morning and twelve in the evening. This was really great! I could bicycle my daughter to school in the morning and pick her up after school. Eat an early dinner with my family and back to class. Friday's were staff meeting days and I was learning what it was like to be part of a *learning community.* And Friday nights were mine!

Reflection Journal

The idea for a journal came to mind as I reflected on my first year as a full-time math teacher. While working part-time (that is, juggling three part-time teaching jobs), I had been troubled by the lack of *real* progress by some of my students. As a full-time teacher with paid time devoted to preparation, planning, curriculum, and materials development, I had a better opportunity to reflect on why I was having such limited success in reaching these students. I knew it was because they didn't really understand what was going on with the math. I knew that no one really learns math by memorizing a bunch of rules. In my classes we spent more time developing concepts than on mechanics, and this was working well for most. But it was not working for all, and that just wasn't good enough.

As I started my second year, I decided to document every aspect of one six-hour-a-week math class: planning, implementation, and student interactions. Lesson plans included detailed notes from conceptual underpinnings to the most minute subskills. I summarized how every class progressed. I documented how students, together and individually, engaged in the work—conceptually, operationally, and emotionally.

Looking back, I realized how most of my lesson plans (all typed!) were too ambitious; many objectives and activities rolled over to the next class. I also recalled what it felt like each time I "got it"— each time I understood where and why a student was getting stuck. It usually had to do with my overlooking some piece of the path that led to understanding and mastery. Many students could make the leap over a missing piece, but for others, what seemed like a very small omission turned out to be a chasm. These students weren't going to leap forward without filling in some more of the puzzle.

Owning the Math

Back to the students. Roberta didn't have a good grasp of quantity. Once we figured this out, it helped explain why none of the "operations" meant to manipulate quantities made sense. She needed time to count out the totals, to learn for herself how multiplication worked as a fast way to add and that division could be thought of as either "grouping" or "partitioning" – and how each means something quite different. It also meant that once we tackled the hard work of mastering quantity, she was free to take off and fly. She did and along the way she found great joy in mathematics.

Miguel did fine with fractions—after all, he was measuring wood with a high degree of precision almost every day. But he blocked on algebra. He explained that failing algebra had helped his

Continued on page 17

Remembering...

continued from page 16

decision to drop out of high school. So, we started into algebra shortly after he got settled into the class. I brought in a balance beam scale and presented him with a series of projects where he had to balance known and unknown quantities (items in a "black box") on the scale. One day he got so excited it was impossible to contain him—and who would even try? The idea of what it meant to do "inverse operations" to both sides of the equal sign had burst into his consciousness. And none too soon. He had been troubled with "how is this going to help me pass the GED?" Once he understood basic concepts, he was poised to tear through algebra much faster and with a level of understanding that would stay with him for life.

Marie tried to remember rules about manipulating fractions, but she really didn't know what they represented. In addition to using the many manipulatives we had created, I also tried using capacity measurement to explain fractions—and more! She had measuring spoons, cups, beakers, and test tubes to use, and a load of projects to undertake. Once this aspiring nurse understood the relationship of capacity measurement to medication doses, her frustration was replaced with a burning desire to learn. She wanted to be sure she had mastered every possible aspect of fractions— after all, patients' lives would be at stake.

I needed to fill in my own "gaps" in understanding before I could be more useful to students.

Practitioner Research

I spent seven years at this program, and the two years I documented teaching and learning made these some of the most rewarding years of my life. Documentation and reflection pushed me to study more of my subject and craft. I needed to fill in my own "gaps" in understanding before I could be more useful to students. I spent hundreds of hours at the library researching math analysis and learning disabilities. This pushed me to enroll in a masters program where my two years of documentation and some additional research led to a new math diagnostic instrument for the Learning Center.

We didn't have a name for this approach to the teaching and learning process back then, but those who pursue their craft through "practitioner research" projects today have my full support and admiration. What a glorious way to live a life and make a living!

Bob Bickerton has been the director of Adult and Community Learning Service at the Massachusetts Department of Education for the past 13 years. He started in ABE 30 years ago and has worked as a teacher, teacher trainer and program director. He can be reached at 617- 338-3850 or by email at <rbickerton@doe.mass.edu>.

Upcoming Issues of *Field Notes*

We welcome submissions on the topics below. Please call Lenore Balliro, editor, at 617-482-9485 or email <lballiro2000@yahoo.com> by the date indicated below to discuss your idea for an article.,

Winter 2002
Managing ABE Programs
Full

Spring 2002
Youth in ABE Programs
Call by: December 1
Submit by: December 15

Summer 2002
How I Entered the Field of ABE and Why I Stay There
Please tell us your story in about 500 words.
Call by: April 1
Submit by: April 15

Matematiko
www.matematiko.com

By Alan Tubman

I started developing a math practice program several years ago as a supplement to the materials that were available in my GED classroom. I was fortunate to receive a donation of three or four IBM compatible computers that were discarded from organizations that were updating to newer technology. These were of course text-only computers that would run only DOS programs.

I began writing programs for drilling multiplication facts and as time permitted, I added other modules until finally I had about a hundred modules ranging from simple operations with whole numbers to basic algebra and geometry formulas. These modules were not intended as a self- study program, but as a tool to offer students extra practice with material taught in the classroom.

I then started sharing these programs with colleagues in Massachusetts. At first the programs were all text (DOS). Then I decided to switch to WINDOWS 2000/95/98/NT4.0. I began with the mathematics tables and continued with basic math, fractions, decimals, mixed numbers, etc.

For more information, contact: Alan Tubman, 26 Quissett St., Worcester, Massachusetts 01602

Alan Tubman is a GED instructor at the Worcester Community Action Council (WCAC) in Worcester. teach a class of youth between 16 and 21.He can be reached by email at <alan@matematiko.com>.

Framework for Adult Numeracy Standards

From http://literacynet.org/sciencelincs/teachertutor-num.html

"A Framework for Adult Numeracy Standards"is based upon a study by the Adult Numeracy Network (ANN). In this study, instructors and learners identified the mathematical skills and abilities adults need to fulfill their life roles. These topics are similar to the subjects that will be emphasized in the 2002 GED Math test. For a more in depth examination of the study and description of the frameworks, see *A Framework for Adult Numeracy Students, The Mathematical Skills and Abilities Adults Need to Be Equipped for the Future,* by Donna Curry, Mary Jane Schmitt, and Sally Waldron at <**www.std.com/anpn/framewkTOC.html>.**

Number and Number Sense

This skill (being able to handle numbers comfortably and competently) needs to be explored using whole numbers, fractions, decimals, percents, ratio, money, and estimation. Estimation, mental math, computation, and calculators are all tools that develop number and number sense.

Problem Solving: Reasoning and Decision Making

Problem solving includes seeking to understand the problem then figuring out what information and math skills are important to use and solve the problem. While problem solving is embedded in mathematics, there are specific skills and strategies that help greatly.

Data Analysis, Probability and Statistics, and Graphing

Reading charts and graphs, interpreting data, and making decisions based on information are key skills to being a successful worker and informed citizen.

Geometry: Spatial Sense andMeasurement

Measurement, a foundation skill for geometry, is an essential life skill. Awareness of acceptable tolerances, margins, and upper and lower limits critical to measurement competence. Today, much is computerized, but the results are only as good as the information inputted. Visualization and concrete models help reasoning in this area.

Algebra: Patterns and Functions

Algebra includes more than formal methods of equation solving, age problems, and lots of X's and Y's. Conceptual understanding, algebra as a means of representation, and algebraic methods are all problem solving tools. Algebraic reasoning allows us to think about and express patterns, relations, and functions which ultimately give us access to technology.

When Math Becomes a Thrill

By Alice Levine

I've been teaching adult basic education in a variety of settings for over 20 years, and though I had taught some math here and there, I had never seen myself primarily as a math teacher. In the old days, I remember saying that I liked teaching a few math classes a week because it was so neat and concrete, the progress was so clear, and it provided a nice contrast to the complexities of teaching ESOL. However, in my current work with parents in a Family Literacy Program at the David Ellis School (a public school in Boston), I have fallen in love with the new ways that math is being taught and learned in elementary school classrooms and have found it thrilling to share these new approaches with my adult students.

Until I started teaching parents at the Ellis, I'd never worked with adults who were so focused on really understanding what they were learning (with no interfering agendas like preparing to take a standardized test or obtain a credential). The Ellis parents come to the class initially because they want to be able to help their kids, but somewhere along the way, they get so excited about math *making sense* to them for the first time it's clear they are also learning for themselves.

Once the parents believe that there isn't just one right way to solve a problem, they are really motivated to share their math strategies and to articulate their mathematical thinking with each other. Because they want to be able to *explain* what they've learned in class to their children, they have a natural interest in the communicative aspects of math learning.

For example, they know what "borrowing" is but wonder about the meaning of "regrouping" or "trading."

Responding to Needs Assessment

When we started the Family Literacy Program at the Ellis, Spanish-speaking parents clearly wanted ESOL classes; it was not so clear how we could serve the English-speaking population at the school. After getting no significant response to a flyer about ABE-type classes, we put out a survey. We asked parents what they'd like to see in parent classes, and we purposely included items that emphasized how they could help their kids as well as ones that focused more on the adults' own skills. One of the most frequently checked items was "Understanding How Children Are Learning Math Now: Why Does It Look So Different from When We Were in School?" Based on this clear interest, we started a six-week pilot math class for parents in May 1998. The response of the parents who participated was so positive that we ran the class throughout the school year for the next three years. During the 2000–2001 school year, we added a second section of the class taught in Spanish.

Classes meet just once a week. They are purposely scheduled during the day while the children are in school. Although I always bring in interesting math problems, the direction of the class takes unexpected turns as parents ask questions, bring in sample problems, and share their own ideas. Our class sessions usually involve one or more of the following activities:

- Trying out sample problems from the 4th grade MCAS test and then discussing what kinds of math activities students need in lower grades to prepare them for the kind of mathematical thinking on the test;
- Working through problems from children's homework that parents bring in to class (or that I get from K-5 teachers at the school);
- Experimenting with the same manipulatives the children use in class;
- Adding to our running list of Parent Math Vocabulary. Parents note that math terminology has changed from when they were in school. For example, they know what "borrowing" is, but wonder about the meaning of "regrouping" or "trading;"
- Doing lots of collaborative work and talking about different ways of solving problems;
- Generating ideas for things parents can do at home with house-

Continued on page 20

When Math Becomes...

continued from page 19

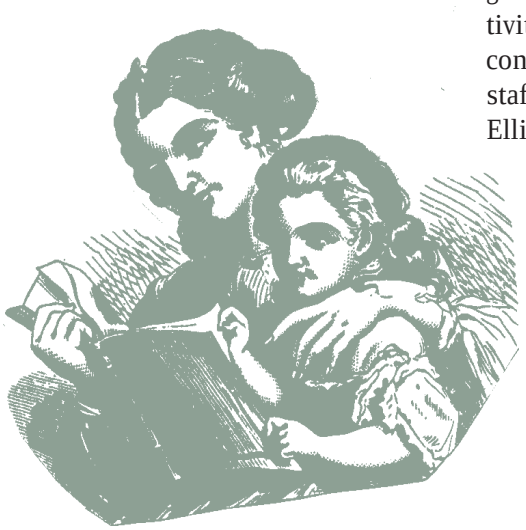
hold materials, through daily activities, and through games, to help their kids develop important math concepts and to develop a confidence in and enjoyment of math.

As parents become enthusiastic about math and start seeing math problems as positive challenges, they convey their new feelings about math to their children. Parents have told me that helping their children with math homework is no longer drudgery; it has become something they look forward to. Many of the mothers and grandmothers who attend the class talk about creative ways they have found to engage their children in mathematical thinking—on the playground, in the kitchen, or as they plan graduation parties, barbecues, or family reunions.

Math Ambassadors

The Parent Math Class has created a core of parents who feel comfortable in the school and who begin to take on leadership roles there. As their confidence about math increases, they become less intimidated about engaging in dialogue with the K-5 teachers about issues of curriculum and instruction. They start to spread the word to other parents—and the school begins to get the reputation of being a more welcoming, accessible place. We have a group of informal "math ambassadors" who spread positive feelings about math and math reform—to their children, to other parents in the school, and to people in their communities.

Parents in the math class



naturally progress from thinking about their own children to thinking about the performance of students in the school as a whole. They begin to want to help other Ellis parents understand the new math standards and approaches. Thus, our initial strategy—of providing intensive math classes to small groups of parents—has expanded; we now reach out to larger numbers of families without losing our emphasis on helping parents gain a deeper understanding of the elementary school math curriculum.

Family Math Nights

For two consecutive years, we have run Family Math Nights at the school, where 200–250 parents and children have engaged in intergenerational, hands-on math activities. It's wonderful to see the confidence of my students as they staff the math stations—alongside Ellis teachers or alone—sharing their own understanding of math with other Ellis parents and children.

Teaching math is no longer just a break from the complexities of teaching ESOL. Now, I'd prefer to teach math all day long. And parent participants who used to hate math now tell me that they see math everywhere and seek out opportunities to learn more. For all of us, math has become something much different from the old-style rote learning; math, at its best moments, has become a thrill.

This article was based on a presentation at the *Adults Learning Maths 7th AnnualConference* held in Medord, MA. , July, 2000. Her abstract can be found online at <www.alm-online.org/>.

Alice Levine is a family literacy coordinator for Boston Excels, a program of The Home for Little Wanderers. If anyone is doing similar work with parents, or is interested in knowing more, Alice would be pleased to communicate with him or her. She can be reached by email at <a.levine@att.net>.

Good mathematics is NOT how many answers you know...but how you behave when you DON'T know.

—author unknown

Fast Math: Straight to the Point

By Michelle Ede

I've been an adult education teacher for eight years. Like many in the field, I've taught a variety of subjects. I've worked with lots of different students, all struggling with their own personal trials and tribulations. Nothing seems to compare, however, to the fear and loathing of mathematics that so many GED learners bring to class. "Does the test have word problems? I can't do those." "Why does the science have *math* stuff in it?" and "Can't I just skip the math?" were all questions I heard regularly.

Many math books weren't working very well for the learners in my class, especially learning disabled students. Even the best books were wordy, visually unappealing, and dry. I used a variety of approaches, such as manipulative use and group work, but because of time constraints, multi-level/multi-subject classes, and differing skill levels, students still needed books for independent study. The trouble was, learners were often unable to use them without becoming de-motivated and requiring significant one-on-one assistance. I found that the students faring worst were the ones with ADD and LD, the ones who were not strong visualizers, and the ones who had reflexive thoughts of, "forget it!" whenever math was mentioned.

Math is real. It is not supposed to be scary or disconnected from its real-life purposes. Math, like science and art, is naturally rooted in our physical existence—that is, until somebody plucks it up, strips it of its images and causes, and drops it lifelessly onto a clean white page. Often, despite the tiny size of the letters and cryptic examples given, there is still little space left in which students can stretch out cognitively. This didn't make sense to me. We all know that a classroom without enough space is uncomfortable, and that crowded cities have high crime rates.

Math is real. It is not supposed to be scary or disconnected from its real-life purposes.

Clearly, our brains need space, and when it isn't present, we're unhappy. If the learners in my class were going to be successful in math, they would first have to be happy.

Hey Wake Up!

Students also needed a visually stimulating book that explained math in the same conversational style I used in class. They needed a book that got straight to the mathematical point, sidestepping excessive verbiage and shouting out, "Hey, wake up and try this! Math is great, you can be good at it, and whoever has told you any different is wrong!" I knew the book was unlikely to materialize; in fact, it never did. My students and I settled for my repeatedly saying those types of things as often as possible.

This past year, however, I got the chance to develop a student-centered GED math book for the Northeast YALD (Young Adults with Learning Disabilities) Project, for which I've been a practitioner trainer since 1995. The book would address the math learning difficulties observed in GED classrooms, using information gathered from my work.

I visualized the book I wanted learners to have. I put what I knew about ABE teaching into it. I wrote it in the teaching style my students have helped me develop by showing me what works for them. I left space here and there, and put in plenty of interesting graphics. I named it "Fast Math" because of its simplified style and pointed approach. When it was finished, I brought it to my classroom for a field test. It has since become a favorite, and my students keep asking me if I'll make a similar book for the other GED subjects. I don't know if I will, but the question sounds much better to me than "Can't I just skip the math?"

Michelle Ede is a GED/ESOL teacher for Haverhill Community Action. She can be reached by email at <npsn@greennet.net>.

If your learning center would like a free, reproducible copy of "Fast Math," contact Michelle Ede at Northeast YALD 978- 373–1971, ext. 251.

Understanding Numeracy

A Review of Adult Numeracy Development: Theory, Research,Practice by Iddo Gal
Hampton Press, 2000

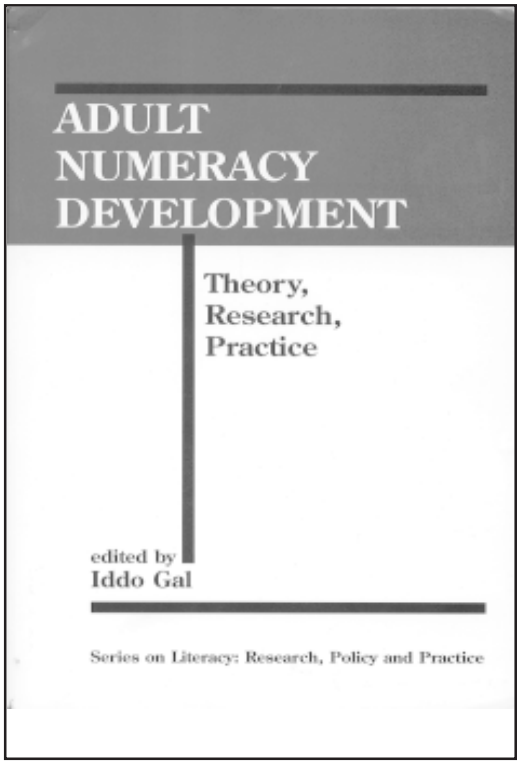
Review by Sally Waldron

Adult Numeracy Development is part of the *Series on Literacy: Research, Policy and Practice* published by the National Center on Adult Literacy at the University of Pennsylvania. Iddo Gal, editor and the author of several chapters, served as the director of the Numeracy Project at NCAL, where he began work on this book. He currently teaches in the Department of Human Services at the University of Haifa, Israel. In his preface, Dr. Gal states:

In developing this volume …We sought colleagues able to address both theoretical aspects and classroom realities and to reflect on the challenges and dilemmas involved in implementing new as well as proven teaching methods when working with diverse types of adult students. (p. ix-x)

Adult Numeracy Development is a terrific resource for math teachers and other practitioners; it succeeds in balancing research and practice, and innovation and proven approaches. While many of the participating authors come from the United States (and some from Massachusetts), contributors also come from the United Kingdom, Netherlands, Israel, Australia, Canada, and Malaysia. And while there are many differences in the contexts from which each author writes, there are also many similarities: adult educators who teach math often lack prior training in math teaching and mathematics itself; they are challenged to "meet the math-related goals and needs of adult learners, as well as to satisfy the increasing demand by public agencies, community organizations, or business organizations to improve adults' numeracy or mathematical literacy." (p. 1)

Adult Numeracy Development is divided into four sections:



Perspectives on Numeracy, Approaches to Instruction, Reflecting on Practice and Learning, and Assessment. Each section has chapters written by practitioners and researchers, and by US and international authors. For this review, I am focusing on two chapters: "Journey Into Journal Jottings: Mathematics as Communication" by Donna Curry and "Assessment of Adult Students' Mathematical Strategies" by Mieke van Groenestijn.

Writing About Math

"Journey Into Jottings" really bridges the research and practice divide. The author, Donna Curry, provides straightforward descriptions of how to implement journal writing in a math class and what she and her students learned by asking them to write about math.

Donna's brings years of experience teaching math in a variety of ABE contexts to her writing. This chapter reflects her experiences as a member of the Massachusetts ABE Math Team where she explored the National Council of Teachers of Mathematics (NCTM) standard—Mathematics as Communication—while teaching in a workplace education program and doing teacher research. Donna wanted to know if journal writing would increase her students' understanding of mathematical concepts, confidence in tackling math problems at work and at home, and comfort with speaking the language of math. Students in Donna's class were preparing to pass a required standardized test for the workplace. She chose journal writing because "it would address the writing skills for communicating mathematically

Continued on page 23

Adult Numeracy...

continued from page 21

and provide opportunities for students to reflect on and clarify their own thinking about math." (p. 241) She felt that journal writing would be easy to implement in a structured class.

Having students keep daily math journals led to four changes in Donna's classroom:

- Students increased their use of math language in the classroom.
- The teacher was able to engage in ongoing student assessment more easily.
- Students gave Donna more feedback on the classroom techniques she used.
- Students reported to Donna examples of their application of math learning to everyday life.

Research also led Donna to other questions: How can I encourage students to write more? How do I make sure students aren't just writing what they think I want to hear? How can I tell which specific activity helped students gain confidence and learn new skills? How do I help students who are afraid of being wrong?

Math Assessment

"Assessment of Adult Students' Mathematical Strategies" describes the math interview process, the "Supermarket Strategy," used nationally in the Netherlands to assess ABE students. Written by Mieke van Groenestijn, a professor in adult and special education, the chapter summarizes the growth of Realistic Mathematics Education (RME) in the Netherlands in the early 1980s. RME "emphasizes the use of realistic context problems, representations of reality, and models to relate classroom instruction and learning to the student's real environment and real experience." (p. 336)

With the adoption of RME came the need for assessment tools that would let teachers analyze learners' mathematical strategies and skills. The resulting Supermarket Strategy was developed to be used nationally for placement, ongoing assessment, and post assessment. Considerations in developing this tool included that it "must consist of functional problems in an everyday-life context that can be solved in different ways. The student must be free to use his or her own methods … A good answer is important, but the process by which the student solves the problem gives more information about his or her way of thinking and the quality of his or her calculations." (p. 337)

The Supermarket Strategy

The Supermarket Strategy tests three skills areas (basic skills, proportions, and measurement and geometry further subdivided into seven fields of knowledge) across six levels of complexity (elementary, intermediate and advanced, each broken into two levels). The assessment process consists of a 30–45 minute interview/observation with each student using a special advertising leaflet developed in collaboration with a large supermarket chain and a selection of 60 "context-rich" problems. Three types of questions are asked on each problem: "How are you going to do it? How are you calculating/what are you doing now? How did you do it?" Since observing the process by which students arrive at an answer is so critical to understanding mathematical reasoning, interviewers are allowed (actually encouraged) to help students when they get stuck in certain ways. The interviewer can structure the task, give a similar but easier task, provide concrete materials, or try calculating together with student. Parts of a sample assessment interview conducted with an ABE student from Morocco are included in the chapter and provide an opportunity to really understand what the Supermarket Strategy is and how the process works. The description paralleled my experiences with Massachusetts students and reminded me of how much more I learned working and talking with math learners than I did by administering a paper-and-pencil computational test.

The Netherlands found that "well-trained teachers using appropriate adult assessment instruments such as the Supermarket Strategy are the staring points for quality in math education in ABE." (p. 100) Unfortunately Adult Basic Education services have merged with Further Education and Vocational Education services in the Netherlands as part of a national scheme to reduce unemployment, and a new assessment is being developed. This new written test yields a standardized score and a grade level. Since the new test has a number of problems, however, the use of the Supermarket Strategy is again increasing. Maybe there's hope for the US, too.

Sally Waldron works as the Director of the SABES Central Resource Center at World Education. She taught math for more than 15 years. she can be reached at 617-482-9485 or by email at <swaldron@worlded.org>

Adult Numeracy Development is available from <www.amazon.com>.

Bringing Reform ...

continued from page 12

ANN members and invited guests considered four major policy documents and the role of numeracy in these documents. As a result of this meeting and as part of its plan for national visibility, ANN submitted three commitments toward working on goals of the National Literacy Summit Initiative for the coming two years:

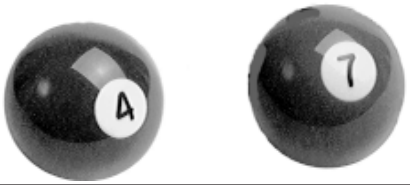
1. ANN will draft and circulate a position paper urging policy makers to include numeracy as well as literacy and language as a focal area;
2. ANN will develop and deliver presentations for national and state adult education conferences that highlight the recommendations in the ANN Framework, a national standard for numeracy instruction; and
3. ANN will continue to connect US practitioners to the work of ALM and other relevant research through its newsletter and Web site and will encourage national research agendas on adult education and literacy to include numeracy issues.

Summary

The past decade has seen teachers in Massachusetts adult basic education organize to rethink and reform numeracy instruction. Certainly, our work would have been much less rewarding had we not looked to others outside of Massachusetts: to our energetic and talented colleagues in Adult Numeracy Network and the Adults Learning Mathematics Research Forum. Taken together, we are confident these grass roots efforts have laid a solid foundation to help guide policy, research, and large-scale curriculum frameworks and assessment for adult literacy and numeracy instruction in all 50 states.

Esther Leonelli has been an ABE and GED math instructor at the Community Learning Center in Cambridge, MA since 1985 and a teacher-writer for theEMPower (Extending Mathematical Power to Adults) Curriculum Project at TERC, Cambridge, Massachusetts, for the last year. She also moderates the Numeracy List (numeracy@world.std.com), She can be reached at 617-349-6363 or by email at <edl@world.std.com>.

Mary Jane Schmitt works at TERC as co-director of the EMPower Project, a mathematics curriculum development project for adults and out-of-school youth. She hopes all ABE/GED teachers who teach math check out the ANN and ALM Web sites and join the numeracy list discussion. She can be reached by email at <mary_jane_schmitt@terc.edu>.



Notes

[1] See *From the Margins to the Mainstream: An Action Agenda for Literacy (2000) Report of the The National Literacy Summit Initiative*. "The National Literacy Summit Initiative is a field-driven effort to improve our nation's system of adult literacy, language, and lifelong learning services. Its Action Agenda was developed through grassroots consensus building and serves as a blueprint for community action." <www.nifl.gov / coalition / summit / index.html> While "compute and solve problems" is included in the definition of *literacy,* and "calculating" is included in the broad range of essential skills, nowhere do the words *numeracy* or *mathematics* appear in the goals of the initiative or in the document.

[2] *Proceedings of the Conference on Adult Mathematical Literacy*,edited by Iddo Gal and Mary Jane Schmitt, and published by the National Center on Adult Literacy (Philadelphia, PA: 1994). For an electronic Summary of Discussions, go to <www.std.com / anpn / virtual.html>

[3] Numeracy@world.std.com.The list is archived on both the NIFL LINCS discussion lists <www.nifl.gov / lincs / discussions / numeracy / numeracy.html>and the Math Forum <http: / / forum.swarthmore.edu / epigone / numeracy.>

[4] Available at <www.std.com / anpn / framewkTOC.html>.

Adult Numeracy Network (ANN)

ANN, an affiliate of the National Council of Teachers of Mathematics (NCTM), is a volunteer group of math teachers interested in promoting good math practices in adult basic education. In addition to drafting several important documents, they also sponsor an electronic forum, The Numeracy List <Numeracy@world.std.com>. To learn more about ANN, go to their Web site at <www.std.com/anpn/anpnmission.html>.

Wicked Good Math Web Sites

literacynet.org sciencelincs/teachertutor-num.html
This highly recommended site is based on frameworks developed by the Adult Numeracy Network (ANN) and is sponsored by NIFL. Don't miss it.

hub1.worlded.org/docs/maththing/ny1home.htm
"Meaningful Activities That Help Math." Includes workshop plans, activities, and experiences to help develop a positive atmosphere for learning math.

www.std.com/anpn/
Adult Numeracy Network. Find out how ANN is a leader for making numeracy a priority in adult basic education.

projects.edte.utwente.nl/hotmath/home.htm)
Practical, hands-on math activities.

www.alm-online.org/

Adults Learning Mathematics (ALM) is an international research forum bringing together researchers and practitioners in adult mathematics/numeracy teaching and learning in order to promote the learning of mathematics by adults.

www.literacytech.org/users/estabrook
"Math Beyond Worksheets"written by Ruth Estabrook.Contents include: creating student centered lessons; turning a worksheet into an activity; brain teasers and number tricks; resources and links.

www.nctm.org/
National Council of Teachers of Mathematics (NCTM), the professional organization for math teachers. Log on here to look at math standards, review publications, get information about joining.

forum. swarthmore. edu/
Includes problem of the week, Ask Dr. Math, teacher 2 teacher,Web lessons,discussion groups and more. Math resources by subject.

forum. swarthmore. edu/teachersnonenglish. html
Minorities and math, non-English language resources.

www.shianet.org/~reneenew/mathLD.html
Math and learning disabilities.

gseweb.harvard.edu/~ncsall/fob/2000/fobv4ib.htm
September 2000 issue of Focus on Basics is devoted to math. For hard copies, contact NCSALL by email at <FOB@WorldEd.org>.

www.west.asu.edu/achristie/math/mathconst.html
"Dr. Alice Christie's Constructivist Math Page." Developing mathematical literacy, online math manipulatives, students as information producers, finding online collaborative projects, and more.

www.net1plus.com/users/devenslc/mathexercises.html
"ABE/GED Hands on Math Activities." These notation games were developed for adult learners by the Mount Wachusett Community College in Massachusetts. Rich collection of math activities for teachers and learners in group settings.

www2.wgbh.org/MBCWEIS/LTC/CLC/numintro.html
Boston adult numeracy practitioners homepage.

www.std.com/anpn/framewkTOC.html

The Mathematical Skills and Abilities Adults Need to Be Equipped for the Future, by Donna Curry, Mary Jane Schmitt, & Sally Waldron. The Adult Numeracy Practitioners Network System Reform Planning Project, July, 1996.

Math Resources

Good Series for Students (Books)

Akers, J., et al. (1981). Investigations in Number, Data, and Space. Palo Alto, CA: Dale Seymour Publications, book 1. (This book was developed at TERC in Cambridge, MA).

Lappan, G., et al.(1998). *Connected Mathematics*. Menlo Park, CA: Dale Seymour Publications.

Algebra

Goodridge, B., Leonelli, E., Moses, M., Steinback, M., & Tierney, C. (1999). *Foundations for Algebra: ABE Math Curriculum Frameworks Unit* . Malden, MA: Massachusetts Department of Adult Education and Community Services.

Meader, P., & Storer, J. (1998). *Math for All Learners, Algebra.* Portland, ME: J. Weston Walch Publisher. (There is also a Pre-Algebra edition.)

Marr, B., & Helme, S. (1995). *Resources for Teachers: Higher Math Some Beginnings in Algebra.*Melbourne: ARIS/Language Australia.
(Available from Peppercorn Press, title 8086.)

Resources for Teachers

(Includes all areas of math)

Alcoze, T., et al. (1993). *Multiculturalism in Math, Science, and Technology: Readings and Activities* CA: Addison Wesley.

Cohen, S. (1991).*Figure It Out, Thinking Like a Math Problem Solver* (Books 2 & 3). North Billerica, MA: Curriculum Associates.

Goddard, R., Marr, B., & Martin, J. (1996). Strength in Numbers: A Resource Book for Teaching Adult Numeracy. Melbourne:ARIS/Language Australia. Available from Peppercorn books, title # 8069.

Helme, S. & Marr, B.(1999). *Mathematics: A New Beginning : A Resource Book for Teachers of Adults Returning to Study*. Melbourne:Language Australia, 1999. Available from Peppercorn Press, Title #8052.

Herr, T., & Johnson K. (1994). *Problem Solving Strategies: Crossing the River with Dogs.* Berkeley, CA: Key Curriculum Press.

Stenbmark, J.K,, Thompson, V, & Cossey, R. (1986). *Family Math.* Berkeley: Lawrence Hall of Science.

Huntington, L., Leonelli, E., & Merson, M. (1998). ABE *Priority Math Curriculum—Number Sense Measurement,* Data. Boston, MA: Adult Literacy Resource Institute.

Newsletters, Journals

Math Literacy News, Ohio Literacy Resource Center Research 1-1100, Summit St., Kent State University PO Box 5190. Kenyt, OH 44242.
email: <olrc@literacy.kent.edu>
Phone: 330-672-7841, 800-765-2897

As a member of NCTM, you can subscribe to the following journals: *Mathematics Teacher (MT), Journal for Research in Mathematics Education (JRME),Journal for Research in Mathematics Education Online (JRME Online)*. Go to <www.nctm.org> for more information.

Learning Differences and Disabilities in Mathematics

Bley, N., & Thornton, C. (1995).*Teaching Mathematics to Students with Learning Disabilities* (Third Edition). Austin, TX: Pro-Ed Publishers.

Marolda, M., & Davidson. P. (1994). "Assessing mathematical abilities and learning approaches." In *Windows of Opportunity: Mathematics for Students with Special Needs.* Reston, VA: National Council of Teachers of Mathematics.

Sharma, M. (1994). *Learning Problems in Mathematics—Diagnosis and Remedial Perspectives.* Framingham, MA: Center for Teaching/Learning of Mathematics.

Note: Peppercorn Books, PO Box 693, Snow Camp, NC 27349, distributes many international numeracy titles. Write for a catalogue.

What Is Constructivism?

By Lenore Balliro

Classroom teachers often use a constructivist approach in their teaching (in literacy as well as numeracy) without explicitly naming it as such. Simply put, constructivism, a theory with roots in Dewey, Piaget, and Vygotsky, posits that learners actively construct meaning about the world; they are not merely passive recipients of some stable body of knowledge that is somehow "out there" independent of how knowledge is experienced by the learner. Professor George E. Hein (1991) has named a number of learning principles we can derive from constructivist thought. I have drawn from his principles to clarify how many current approaches to math reflect a constructivist framework.

1. Learning involves hands on experience plus reflection about that experience. Constructivist math involves manipulatives and other concrete approaches to lead to a deeper understanding of math principles.

2. Learning is social. Constructivist math encourages working in groups or pairs.

3. Learning involves language: the language we use influences learning. So, thinking aloud or talking with others is a critical component of learning and understanding. As learners in math groups work together, they are talking aloud about what they are doing. As they present their answers to the class, they are articulating their process and deepening their understanding of math principles.

4. Learning is contextual: we learn in relationship to what else we know, believe, and feel.

5. We need previous knowledge to build new knowledge. (Many teachers will recognize this principle in teaching reading through developing scaffolding or building schemas to increase comprehension, then spiraling new knowledge from established knowledge.) It takes time to learn: We need time to reflect, revisit ideas, and think about them for true learning to take place.

6. Motivation is essential for learning. We need to understand the reason why we are doing something or we will not be very invested in it or remember what we learn. Constructivist math is committed to helping learners understand reasoning processes, problem solving, and other math strategies rather relying on drill-and-kill approaches.

George E. Hein, paper delivered at the International Committee of Museum Educators Conference Jerusalem, Israel. Oct 15–22, 1991.

Mark Your Calendar

October 12–13

MATSOL 2001: Telling Our Stories
Location: Sturbridge Host Hotel and Conference Center
<www.matsol.org>

October 17–20

Literacy Volunteers of America (LVA), Annual Conference
2001: A Literacy Odyssey
Location: Albuquerque, NM
Contact: Peggy May, (843)671-2008
<www.literacyvolunteers.org/conference>

October 24–25, 2001

Massachusetts Coalition for Adult Education (MCAE), Annual Conference
Network 2001
Location: Marlborough, MA
Contact: MCAE, 800-339-2498,
<www.SABES.org/mcae2001.htm>

December 2–4, 2001

Institute for Work & the Economy/Northern Illinois Univ., Workplace Learning Conference, 6th Annual
Location: Chicago, IL
Contact: NIU, 888-619-9215,
<www.workplace-learning.net/>

Thank You! And Please Continue to Help Us!

Thank you, thank you, thank you to everyone who responded to our plea for updated mailing list information. If you didn't have a chance to respond last time, please take a moment now. Let us know if you want to be removed from the mailing list, if you have changed your address, or if you have staff members who should be added to our mailing list. Complete the information below and mail to: Heather Brack, World Education, 44 Farnsworth St., Boston, MA 02210. Or email your corrections and additions to HBrack@worlded.org.

Please remove my name from your mailing list. (Use additional paper for multiple names.)

Name:
Address:
City, State, Z ip

Please add my name to your mailing list:

Name:
Address:
City, State, Zip

Volume 10 Number 1
FIELD NOTES
by and for the Massachusetts Adult Education Community
funded by the Massachusetts Department of Education

Nonprofit Org
U.S. POSTAGE PAID
Boston, MA
Permit 50157

WORLD EDUCATION

SABES
System for Adult Basic Education Support