Robert Moses on breaking habits, page 5.


Programs, books, other resources page 8.

Math classes cheat students

by Alex Poinsett

In an ironic aside to mounting national campaigns to reduce math illiteracy, the comic-strip character Calvin looks up from his homework to address his pet tiger Hobbes: "I don't think math is a science. I think it's a religion."

"A religion?" asks Hobbes, scratching his head.

"Yeah!" says Calvin. "You take two numbers and when you add them, they magically become one new number! No one can say how it happens.

You either believe it or you don't. This whole arithmetic book is full of things that have to be accepted on faith! It's a religion! As a math atheist, I should be excused from this."

Calvin's attitude toward math would be humorous if it weren't so common.

"Students complain that math messes up their [grade-point] averages," reports Leona Brady, assistant principal of Chicago Vocational High School; so they want to drop the course. "I tell them: 'If your average is bad because of math, you're not going anywhere anyway! You have to bring that average up with the math."

Brady adds that even parents have pressured her to let their children drop math courses. But these children and parents would do well to heed her warning. Nationally, three out of every four students leave school unable to satisfy either college or on-the-job math requirements, according to "Everybody Counts: A Report to the Nation on the Future of Mathematics Education," from the National Research Council (NRC). Blacks, Hispanics and Native Americans are disproportionately shut out of many scientific and business careers, the report adds.

Yesterday's shopkeeper arithmetic—crunched more quickly and
Third-grade math problems

1. How much do the bananas weigh?
   A. 1/2 pound
   B. 1 1/2 pound
   C. 2 1/2 pounds
   D. 3 1/2 pounds

2. What is the sum of the numbers which are within the rectangle, but which are not within the circle?
   A. 13
   B. 16
   C. 17
   D. 20

3. Kate has three dimes. Her sister Anna has four nickels. Which sentence shows the amount of money Kate and Anna have together?
   A. 4 + 3 = 11¢
   B. 3 + 10 + 4 + 5 = 11¢
   C. (3 x 10) + (4 x 5) = 11¢
   D. 7 x (10 + 5) = 11¢

Sixth-grade math problems

4. What portion of the grid is shaded?
   A. 1/6
   B. 1/3
   C. 2/3
   D. 5/6

5. Michael paid $1.00 for 6 toy cars. At another store, Bert bought 3 toy cars of the same kind for 40¢. Who made the better buy?
   A. Neither—because each paid the same price per car.
   B. Michael—because he got twice as many cars.
   C. Michael—because he paid about 34 less per car.
   D. Bert—because he paid about 34 less per car.

6. The following temperatures were recorded. What is the mean temperature?
   Day     Temp
   Monday  58°
   Tuesday 73°
   Wednesday 57°
   Thursday 69°
   Friday  83°
   A. 57°
   B. 58°
   C. 68°
   D. 69°

Source: Illinois Goals Assessment Program

accurately today by machines—has yielded to occupational demands for people who know how to analyze problems, not just do calculations. More than 75 percent of all jobs require proficiency in simple algebra and geometry as a prerequisite for training or for licensure, reports NRC.

Carpenters and carpet layers, for example, use plain geometry. Algebra helps firefighters determine the proper water pressure for their hoses. And plumbers use algebra to calculate the proper slope of pipes.

Indeed, students must learn not only arithmetic, but also estimation, measurement, geometry, optimization, statistics, and probability—all of the subtle ways in which mathematics threads through everyday life. In the process, they must also gain confidence in their ability to communicate and reason about math.

“Math is the great sorter, the thing that screens the kids out,” observes Zalman Usiskin, director of the University of Chicago School Mathematics Project, the nation’s largest university-based program to overhaul schools’ math curricula. “At a minimum, if you don’t get through algebra, you’re dead. You can’t really take science classes unless you’ve had it. You can’t get into trades. You can’t enter most colleges and universities.”

Algebra clearly is a stumbling block for students in Chicago’s public high schools. In a recent semester, 6,500 freshmen—17 percent of the honors students and 32 percent of regular students—failed the course.

Behind at start

The problem begins much earlier than high school, of course. Indeed, it springs from a kindergarten math curriculum—defined by textbooks and workbooks—that expects far too little of youngsters. In the early 1980s, the University of Chicago School Mathematics Project interviewed about 500 children in Chicago and suburban schools and found that they knew more about numbers than their schoolwork suggested.

“Much of the kindergarten curriculum at that time—and even today except for ours—was a workbook that had a bunch of things in it that dealt only with the numbers one through 10,” says Max Bell, who directs the project’s primary materials component. Nearly all the kids could count to 20 and some past 20. A significant number could count to 100. And it didn’t matter whether they were from the inner city or suburbia.

“The kindergarten curriculum made a great big fuss about things that kids knew perfectly well how to do,” Bell continues. “What they didn’t know was our conventions [or symbols] for writing it down. We concluded that we were enormously underestimating what kids could accomplish.”

It is not surprising, observes Bell, that little children who know how to talk and perhaps know the alphabet and punctuation marks also know how numbers work. “In mathematics, instead of thousands of words and complex grammar rules, you have 10 symbols and some perfectly well-understood ways of combining things and attaching numbers,” he explains. “There’s a way of talking about most mathematical ideas to five-, six- and seven-year-old kids. In fact, they often relate to mathematical ideas better than older people who have their minds all cluttered up with other stuff.”

Too abstract, too early

Most math instruction has been not only too little, too late, but also too abstract too early, math reformers say. In direct opposition to the “new math” of the 1960s, the new math of the 1990s begins with the concrete and moves toward the abstract.

“There was no national consensus during that [earlier] era like there is now,” recalls John Dossey, an Illinois State University professor and past president of the National Council of Teachers of Mathematics. “Furthermore, some ‘new-math’ programs foisted the use of symbols for sets and logical operations on children in kindergarten and first grade. Some of that was very detrimental because the kids worked with the symbols before they understood what they meant.”

A teacher holding up “sets” of three and two fingers helps youngsters visualize much more easily,
Dossey notes. Similarly, the University of Chicago project engages children's senses, providing children in kindergarten through third grade with kits containing a meter/yard tape, play money, a combination six-inch ruler and compass, chip counters, a deck of math cards and a calculator.

Children also keep daily attendance and weather records, maintain job charts and daily schedules and perform other exercises using data from their classrooms.

Hands-on, real-world mathematics is catching on in kindergartens and primary grades, says Usiskin. But third through sixth grades are not receiving the attention they need, he says. "I think the reason is that it's the hardest level. It's where teachers spend all their time doing computations. It's the backbone of the elementary-school curriculum."

For math reformers, seventh grade marks the beginning of algebra. The University of Chicago project has produced Transition Mathematics, a textbook that capitalizes on the years' arithmetic of students while preparing for algebra and geometry. Similar in pedagogy is the Algebra Project (CATALYST, October 1990) developed by civil rights activist and Harvard-trained mathematician Robert Moses.

Instead of simply giving children mathematical operations, Algebra Project teachers help them to build the operations themselves. They begin with familiar physical events—for example, a relay race involving several sets of runners—and ascend to abstract math through five steps: Children (1) identify an appropriate physical event, (2) draw a picture or make a model of it, (3) describe it in their own everyday language, (4) describe it in a more formal language and (5) use mathematical symbols to represent it.

Moses, who is working with six Chicago schools, trains teachers to abandon the role of knowledge giver. He sees teachers instead as consultants and moderators, facilitating children's participation in what he calls the social construction of math. Children interact with one another, working together in teams, sharing information, discussing ideas, defending their propositions, taking responsibility for their own work and learning how to learn as well as what to learn.

"We want to replace teachers' habit of just delivering information with the habit of helping students to construct the information, asking them questions that tease answers out of them," he explains.

National standards

As national leaders in math curriculum reform, both the Algebra Project and University of Chicago School Mathematics Project are in step with new standards unveiled in 1989 by the National Council of Teachers of Mathematics. NCTM members and the broader mathematics, science, engineering and education communities had worked for three years to produce these criteria for judging the quality of math curricula.

The standards divide into grades K-4, 5-8, 9-12, explaining what children should know about problem solving, use of numbers, geometry, etc. at each level. A fourth part offers professional standards to guide math teachers beyond the traditional role memorization that many of them once experienced as students.

With John Dossey as one of its developers, the mathematics test in the Illinois Goals Assessment Program
Eighth-grade math problems

7. A chemical was to be diluted 2 parts to 1000 for a solution. If the chemist wanted 75,000 ml of solution, how much of the chemical would be needed?

A. 75 ml  
B. 150 ml  
C. 500 ml  
D. 37,500 ml  
E. 150,000 ml

8. Which of the following ordered pairs does not satisfy the equation \( y = 2x^3 \)

A. A  
B. B  
C. C  
D. D  
E. E

9. Figures ABCD and BEFC shown below are squares. What is the distance in inches from point G to point H?

A. 12 inches  
B. 4 inches  
C. 3 inches  
D. 2 inches  
E. 1 inch

Eleventh-grade math problems

10. Which of the following proportions is NOT equivalent to \( \frac{r}{s} = \frac{u}{w} \)

A. \( \frac{r}{t} = \frac{s}{u} \)  
B. \( \frac{s}{r} = \frac{u}{t} \)  
C. \( \frac{s}{u} = \frac{r}{t} \)  
D. \( \frac{t}{s} = \frac{u}{r} \)  
E. \( \frac{t}{r} = \frac{u}{s} \)

11. Find the area of the following figure.

A. 12m  
B. 8m  
C. 8m²  
D. 8m + m²  
E. 16m

12. The Wilsons purchased the following items for their lawn at the garden center. Round each price to the nearest dollar and estimate the sum.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trowel</td>
<td>$4.29</td>
</tr>
<tr>
<td>Grass seed</td>
<td>$2.97</td>
</tr>
<tr>
<td>Hose</td>
<td>$15.89</td>
</tr>
<tr>
<td>Rain gauge</td>
<td>$10.23</td>
</tr>
</tbody>
</table>

A. $30  
B. $32  
C. $34

Source: Illinois Goals Assessment Program

also reflects the standards, to the extent a paper-and-pencil test can.

The standards urge "authentic" evaluation as well. "For example," explains Dossey, "a group of children, given no instructions, might be asked how they would build a doghouse out of a four-foot by eight-foot sheet of plywood. They would have to think about how to cut the pieces, how the shapes would have to fit together, how to cut the pieces in such a way that they get the most out of them. Would it be better to have something like a lean-to up against the house so that they would not have to build a back wall?"

"All of these questions deal with real-world problems," Dossey notes. "Normally, we don't give kids this opportunity. We say 'Mary has two apples. Sue has three apples. How many apples do they have together?' But when kids come to school they are really capable of solving much more difficult problems. The challenge is to bring the math out of the classroom and more into the world."

A new two-volume text, The Algebra Framework, produced by the Board of Education's Bureau of Mathematics attempts to do just that. Some 400 Chicago high school teachers are evaluating it.

"For years we [taught] equations for three fourths of the algebra curriculum and then at the end we started giving students problems to solve and graphs that were related to the problems," recalls Dorothy Strong, bureau director. "Now we may start off with the graphs, in keeping with the NCTM standards. The standards suggest that we begin at an application level with experience. We went a step further and said that experience has to come out of the child's real world."

Like kids estimating the number of sausage pieces on a pizza. Like kids finding the coordinates for the pizza parlors in their neighborhood. Like kids graphing—not State and Madison—but 52nd and Cicero, where they live.

"The need in math education is to determine what we can use out of the student's environment that will make their math successful," said Strong.

"Between the graphing calculator and the computer, every equation that we ever taught a kid can now be done by a machine. Our need is to help kids identify problems in their world, generate mathematics language for those problems and then solve them."

But work toward this heady agenda is slowed by a shortage of qualified math teachers. "We do not meet state staffing requirements at the seventh- and eighth-grade level," says Strong. "We have tried to meet our needs by putting some teachers on 'extended day,' teaching six instead of five math classes a day."

Academy serves few

Chicago is blessed with a new teachers academy devoted to upgrading math and science instruction. But it is serving only a relative handful of teachers. (See separate story on page 6.)

Like Strong, Dossey and the new academy, Moses stresses the need to attach math instruction to the real world. But beyond that, he sees algebra as pivotal.

Historically, algebra has been a gatekeeper, screening out all but the top 10 percent of students who were adept at math and science, says Moses. But today's technology requires massive numbers of people who can analyze data, not merely crunch them. No longer can the national economy afford to let algebra lock people out of higher math, higher education and, ultimately, the professions. Hence, Moses sees a political and economic urgency to improving algebra instruction for all.

And for disadvantaged youngsters, algebra is an issue of survival, Moses believes. Indeed, he has a near apocalyptic vision of masses of disadvantaged students—unable to get by algebra and enter college—eligible only for dead-end service jobs, the military, permanent unemployment, or prison or death.

Calvin, take note.

Alex Poinsinet is a Chicago writer.

Math reform = changing habits

by Michael Klonsky

Robert Moses, civil rights leader and creator of the Algebra Project, was in Chicago recently to help train teachers, administrators and community activists to be math coaches. In an interview with writer Michael Klonsky, he talked at length about the challenge of overhauling math education. The following is an excerpt.

Q. What's wrong with the way kids are presently learning math in Chicago?

A. I think the problem is the same one that faces the whole country. I saw children working individually, trying to solve their own problems. Their goal was to get the "right answer." Typically, math is taught with an example of how to do a problem, followed by a series of similar problems.

Q. What's wrong with that?

A. There's no problem solving. It's just learning how to work through a certain procedure. The other problem is that, typically, all the problems on the page carry the same procedure.

There was one little fellow with a page of fractional problems. He had one problem which added up to 6 over 5. He couldn't leave the answer in that form, and he really didn't have a clue as to what the answer should be in another form. So I took out a piece of newspaper and divided it into five equal parts. He could name each part as one-fifth. Then I took out a second piece of newspaper and divided it into five parts. It then was easy to identify six-fifths [as a whole plus one-fifth].

Children are just dealing with symbols and how to manipulate them. But how do these symbols get attached to real objects? This is exactly the kind of problem we're trying to address in the Algebra Project. We pay a lot of attention to going back and forth between mathematical symbolism and something that's physical.

Q. It seems like you're very critical of the top-down method of teaching.

A. Yes, the teacher is trying to deliver, if he or she can, mathematical information to a large group of students. They are sitting, trying to absorb this. The test of whether they have or have not is whether they can master certain paper-and-pencil routines.

Q. What is your alternative?

A. We want to replace the habit of just delivering information with the habit of helping students construct the information. If you're in the habit of giving an answer every time some-one asks a question, it's hard to change that habit to asking them another question—so that you're teasing the answer out of them.

Q. I heard you say it should take about two years for a teacher to make the transition to the new method of teaching?

A. Yes, there's the problem of changing habits, deeply ingrained habits that are part of their teaching routine.

Q. What kind of tactics are you using to win over teachers to new concepts in teaching?

A. One thing that really needs to happen, and didn't happen enough in the initial stages of our program, is initial discussions over a period of time with teachers and administrators in particular schools where you are thinking about starting the project. It's not enough to work with the local school councils or even with the community organizations. There must also be the same kind of education within the teaching staff and administration. What they need is buy-in time to think through what's involved and to buy into it.

Q. What are some of the social ramifications of the typical teaching method?

A. In industry, in engineering firms, for example, people are required to do problem solving in groups. What they find, of course, is that their training has prepared them to solve problems individually. So the whole process of a group approach to problem solving is foreign to them. All the ways to interact with people, to size up someone else's approach to a problem, how to be heard if you do have the correct approach to the problem—all of that is missing.

Q. How can you track the progress of Project kids?

A. The question for me is, at the end of the year, are the kids ready for the meat of the current high school math program? Are they moving through college prep math?

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Michael Klonsky is a Chicago writer who has been following the Algebra Project.
Popsicle sticks a staple at ‘hands-on’ academy

by Lorraine V. Forte

Second-grade teacher Barbara Bibbs introduced her students to the concept of 1,000 by dumping 1,000 popsicle sticks on the floor.

The youngsters then picked up the sticks and bundled them into groups of 10. Next they bundled the groups of 10 into groups of 100. Finally, 10 students were chosen to stand up and hold the bundles of 100 sticks in front of the class.

"It took a long time, but it was really something that sank in with them, more than if I just said to them or wrote down that a 1,000 is 10 groups of 100," said Bibbs, of Medgar Evers School, 9811 S. Lowe.

Bibbs acquired her new appreciation for popsicle sticks at the Academy for Mathematics and Science Teachers, an independent teacher development project located on the campus of the Illinois Institute of Technology. She is one of about 125 teachers from nine elementary schools who constitute the academy's first class.

Math Tools

Two days a week, the teachers become students again in one of two programs: Math Tools, developed by the University of Chicago for primary-grade teachers, and Teaching Integrated Math and Science (TIMS), developed by faculty at the University of Illinois at Chicago. After 10 weeks, teachers will switch programs. While at the academy, substitute teachers trained by the academy tend to their classes at their home schools.

Most of the academy's students are regular classroom teachers who have had no special training in math or science. Bibbs, for example, remembers having taken "several" math courses in college, including basic concepts, algebra and teaching methods. The academy reinforces basic concepts and offers new ways to teach math and science.

"What I've learned here is a fresh approach," said Bibbs, who is enrolled in Math Tools. "That's what happens here. You get buttons pushed. When you hear something, you may not do it the same way in your own class, but it gets you thinking."

Bibbs turned to popsicle sticks after hearing repeatedly in Math Tools that manipulatives—sticks, blocks and geometric shapes and solids—are powerful teaching tools.

"If you count to nine without actually seeing what that means, it just doesn't mean as much," said Sheila Sconiers, one of the University of Chicago professors who developed Math Tools.

This program also emphasizes early exposure to basic concepts of geometry—for example, recognizing triangles, squares and other shapes—and to calculators. A 1988-89 study of 640 first- and second-graders showed that those who used calculators developed better computation skills, a better understanding of math operations and solved story problems more easily, Sconiers said.

Evers Principal Emmerine Clarkston said that both teachers and students are more excited about math since six of her 10 classroom teachers began attending Math Tools classes. Teachers are using manipulatives more, she reported, and children seem to be more interested in their lessons when they involve manipulatives.

TIMS seeks to take science out of textbooks and put it in students' hands. In the process, students put math to work. "You need the math to do the science," said Leon Lederman, Nobel Prize-winning physicist and University of Chicago professor, who spearheaded the drive to open the academy. "You can't separate the two."
In TIMS, teachers practice simple experiments aimed at teaching scientific procedures, from drawing a picture of an experiment to collecting the data and plotting results on a graph.

One recent afternoon, teachers discussed Grab Bag, a game that helps teach the concept of variables. Students grab as many “variables” out of a bag as they can within a set time limit, count them, and then make a graph of the results. One teacher adapted Grab Bag by using a deck of cards, designating each suit as a variable. Another used paper clips and colored paper, and a third used popcorn, peanuts and jelly beans.

**Proven method**

Twenty-five teachers from Morrill School, 6011 S. Rockwell, are enrolled in TIMS, and most are enthusiastically recreating the experiments in their own classes, said Principal Diana Gonzalez-Scatton.

The hands-on approach is crucial because “some kids can’t understand the abstract,” said Patty Carriere, who teaches a computer lab at Morrill. Carriere said TIMS inspired her to order computer software that will help students reinforce graphing and other concepts they learn in their regular classrooms.

TIMS has had impressive results with all kinds of children—city and suburban; black, white and Hispanic; rich and poor. A 1987 study of 5,000 Chicago and suburban students found that after one year of TIMS instruction, their scores on tests of math and science “process” skills—for example, measuring volumes and interpreting graphs—shot up three grade levels, or two levels more than average.

Backers of the academy have set the ambitious goal of having each of the city’s 15,000 teachers who teach math and science go through the academy. But they face a daunting challenge: Raising the required $30 million a year to serve all teachers in the next six or seven years.

Still, academy staff and backers say they are optimistic about the project’s eventual success. Lederman is working to recruit other scientists to serve as volunteer advisors and teach classes on the latest scientific developments.

And summer training sessions are in the works for two other programs:

- Chemical Education for Public Understanding program, a high school program dealing with environmental awareness and education. Developed at the University of California at Berkeley, the program is being field tested at three elementary schools as well, Newberry Mathematics and Science Academy, Ft. Dearborn Elementary and Lawndale Community Academy.

- Fast Plants, which uses fast-growing plants developed by University of Wisconsin researchers to explore botany and plant development.

Jerry Hayes, the academy’s associate director, said a two-day seminar will be held in June for kindergarten teachers, with faculty from the Chicago Academy of Sciences, the Erikson Institute and area universities.

“We want kindergarten teachers to realize that what they do is important, that there are things they can do even at that early stage,” he said.

Lorraine V. Forte is a Chicago writer. For more information on the academy, contact outreach coordinator Linda Bush or Bruce Rickley (312) 809-0100; on Math Tools, contact Sheila Scabier (312) 702-1561; and on TIMS, contact Martin Gartman (312) 413-2971.

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**Funding shortfall restricts program**

The Academy for Mathematics and Science Teachers is a hit with teachers, but its future is far from secure.

“If we’re really looking at changing the whole school system, we need to have 1,000 teachers enrolled at a time, and that takes a lot of money,” said director Jon Thompson, who headed up a Kalamazoo (Mich.) math and science academy for students before coming to Chicago.

Initially, academy backers hoped to raise $11 million the first year and up to $30 million in subsequent years. With that money, they could train up to 400 substitute teachers, bring in up to 100 schools a year and serve the entire system in six years.

The academy now is counting on only $5 million to $6 million for the first year and shooting for $15 million for the second. Most of this year’s money is coming from the U.S. Department of Energy and the National Science Foundation. NASA is expected to contribute about $200,000 for a resource center. State and private funds account for the remainder.

So far, the Chicago Board of Education has not chipped in. Gordon Berry, the academy’s former acting director and a senior physicist at Argonne National Laboratory, said future federal funding may depend on a school-system contribution.

Adrienne Bailey, associate superintendent for instructional services, said the board is studying ways to help, if not through direct funding then through personnel or equipment.

Meanwhile, some principals have reported problems with some of the 45 substitute teachers the academy has been able to hire.

One school, Marconi Community Academy, 230 N. Kalmar, pulled out of the program because of dissatisfaction with its substitutes. One substitute could not control his classroom and another refused to stop teaching to consult the teaching guide, said Principal Eugene Kaide.

Marconi teachers believed academy programs were worthwhile, said Kaide, but academy staff were “unsympathetic” about the substitute problem.

Morrill School Principal Diana Gonzalez-Scatton said most of her substitutes are very competent but several have little experience and some difficulty maintaining discipline. “We’ve tried to work with it because our teachers are getting so much out of the academy,” she said.

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Lorraine V. Forte
A sampler

Chicago's math promoters try different angles

Math that's all in the family

"Everyone knows that if you want your child to be a good reader, you should sit down and read to him," says Janet Beissinger, a mathematics professor at the University of Illinois at Chicago. "Family Math gives parents and children a chance to sit down and enjoy math the same way."

Through Family Math, parents and children attend classes together to learn math-related games and activities they can do together. "We try to expose kids to the idea that math isn't just number facts," said Beissinger. "It's also geometry, spatial concepts, logical reasoning."

To get at the concept of fractions, for example, players toss a die marked with fractions instead of whole numbers. They then cut pieces of colored paper into fourths, sixths or eighthths, depending on the outcome of the toss.

"Balloon ride," a version of pick-up sticks, is aimed at teaching logic and strategy. Ten toothpicks are laid out on a table as "anchors" for an imaginary balloon. Players take turns picking up one or two toothpicks at a time, with the goal being to pick up the last sticks and "win" a balloon ride.

"Even younger children can very quickly notice a pattern, that if they leave their opponent with three toothpicks, they've put themselves in a winning position," Beissinger explained.

With the help of a state science literacy grant, Beissinger and three other UIC faculty members are training community groups, PTA members, teachers and others to run the sessions in their schools. So far, 75 people have been trained in three workshops, and two more workshops are scheduled for May and June.

For more information, contact Ateia McClellan and Luther Stewart get the picture with an abacus.

Beissinger, Steven Jordan or Martin Gartzman at the UIC Office of Mathematics and Computer Education (312) 996-5238.

Games start with answers

Some teachers believe that the best way to teach students how to solve math problems is to give them the answers.

These teachers are school sponsors in the Chicago Academic Games League, a 12-year-old program that holds monthly math tournaments for sixth- through eighth-graders at the University of Chicago Lab School, 5840 S. Kenwood.

In the competitions, students are given an answer and asked to find as many equations as possible that would yield that answer.

"It demystifies algebra," said Rita Yacker, a parent who helped found the league. "When they get to high school, they are familiar with the form and with the vocabulary."

More than 6,000 students have participated in the program since it began in 1979; currently about 200 students from 13 schools compete in each tournament.

Twenty teachers and 13 parents serve as chaperones for these events; about 30 parents chaperone for the weekend tournament held in Lake Geneva, Wis., each May.

To join, schools must pay a $15 membership fee, which entitles them to workshops, "teamworks" (a monthly newsletter) and a 25-percent discount on all games and materials.

For more information, contact Rita Yacker (312) 363-0328.

Churches, schools team up

Thanks to partnerships between neighborhood schools and neighborhood churches, 1,200 students in third through eighth grade are getting extra help in math and science, including trips to museums.

For 22 sixth-graders at Avalon Park Elementary School, 8045 S. Kenwood, the pairing has afforded an opportunity to work with computers. "The kids just fight over the computers," said Lydia Mitchem, an assistant tutor at Avalon Park United Church of Christ.

Avalon Park is one of 200 churches participating in the Black Churches in Education Project, organized by the Chicago Urban League with financial backing from Northern Trust Bank.

To join the program, a church must recruit a coordinator and tutors, who must have at least a high school diploma, be knowledgeable in the subject and "be good with children."
said program director Dondieneita Fleary. Churches are encouraged to
enlist adults with college degrees or
teaching certificates.

Churches also must sign up at
least 15 students, who attend for two
hours after school from two to four
days a week. One church, South
Shore Baptist, serves 70 students.

The Urban League organizes tutor
training, which includes instruction in
Family Math and a four-hour session of
Science Explorers, programs offered through the University of
Illinois at Chicago.

A program evaluation focusing on
test scores and grades of participants
at 17 churches is in progress.

For more information, contact
Dondieneita Fleary (312) 285-3800.

Resource center
opens on South Side

A math and science resource cen-
ter has opened for teachers on the
Far South Side.

It is housed in Carver High School,
13100 S. Doty, sponsored by
Chicago State University and funded
by a five-year, $265,000 grant from
the National Science Foundation.
Although focusing on Carver and its
feeder elementary schools, the center
is open to all Chicago teachers.

Instruction aids, such as a moving
replica of the human body or math
building blocks, may be checked out
from 3 p.m. to 5 p.m. Monday
through Thursday. The center also will
offer help with selected parts of
Teaching Integrated Math and
Science (TIMS) and the University of
Chicago School Mathematics Project.
One focus is on teaching students to
use “mental mathematics,” thinking
through problems before putting them
on paper.

By targeting elementary schools,
university officials hope to groom
more blacks and Hispanics for
careers in math and science. “The
underrepresentation of minorities in
math and science is overwhelming,”
said Leonard Etinger, Chicago
State’s acting dean of continuing edu-
cation. “Less than 1 percent of the
Ph.D.s given out each year go to
blacks.”

For more information, call Leonard
Etinger (312) 995-3974.

Inner-city high schools
chalk up victories

Bowen High School, 2710 E.
89th, is far from the top ranks of
Illinois high schools, yet its
Mathcounts team qualified for this
year’s state finals.

The Chicago Urban League paved
the way by creating a regional con-
test for the 19 lower-scoring high
schools it sponsors in Mathcounts
competitions.

“This gives the students who
couldn’t get into Whitney Young,
Kenwood and other top schools a
chance to win math contests,”
explained program coordinator
Michael Hyatt.

Four hundred students competed in
the league’s regional, answering
problems involving algebra, geom-
etry and pre-calculus. Students from
eight schools qualified for the finals,
where they are scheduled to compete
individually or as members of two-
and eight-person teams.

The league has sent a school to
the finals each year since its program
began, said Hyatt, but the numbers
are up since the creation of a separ-
ate regional competition.

To prepare for the contests, particip-
ants get tutoring once or twice
a week in their specialty from a high
school teacher.

Many of the students in Math-
counts are graduates of the 30 ele-
mentary schools in the Urban
League’s Mathletes program, which
offers tutoring to seventh- and eighth-
graders at low-scoring schools. The
goal is to have students enter high
school knowing algebra.

The national Mathcounts program,
originated in 1981 by CNA Insurance
Companies and the National Society
of Professional Engineers, is geared
toward seventh- and eighth-graders.
Illinois is among those states that shift-
ed it to the high school level.

For more information, contact
Michael Hyatt (312) 285-3800.

Pupils ‘find’ jobs,
put math to work

In Virginia Weston’s fifth-grade
class at Nobel Elementary School,
4127 W. Hirsch, students are learn-
ing how numbers count in real life.

Each student looks through want
ads to find a job and then has to fig-
ure out how to live on its salary.
Along the way, students confront such
obstacles as how to buy a car and
furnish an apartment on a budget. At
one point, they are challenged to buy
or start their own business, using real
data from their community.

“They begin to understand what
it’s like to buy food or clothes on a
budget,” said Weston. “Students
didn’t realize how much things cost
and what their parents do to run a
household. They were in shock.”

Called Math at Work, the program
consists of 20 lessons developed by
DePaul University to teach youngsters
math and life skills. It is now in use at
schools in the Orr Network, which
includes Orr High School, 730 N.
Pullaski, and its feeder elementary
schools.

With support from Continental
Bank, DePaul also coordinates a
cadre of employees from the bank
and Helene Curtis who visit classes,
sharing their experiences with stu-
dents using the program.

DePaul offers a similar “community
math” program in which students con-
duct surveys in their neighborhoods
and then interpret the results.

For more information, call Barbara
Radner at DePaul’s Center for
Urban Education (312) 362-8173.
Prepping blacks, Hispanics for math, science careers

Beginning this summer, 160 black and Hispanic eighth-graders with above-average ability in math and science will get four years of high-powered help aimed at propelling them into math and science careers.

They will attend six-week summer institutes and Saturday lessons in math, science and English at Truman College, 1145 W. Wilson. They also will work in real laboratories and on special science projects.

Called Ventures in Science, the program is modeled after Project C.A.U.S.A., a successful precollege program of the Ana G. Mendez Educational Foundation of Puerto Rico. Students who are not fluent in English are eligible.

Ventures is sponsored by Truman College, the Chicago Public Schools, Argonne National Laboratory, the University of Illinois at Chicago and Motorola Inc. The U.S. Department of Energy has pledged $400,000.

For more information, call Ruth Burgos-Scossor, Truman’s vice president for faculty and instruction (312) 989-6125.

Recruiting minorities for math, science teaching

Joy Parker, a sophomore at Kenwood Academy, has always helped his friends with their math homework. So last year, when his geometry teacher asked who would like to participate in a program that is grooming future math teachers, Parker raised his hand.

“I thought I might as well, since I was good with helping other students,” he explained.

Parker became one of 35 students selected for Project SMART—Science, Mathematics, Advocacy and Recruitment for Teaching—organized by the Chicago Urban League in cooperation with Northwestern University’s School of Education.

SMART aims to increase the supply of minority math and science teachers by tapping freshmen for special treatment throughout high school and college, including tutoring, mentoring, cultural enrichment and possibly scholarships.

Parker is learning that being a teacher requires not only having knowledge of a subject area but also being familiar with the world around him. He’s visited nuclear plants, science research laboratories and major museums. He also has skied at Lake Geneva, Wis., and attended dance and theater performances.

“These cultural activities help them develop into even more well-rounded people,” said SMART coordinator Maxine Duster.

SMART is now recruiting students from three high schools, Kenwood, DuSable and Phillips.

For more information, contact Maxine Duster (312) 285-5800.

Other resources

Programs

- Roosevelt University is the site of summer math and science institutes offered under the auspices of The Woodrow Wilson National Fellowship Foundation. Aimed at teachers of seventh- to twelfth-graders, the institutes are taught by specially-trained high school teachers.

- In addition, Roosevelt will conduct math institutes for primary- and intermediate-level teachers. For more information, call Brigitte Erbe (312) 341-3868.

- Manuevers with Mathematics, developed by the University of Illinois at Chicago, offers materials and workshops for teachers in grades five through eight. Geometry, problem-solving, estimation and mental computation are strongly emphasized, and full-function calculators are used. For more information, call Kathryn Chval (312) 996-8708.

Publications


- Secada, Walter G. and Deborah A. Carey Teaching Mathematics with Understanding to Limited English Proficient Students, a 56-page review of research and selected programs, aimed at curriculum planners and teachers. (October 1990) ERIC Clearinghouse on Urban Education, Box 40, Teachers College, Columbia University, New York, N.Y. 10027.

Organizations


Television

- “Square One,” broadcast from 4:30 p.m. to 5 p.m. weekdays on WYCC-TV Channel 20, features games, music videos, sit-com parodias and Mathnet, a detective series. The current series runs through April 30. Episodes can be videotaped and used in classrooms up to three years.
Opinions

So far, radical rhetoric, conventional classrooms

by William Ayers

The conventional language of reform is now corrupted through overuse and by contradictory applications. We need to move beyond this language, and we must move, as well, beyond tinkering in the name of reform with this or that piece of the school curriculum or instructional program, and do something dramatically different. We need to stop talking about school reform and begin the difficult task of reinventing schools. That's right, reinventing schools, top to bottom, completely new.

The place to begin, I believe, is to rethink the large purposes of education and of schooling, to consider questions like these:

■ What are the core values of our school community?
■ What knowledge and experiences are most important for our kids?
■ What kind of person do we hope will graduate from our school?
■ What human qualities and habits of mind are embodied in our work here?

A serious encounter with these kinds of questions can be illuminating. For example, one local school council recently took up the question of what core values they wanted to power their particular improvement project. After much work, they reached consensus on several: compassion, respect for self and others, creativity, intelligence.

They then took the next step: they did a thorough search for these values in the school environment, in its routine and its programs. They were startled to find few examples alive and well in the school. In fact, these values were all but invisible in school practice, and they found instead lots of contrary evidence: disrespect in the lunchroom, dullness and conformity in the curriculum, bitterness in the hallways.

Sending wrong signals

They discovered that all the machinery of schooling—the bells, the intercom, the rows of desks, the mass migrations to the toilets, the obsession with quiet and order, the endless testing of discreet skills, and on and on—had become a context that resists intelligence. They concluded that any normal kid, wondering what kind of intelligence is needed to succeed in the school, could sensibly figure that being quiet and dull is the only reasonable way.

Exploring and recovering large purposes is a necessary first step, but it is only a start. A collective commitment must lead to the construction of a framework for change. And this framework, at once idealistic and practical, must allow for the achievement of these large educational purposes for all children. It is not enough to have high expectations for some learners with the majority tracked off into the educational wastelands until they are old enough to drop out. Reinvented schools must be based on a belief in the educability of all youngsters. They must hold ambitious goals for everybody's children.

A school structured around high expectations for learners will have to rethink much of the received wisdom and common sense of schooling. Typically, schools are little factories, everything neat, ordered and on schedule—or at least hoping to be so.

Children are the products, moving along the assembly line, being filled up with bits of subject matter until they are inspected and certified to graduate to the next level. Never mind that in Chicago half the kids fall off the line altogether, and for those, who keep moving, at the end of the line rarely represents an opening of possibilities. The line itself has become the important thing—the line and the stuff being poured into the youngsters.

How learning happens

In reinvented schools the factory model will be rejected in its entirety. Reinvented schools will be based on what is known about learning. People learn best when they are actively exploring, thinking and asking their own questions. People learn constantly. People learn in a variety of styles and at a range of paces. People learn when their emotional, psychological, physical, cultural and cognitive needs are met.

In reinvented schools children will be active, engaged with a variety of concrete materials and primary
Teachers need time to talk

by Alice H. Price

In the preceding Opinions essay, William Ayers urges that “it is time to move beyond...radical reform rhetoric.” I disagree. Now is precisely the time for more rhetoric. And this rhetoric needs to come from the teachers who are most aware of compelling reasons for change.

To bring about the radical reform that Ayers envisions, we must involve teachers. The teachers I talk with want quality, both in their teaching and in the students’ learning. We agree on the need. The direction and implementation remain in question.

If teachers could trust that their ideas for reforming the schools would be implemented, I think they would be happy to form discussion groups and to plan for significant change. As all professionals do, teachers spend a lot of time talking about problems. But teachers work in isolation; going into a classroom and closing the door is more than a metaphor for our isolation—it’s reality.

Many other professionals work in teams. A friend of mine, a scientist, works within a group of 15—five chemists, five clinicians, five pharmacologists—discovering new medicines. Teachers work alone. So, first, we need to support teachers coming together to talk about their problems and solutions. I have never been with a group of teachers where I did not learn from their ideas.

Presently, I am one member of a Mellon Seminar group in which 50 Chicago public high school teachers meet one Saturday a month at the University of Chicago to discuss “Race, Ethnicity, and Literacy.” We all learn from one another. We need many more such forums.

Within such a group, teachers can learn about school reforms that have already taken place, both in Chicago and in other cities throughout the country. For example, the Chicago Teachers Union recently sponsored several speakers on reform in the schools. Before I heard Albert Shanker, president of the American
Federation of Teachers, talk about restructuring, I had no idea that real changes were taking place within the public schools of New York.

If a “Chicago Restructuring Academy” made available literature and speakers who could inform us of successful ways of changing the structure of schools, then I believe that teachers would understand the magnitude of the change possible within our own system.

Many teachers often fantasize about opening their own school. Now we learn about New York teachers establishing alternative schools within their larger high school system, actually beginning their own alternative schools while being paid their salaries and remaining a part of the larger public school system. These are successful changes we need to know about.

The New York arrangements are entirely voluntary. Teachers do not have to leave the school they know; there is simply alternative schooling within a larger public school. This concept gives choice and empowerment—terms we hear but often do not apply to ourselves.

Break old molds

When Albert Shanker talked about restructuring, it was new and exciting to many of us—and it made us want to try it in our own schools. Shanker advocated alternative structures for the place we call school:

■ Change the 40-minute, nine-period day to a different model.
■ Use two- or three-hour blocks of time.
■ Stagger classes so that teachers do not meet with five different classes every day.
■ Encourage teachers to work with students for two or three years, not just for one year.
■ Allow teachers to work in groups and teach together.
■ Abolish the idea of one teacher per classroom.

I hear teachers talking about their problems with the 40-minute time slot, with the hectic pace of students running from teacher to teacher, with their isolation from other teachers, trying to “cover” as many as seven different subjects each day.

Surely the New York model presents us with persuasive ways of thinking about a school within a school, where students who are interested in collaborative learning and team teaching could have a different learning experience.

Surely the majority of our schools are outmoded. A compelling metaphor comes from William James, quoted in the report on schooling, “Tyrannical Machines,” by Lynne V. Cheney, chair of the National Endowment for the Humanities.

James wrote (in 1903): “The institutionalizing on a large scale of any natural combination of need and motive always tends to run into technicality and to develop a tyrannical Machine with unforeseen powers of exclusion and corruption.”

Cheney explains that one way of abolishing these tyrannical machines is to “provide alternative systems” for teachers. “They should have abundant opportunities to study the subject they teach.”

Many teachers are eager to improve their teaching. They yearn for more study. They realize they can be part of the “teacher as researcher” movement which encourages us to look closely at the stuff of our lessons, our students and ourselves. They want prod toward genuine reform all the Chicago schools and the system itself.

Such an academy would be a place where Chicago teachers could learn of actual change taking place elsewhere. Teachers would visit other schools that have implemented reforms. The academy would provide money and released time for these teacher visitations.

Philadelphia provides a model. An $8 million grant from the Pew Charitable Trusts has funded, through the University of Pennsylvania, just such a restructuring effort. Now we need financial support for our Chicago dream.

Alice H. Price is an English teacher at Lincoln Park High School.

McDowell School math teacher Wilhelmina LeRoy has an eager class.
REFORM UPDATES

Mending LSC elections. Last November the Illinois Supreme Court ruled that the process of electing local school council members violated the Constitutional principle of one person, one vote. Since then, school reformers have been looking for a new way to put six parents, two community members and two teachers on each council. The proposals include:

- Each parent, community resident and school staff member would get three votes to be used in any category. For example, a teacher could vote for two teachers and a parent, or a parent could vote for three parents. (Backers include the African American Education Reform Institute, the Parent/Community Council and the Chicago Urban League.)

- Each parent and community member would vote for six parents and two community members. The elected members would appoint two teachers following an advisory election by school staff. (Proposed by the Citizens Schools Committee.) A similar proposal by the Chicago Teachers Union would have the Board of Education appoint the teacher members following an advisory election.

- Each parent, teacher and community member would vote for six parents, two community members and two teachers. (Proposed by People United for Responsible Education and the Teachers' Task Force of the City-Wide Coalition for School Reform.)

At least one group, the Citizens Schools Committee, has proposed limiting the community from which candidates and voters may be drawn for magnet and other multiarea schools. It would define community as the area within a 1.25-mile radius of the school.

Several other alternatives were among options outlined by the City-Wide Coalition for School Reform:

- Each parent, community resident and school staff member would vote for six parents, two teachers and two community members. To deter communities from overwhelming parents, voter registration would be required.

- Each parent, teacher and community member would get 10 votes to be used separately or cumulatively. For example, a voter could cast five votes for one parent candidate and five for one teacher candidate.

- A governmental body such as the School Board would appoint all LSC members, possibly following advisory elections.

Teacher poll. All teachers in the school system are being asked to participate in a survey exploring their instructional practices and their views of their work, their school communities and school governance.

Sponsored by the Consortium on Chicago School Research, the survey will be administered by chairs of professional personnel advisory committees during faculty meetings between May 13 and 17.

If 50 percent of a school's teachers participate, the school will receive a profile of its responses at the beginning of next school year.

Spearheading the survey are the Chicago Public School's Department of Research, Evaluation and Planning, the University of Chicago, the University of Illinois at Chicago, the Chicago Teachers Union and the Chicago Panel on Public School Policy and Finance.

For more information, call John Easton (312) 939-2202.

Head Start stays. Under pressure from parents, the Board of Education rescinded plans made by the Interim Board of Education to transfer the school system's Head Start program to the city over the next three years.

The interim board approved the phase-out because rising teacher salaries had outstripped the board's allotment of Head Start funding, creating a deficit of $1.6 million this year and an estimated $3.5 million next year, school sources said.

In the hands of the city, the board's Head Start allotment would go farther because the programs it funds generally are run by community organizations that pay teachers less than the board does. Unlike the board, the city does not require all teachers to have teaching certificates in early childhood education.

Parents rallied against the transfer, arguing that city-sponsored programs might not be as close to their homes and that their youngsters deserved teachers who are early-childhood certified.

Asked where the board would get money to cover the deficit, a spokesperson said negotiations would be conducted with the federal and city governments. Another source said the board likely would have to dip into regular education funds. Meanwhile, the city is taking applications from organizations in the event the board does not find the money.

In the courts. A Cook County Circuit Court judge has denied the request of The Landmark Center for Civil Rights, a proponent of school vouchers, to intervene in a lawsuit seeking more equitable funding of Illinois' public schools. The judge said the request was not directly related to the equity lawsuit.

The center, based in Washington, D.C., sought to intervene on behalf of 27 low-income parents who wanted reimbursement for private-school tuition, pending reform of state school funding.
**Principal recruitment.** More than 100 administrators from as far away as Missouri, Kansas and New Jersey responded to principal want ads placed by the Chicago Leadership Connection.

Of those, 66 attended a principal fair held in March on the campus of the Illinois Institute of Technology. There they met with 52 local school council members who were interested in hiring new principals.

Sponsored by Designs for Change and Leadership for Quality Education, the Chicago Leadership Connection advertised its services in local and national newspapers, including Spanish-language publications. It continued to set up meetings between applicants and councils right up to the April 15 principal signing deadline.

Last year, 6 of 15 candidates who attended the principals fair were hired by Chicago schools, said coordinator Claire Lance. For more information, call Lance (312) 592-5983.

**Class size.** "Lost in the Crowd," a free pamphlet on the benefits of small class sizes, is available from the National Council of Teachers of English.

For a single copy, send a request and business-sized, stamped, self-addressed envelope to: Membership Service Representative, NCTE, 1111 Kenyon Rd., Urbana, Ill. 61801. Multiple copies can be purchased for $7 per 100.

**Open Meetings Act.** "Common Questions about the Open Meetings Act," a four-page guide aimed at local school council members, is available free from the Lawyers School Reform Advisory Project, 17 E. Monroe St., Suite 212, Chicago, Ill. 60603.

**CONFERENCEs**

**School selection.** Open enrollment will be the topic of a forum scheduled for 2 p.m. to 4 p.m. May 24 at the Community Renewal Society, 332 S. Michigan, Suite 500. For more information, call Nelson Ndove (312) 427-4830.

**TELEVISION**

**Reform's hurdles.** Revising the process of selecting local school council members will be the topic of a special one-hour edition of "Chicago Tonight with John Calloway," scheduled for 7 p.m. May 9 on WTTW-TV Channel 11. The show also will deal with a proposed moratorium on school choice, with absentee LSC members and with proposals for state funding for Chicago school reform.
Teachers make house calls

Twice this year, 45 teachers and aides at Mitchell Elementary, 2233 W. Ohio, used a half day of inservice education time to make house calls, visiting about 10 percent of the school's parents.

"It has developed a community bond," said Principal Deanna Rattner. "Parents are so enthusiastic they don't want the teachers to leave."

House calls afford a less threatening atmosphere for parents, she noted. The idea grew out of frustration over the scant amount of time available for teachers to talk with parents on report-card pickup day.

"The average teacher has 30 students, and it gets stressful when teachers are trying to have conferences (while) three to four parents are lined in the hallways," explained Rattner.

Following the well-received visits, the school restructuring report card pickup day so that teachers can spend two hours on home conferences.

Deanna Rattner (312) 534-7655.

Dubois paves way to college

For students at Dubois Elementary School, 330 E. 133rd, college is a foreign land. To show students they can get there, the school arranges campus visits.

"We want to expose them to college at an early age and show them they have a choice to learn and prepare for college," said counselor Hilda Moore.

Seventh- and eighth-graders are selected for the trips on the basis of attendance and grades. With this incentive, students are motivated to do well in school, noted Principal Joyce Johnson. The program also gets them thinking about college requirements as they enter high school, she said.

The two-year program was funded by a $54,000 grant from the Illinois State Board of Education. Hilda Moore (312) 535-5582.

Bank book drive stocks libraries

A three-day employee book drive at Continental Bank netted 14,000 books for 13 needy school libraries.

The bank distributed letters to its employees, explaining the drive, and then posted workers and collection boxes at the bank's entrances. Books were sent to a warehouse for sorting and then distributed among schools in the West Side school network that Continental sponsors.

"It was a way to get books for schools and for employees to understand the educational needs of a school by maintaining a real connection to children," said Nancy Brandt, of Continental.

The drive was a literary lifesaver for Noble Elementary School, 4127 W. Hirsch. The neighborhood public library had burned down, and the school's library was used as a classroom because of overcrowding.

Now each of the school's 32 classrooms has its own library. Nancy Brandt (312) 923-5193.