

International Review

'Silent erosion' of school curriculum

Mike Baker

The former chief inspector of England's schools has said that the national curriculum is being "eroded" as part of a "silent revolution" that is narrowing the range of subjects being taught.

MIKE TOMLINSON, who retired as head of the schools' inspectorate, Ofsted¹, last month, told BBC News that the government's focus on numeracy and literacy had led to a "narrowing" of the primary school curriculum in a "significant number of schools".

He said he was also concerned that, in secondary schools, the introduction of vocational subjects would lead to traditional subjects being "squeezed out".

He said the changes to the curriculum had happened without any of the debate that surrounded the introduction of the national curriculum a little over a decade ago.

Squeezed out

Mr TOMLINSON said: "Over the last years we have had a sort of silent revolution where gradually little bits of the national curriculum have been eroded away or knocked out completely." The literacy hour and daily maths lesson are now taught in all primary schools in England and are also being introduced into the early years of secondary school.

Mr TOMLINSON said the time taken by numeracy and literacy had led to some subjects having less curriculum time than previously. In particular, subjects like geography, history, the arts and practical subjects such as design and technology had been squeezed.

At secondary level, the former chief schools inspector said some schools were now using the new freedom to "disapply a whole year group from a subject". As schools looked towards more vocational subjects, there was "a significant narrowing" of the curriculum and this narrowing was likely to increase.

¹ Office for Standards in Education (OFSTED), officially the Office of Her Majesty's Chief Inspector of Schools in England. <http://www.ofsted.gov.uk> [M.T.]

Backward step

"I do worry about what is being squeezed out and rather sadly it's the subjects that most commonly were not there prior to the national curriculum," he said. He added that "in the space of 15 years we are at risk of moving to a situation that the national curriculum did actually put right".

Mr TOMLINSON said he understood the value of vocational subjects for many students but there was a risk of losing something that would be of value to children for the rest of their lives. "No-one could argue with the view that art, music, drama and English literature are lessons which have an enormous bearing on the way we conduct our lives."

Teachers agree

Mr TOMLINSON's concerns will be welcomed by many teachers. SUE MATTHEW, head teacher of St Ebbe's primary school in Oxford, believes the numeracy and literacy strategies do put a squeeze on other subjects. "The constant focus on core curriculum areas somehow gives us teachers guilt complexes," she said.

"You always feel time pressure and feel that you must get at numeracy and at literacy, so that when you get into lovely creative areas, a bit of you thinks 'Oh my goodness have I done the full literacy hour?' and there is this pressure to get through the learning objectives."

Mr TOMLINSON's views were echoed by MARTIN ROBERTS, head teacher of Cherwell Upper School in Oxfordshire. He believes the government is pushing the core subjects very hard at the expense of history, geography, English literature, the arts and music. "That is being exacerbated in the 14 to 16 age group because the government is now saying we must be better at vocational subjects," he said.

Lack of guidance

Mr ROBERTS is so concerned about the diminishing role for history in the school curriculum that he is holding a national conference to discuss the issue in the autumn.

As BBC News Online revealed recently, guidance to primary schools on the amount of time they should be devoting to different parts of the curriculum was due more than a year ago - but still has not appeared. Responding to Mr TOMLINSON's comments, the Department for Education said it was aware of the pressures on the primary curriculum and was working with the QCA² on the new guidance for schools.

But a spokesperson said it was vital to get the basics right in primary schools and to make the curriculum relevant to older, non-academic secondary school pupils.

² The Qualifications and Curriculum Authority (QCA) is a guardian of standards in education and training: <http://www.qca.org.uk> [M.T.]

The length of the taught week in primary schools varies from 20 hours to 26, according to the national summary report published by Ofsted, but more than three quarters of them have lessons for between 23 and 24 hours.

The percentage of time head teachers said they intended to devote to different subjects is shown in the table below:

English	29 %	geography	4 %
maths	22 %	art	4 %
science	10 %	music	4 %
design and technology	4 %	physical education	6 %
information technology	4 %	religious education	5 %
history	4 %		

[Source: Head teachers' reports to inspectors]

From the BBC, Thursday, May 16, 2002.

See http://news.bbc.co.uk/1/hi/english/education/newsid_1991000/1991816.stm

The Kolam Tradition

A tradition of figure-drawing in southern India expresses mathematical ideas and has attracted the attention of computer science

Marcia Ascher

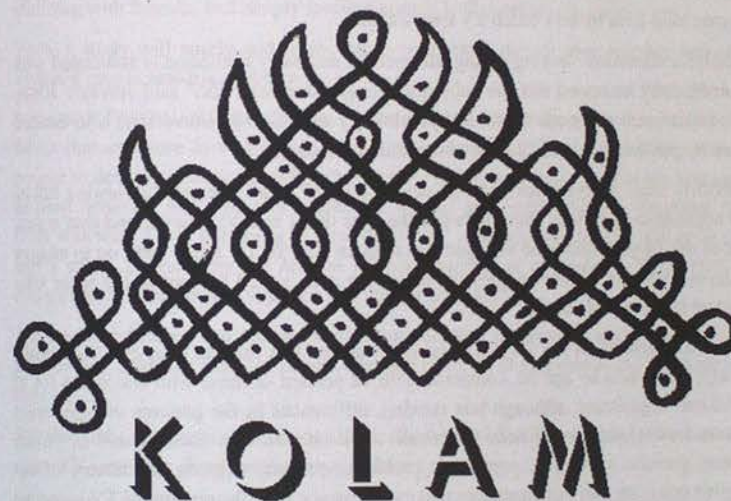
The women of *Tamil Nadu* in southeastern India traditionally cover their thresholds every morning with elaborate designs drawn with rice powder. Girls learn the ritual from their mothers and other female relatives, and kolam skills are considered a mark of grace, dexterity, discipline and concentration. Drawing the kolam figures is an important part of the *Tamil Nadu* culture and landscape. But with their orderly and often highly symmetrical designs, which frequently group into families, kolams are also expressive of mathematical ideas. In the last few decades, kolam figures have attracted the attention of computer scientists interested in describing images with picture languages. Different picture languages have been developed to describe different kolam families.

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From the *American Scientist*, Volume 90, January-February, 2002, pp. 56-63.

See <http://www.americanscientist.org/articles/02articles/Ascher.html>.

Home page for the *American Scientist* is <http://www.americanscientist.org/amsci.html>



³ Links: <http://www.uni-koeln.de/phil-fak/indologie/kolam/frame.html>. Kolam, a journal of Tamil studies: Generating a Sierpinski Curve: <http://www.inf.ethz.ch/%7Estaerk/applets/Sierpinski.html>

More TV for youths now may mean more aggression later

Susan FitzGerald

Teenagers and young adults who watch more than just one hour of television a day are more likely to get into fights and exhibit other aggressive behavior in the years ahead than their peers who spend less time in front of the TV, new research shows.

The study, one of the *largest and longest-ranging* of its kind, builds on findings of a connection between children's exposure to TV violence and aggressive behavior. The latest research suggests that teenagers, particularly boys, and even young adults can be affected long-term by how much TV they watch.

"Extensive television viewing during adolescence and early adulthood is associated with a substantially increased risk for subsequent aggressive behavior," said JEFFREY JOHNSON, an assistant professor of clinical psychology at *Columbia University*, who headed the study published in today's issue of the journal *Science*.

JOHNSON's team analyzed data on 707 people over 17 years, measuring viewing habits and aggression at various times between the ages of 14 and 30. They found that 6 percent of the 14-year-olds who watched less than an hour of TV a day went on to engage in threats, assaults or other aggressive or violent acts, vs. 29 percent of the teens who watched three or more hours.

Likewise, 7 percent of the 22-year-olds who watched less than an hour of TV committed aggressive acts by age 30, compared with 18 percent of those who watched a lot of television. Significant, although less striking, differences in the patterns of aggression remained even after researchers statistically took into account such factors as family income, parental education, psychiatric problems, parental neglect, and history of aggressive behavior - all circumstances that can influence both the amount of TV someone watches and the risk for violent behavior.

"It's a compelling study because it looks at a large group of children over time, into adulthood," said AMY JORDAN, a senior research investigator at the Annenberg Public Policy Center at the *University of Pennsylvania*.

The study measured only the amount of time spent watching television - not the content of the shows. But JOHNSON and other researchers said TV violence was so pervasive that simply watching a lot almost guaranteed extensive exposure. Experts say three to five violent acts are shown during a typical hour of prime-time television.

A recent analysis by the nonpartisan *Center for Media and Public Affairs*, however, found recent declines in serious violence shown on television, with a 17 percent drop from the 1998-99 season to 2000-01.

Recent studies have shown that American children spend an average of 4 1/2 to 5 hours a day engrossed in television, video games, computers and other media, all of which often have violent content.

Based on his research, JOHNSON urged parents to focus not just on their young children's TV habits but to come up with time limits for their teenagers, too. "It's not so much that parents need to become controlling and punitive," he said. "Rather, parents should realize there are much more wonderful things for their kids to be doing than watching TV."

Time spent in front of the TV means time not spent reading, playing with siblings, socializing with friends, and simply running around letting off steam, experts say.

Today's study will surely add to the often-contentious debate over whether television violence causes real-life violence.

JONATHAN FREEDMAN, a psychology professor at the *University of Toronto*, said he believes that exposure to violence in TV shows, movies and other media does not cause people to develop violent behavior. "My feeling is that aggressive people are aggressive in their behavior and they like aggressive movies and aggressive TV. Stopping them from watching TV is not going to have an effect," said FREEDMAN, who will soon publish a study, financed by the *Motion Picture Association of America*, that rebuts the connection between media violence and violent behavior.

The study in *Science* did attempt to take into account histories of aggression. It found that the link held true both for people who had histories of aggression and for those who did not.

But the study, like most research, is able to show only a link between behaviors, not that more TV watching clearly is the cause of later aggression.

Nevertheless, CRAIG ANDERSON, chairman of the department of psychology at *Iowa State University*, said the latest study provided more evidence that there is a real connection. He said the study was particularly noteworthy because it challenged the commonly held notion that media violence affects only children. "The general view in the public seems to be that if you can tell the difference between fiction and reality, then fictional representations of violence won't have any effect on you," said ANDERSON, who wrote an accompanying article in the journal.

The research team looked at families in *Upstate New York* who were part of a large study exploring a variety of sociological issues. They represented the demographics of the area: 91 percent white and 54 percent Catholic.

L. ROWELL HUESMANN, a *University of Michigan* psychologist who has long-running research showing a connection between exposure to TV violence in childhood and ag-

gressive and violent behavior later in life, said that without a doubt, "more aggressive children grow up to be more aggressive adults."

"I think parents should think about what their teenagers are being exposed to," HUESMANN said, "but my own view is what we really need to be concerned about is what kids 12 and under are being exposed to."

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From the *Philadelphia Inquirer*, Friday, March 29, 2002.

See <http://www.philly.com/mld/inquirer/2958547.htm>

Gender gap in math is down to a fraction

'This is fantastic': National test shows girls are quickly catching up to boys

Heather Sokoloff

Girls have nearly closed the gender gap in mathematics, according to a national test of high-school students. Boys outscored their female classmates by the narrowest of margins in the math test, which 41,000 13- and 16-year-olds wrote last year. The results indicate females are on the threshold of nudging males from their long-held position as the dominant sex in math. "This is fantastic," said PAT ROGERS, a PhD in math who is dean of the University of Windsor's school of education and has written extensively on females and math education. "I never actually thought that girls were less able than boys, and this proves that," Dr. ROGERS said. She said she had to wheedle her best friend into taking advanced math when they were high-school students in the early 1960s. The two were the only girls in the class.

Since the Council of Ministers of Education first administered the national math test, called the *School Achievement Indicators Program* (SAIP), in 1993, girls' scores have leapt. When the test was written again in 1997, the gender gap narrowed further. Still, significant differences remained between male and female 16-year-olds.

But in the 2001 test, boys outscored girls by only a few percentage points. Among 16-year-olds, 48% of girls reached the recommended target level, compared with 53% of boys, in the section on basic math skills. And in problem-solving, 70% of 13-year-old girls reached the target, compared with 65% of boys. Yesterday's results come as good

news to Canadian educators and policy-makers who have targeted girls for more than two decades with programs to get them interested in math.

High schools regularly recruit female engineers and mathematicians for career days to provide role models for teenage girls. In some cases, they hold all-female math classes and tailor course materials to appeal to girls. "I just don't think gender is a factor in mathematics. It was 30 years ago, but so much has changed since then," GEORGE BLUMAN, head of the math department at the *University of British Columbia*, said. At UBC, more than half the first-year calculus class is female, with the women scoring slightly higher marks than the men. Fully 40% of undergraduate math majors at the Vancouver campus are female; the same proportion of women do graduate work in mathematics, Dr. BLUMAN said.

In fact, math is the only subject in which males have maintained a slight advantage over females. In reading, boys lag significantly behind their female counterparts, while girls do as well as boys on national science tests. Girls make up 58% of university graduates in Canada, up from 52% a decade ago. "Are boys going to be superior in anything any more?" PAUL CAPPON, director-general of the *Council of Ministers of Education*, said. "That's obviously an important question if we consider the future of men in the workforce."

Dr. CAPPON said boys' worsening reading abilities could be improved if the issue were given the same attention as girls' achievements in math and science over the past two decades. If left unchecked, he added, the downturn in male literacy will burden the Canadian economy, which relies increasingly on language-based skills. "We are in danger of an enormous transformation of our post-secondary system and gender relations. I am concerned that we might face the situation of women having to take on the all the principal roles," he said.

The one area in which boys remained strongest was in tackling the most difficult sections of the exams. Among 16-year-olds, for example, 3.8% of boys answered the most advanced questions on the test correctly, while only 1.7% of girls attained that high level of performance.

From the *National Post On-line*, Thursday, April 4, 2002.

See <http://www.nationalpost.com/home/story.html?f=/stories/20020404/541598.html>

Lonely school days for students in rural Russia

Russia: 5,679 schools with fewer than 10 students!

Liam Plevin

SENNOYE, Russia - NATASHA GLAZYEVA, 8, gives the correct answer to every math problem posed. When the subject is spelling, she also gets called on each time. And when her teacher checks Natasha's homework in class, she pronounces it flawless.

A smart little girl, clearly. But in this class, the round-cheeked, pony-tailed Natasha is also the only student. In fact, she is the only pupil in the four-room schoolhouse, just as she was last year in this tiny Russian farming village, where the population has been dwindling for decades.

Every nugget of praise from the teacher, YELENA PANFILOVA, is for Natasha alone, and every gentle scolding to work on handwriting or remember a grammatical rule is aimed at her as well. During breaks, Natasha bounces a ball off a wall in an empty classroom or helps PANFILOVA weed around the narcissus outside. In winter, they sometimes go skiing.

After classes on a recent spring afternoon, Natasha said the school is fine, though she added, "Of course, I'd like to play with somebody." But to just about everyone else in Sennoye - and to many Russians beyond - Natasha's predicament is troubling. It also is evidence of a painful problem.

Across this vast country, the population is in decline, and villages such as Sennoye have few jobs with which to hold young families. Cash-strapped governments can try to pay the sometimes-steep cost of keeping open those rural primary schools with declining enrollment. Or they can try to close them, a move some view as tantamount to a death sentence for villages, where the school is often one of the few signs of communal life.

Russia has 5,679 primary schools with fewer than 10 students, most of them in rural areas, according to the education ministry; one official estimated that 200 to 300 of the small schools have only one student.

"Our budget can't support this," said LYUBOV ALYOKHINA, who oversees education in the Ramonsky regional government, which covers most of Sennoye's education costs of about \$1,700 a year and has sought to close Natasha's school for two years.

But Sennoye, which lacks even paved roads, is hanging on. Locals have resisted the efforts so far, relying on a federal law that prohibits shutting a school without local consent, and residents say other children will reach school age soon. "If the people believe that the village will develop, you can't take this hope away from them. Hope is more

expensive than money," said YAKOV LVOVICH, an official in the education department for the state of *Voronezh*.

The reasons for the large number of small schools are straightforward: Russia has a population of about 140 million - just more than half that of the United States - but its people are spread across a land almost twice as large. Industrial migration helped drain many villages during the course of half a century in what was then the Soviet Union, and a lack of rural jobs dims the prospects for a reversal.

Russia's population also is contracting. Nearly twice as many people died last year as were born, and the trend was even more severe in *Voronezh*, where there were a little more than 18,300 births but almost 44,000 deaths.

In the mid-1950s, 560 people were registered at Sennoye's collective farm, an official said, and at least 200 remained in the mid-1970s, according to a longtime resident. Now, the village has about 100 people, most of them older.

Rare are young parents such as Natasha's, who left the former Soviet republic of *Kazakhstan* for Sennoye three years ago because it was the ancestral village of Natasha's father. In Sennoye's spare classrooms, the educational tools bear the marks of age. A turntable holds a record of poetry recitals compiled by the *Ministry of Culture of the Soviet Union*, a country that ceased to exist more than 10 years ago.

Natasha and Panfilova work in the former teachers lounge. On a recent day, the lesson turned to logic sequences, requiring Natasha to break down into five steps the process of getting and eating an apple. She could think of only four steps: picking it, washing it, washing her hands and eating it.

"What else can you do with an apple?" Natasha asked. "Maybe you can cut it with a knife," Panfilova responded. "Why?" Natasha asked. "Just to be civilized. When you have guests, you would cut it, I suppose," Panfilova said. "If I had guests, I would cut it," Natasha agreed. "But when I'm alone, I'll just eat it."

From the Seattle Times, Tuesday, May 7, 2002.

See http://seattletimes.nwsource.com/text/134449691_russstudent07.html.

Abstract appeared on ASCD SmartBrief listserv May 7, 2002.

Russia: Electronic Textbooks for Geometry

I. F. Sharygin

Today, as at all times, mathematics is one of the main subjects studied at high school. Among all mathematical disciplines, geometry plays a special role. It possesses the widest spectrum of educational and cultivating possibilities.

On the other hand, recently, new information and learning technologies have been developed, and a market of electronic learning facilities has already appeared. True, the main efforts are focused on creation of CD ROM versions of standard textbooks. Great possibilities of the Internet are almost not used. Note that the situation with the electronic textbooks on geometry is the worst, both in terms of their context and the ways of their electronic implementations.

Currently, a work on creation of electronic textbooks on geometry, based on the textbooks of the well-known educator I.F. SHARYGIN, has been initiated at the *Institute for Systems Analysis (ISA) of Russian Academy of Sciences*. In addition to SHARYGIN, a number of other well-known scientists and specialists in the field of high-school mathematics take part in this work. Among them are the leading researcher of the Steklov Institute of Mathematics N.P. DOLBILIN, professor of Moscow State University L.KH. SABITOV, high-school teacher R.G. KHAZANKIN, and others. We plan to create electronic textbooks for students of all forms, starting from juniors through upperclassmen. Three learning levels - minimal, normal, and advanced - are suggested. In the process of learning, the student can turn from one level to another.

The software is developed by a large group of high-qualified specialists from the ISA and MSU. The textbooks to be created will be implemented both on CD ROMs and in the Internet environment. The learning methodology will be based on the original author's approach. The students will have an opportunity to be trained by well-known specialists on the real-time basis. Two versions - Russian and English - of the textbooks are developed. If required, they can be translated into other languages. We plan to complete this project by the 10th ICME Congress to be held in 2004 in Copenhagen.

It is quite clear that this project requires not only great intellectual efforts but also considerable financial expenditures. The latter is the most difficult problem we face, which cannot be completely solved inside our country. Therefore, we ask the international mathematical society, as well as all others who are interested in this project, for cooperation.

Please send your suggestions to geometry@isa.ru

Math just doesn't figure in girls' plans for future

Study says boys have more of an interest

Mike Wowk

Girls are less interested in math than boys, but not necessarily worst at it, which may explain why there are fewer female rocket scientists and mathematicians than male, according to a study of Metro Detroit school students.

The recently released study tracked data on 1,821 students from grades six through 12 for 17 years. The researchers wanted to know how students' attitudes toward math changed over a long period of time.

It revealed that girls were less likely to pursue advanced math or science studies if their parents said things like, "I was never good at math," or produced similar negative feelings, said PAMELA DAVIS-KEAN, a *University of Michigan* researcher and one of three authors of the study. "Some of the mothers said they don't think it's feminine (for girls to be good at math)," DAVIS-KEAN said. About 92 percent of the students in the study were white and came from working- to middle-class families. Girls in honors or college-track math classes had slightly higher grades than the boys in all grades, according to the study. In regular or basic math classes, the girls held an even larger edge over the boys.

For both genders, interest in math steadily declined from sixth to the 12th grade. By the time they were high school seniors, the boys in both basic math and in honors math said they had more interest in the subject than girls.

Jessica Van Loon, 17, is not surprised.

"Women are still expected to stay home and cook and clean," said Jessica, as she prepared an experiment in her advanced placement chemistry class at the Utica schools' math, science and technology center. "We need to change the stereotyped gender roles. But my parents have been very encouraging for me (to go into a technical occupation)," Jessica said.

DEBBIE FERRY, a math consultant for the Macomb Intermediate School District, said the new study confirms her teaching experience. "When I was a math teacher, we had as many girls as boys in the higher-level math classes," Ferry said. "But when you ques-

tioned them about their career plans, the girls typically didn't choose a career (that included math). They had other interests."

Because they have less interest in math, some high school girls choose not to enroll in advanced math courses, said MONICA LEASURE, an administrator with the Macomb Intermediate School District.

DAVIS-KEAN said the analysis into why girls have less interest in math is still preliminary. But the parent-daughter connection is the most intriguing early guess. "This lack of interest appears to be forming early ... earlier than junior high school," she said.

The first students in the 17-year U-M study are now adults in their 30s. The next step in the research is to see careers the women chose and compare those findings to their earlier interest in math, DAVIS-KEAN said.

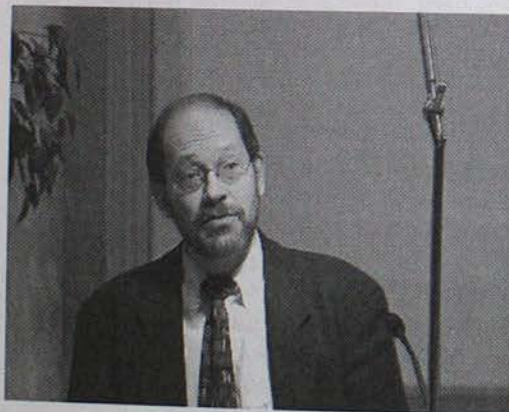
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The 17-year study comparing math aptitude of more than 1,800 Metro Detroit female and male students in grades 6-12 looked at the following information:

- * School grades
- * Adolescents' interest in math
- * Scores on seventh-grade MEAP tests
- * Adolescents' gender
- * Levels of mothers' education

Source: Influences of Gender on Academic Achievement, by Miriam R. Linver, Pamela E. Davis-Kean and Jacquelynne S. Eccles.

From the Detroit News, Tuesday, June 4, 2002.



"Ich freue mich auf die in Zukunft noch engere Zusammenarbeit der beiden Gesellschaften."

Prof. Dr. Peter Gritzmann, Präsident der Deutschen Mathematiker-Vereinigung in seinem Grußwort zur Eröffnung der GDM-Jahrestagung in Klagenfurt am 25.2.2002

Quantitative Literacy: Why Numeracy Matters for Schools and Colleges

Lynn Arthur Steen⁴

"As our society is driven increasingly by science and technology," observed NSF Director RITA COLWELL at a recent Washington forum, "the need to establish levels of quantitative literacy becomes ever more important." Using the anthrax crisis as an example, COLWELL showed how the public would have benefited from better scientific and quantitative literacy. "When we have little direct control over our fate, a firm understanding of probability can alleviate some of the stress."

COLWELL's remarks were made to an audience of over 100 scientists, mathematicians, educators, and policy leaders at a forum on *quantitative literacy* (QL) held at the National Research Council last December. Supported by the Pew Charitable Trusts, the forum was sponsored by the National Council on Education and the Disciplines (NCED) and hosted by the Mathematical Sciences Education Board (MSEB) in cooperation with the MAA. A report on the forum, including background papers distributed to participants and a white paper on quantitative literacy will be published later this spring. (The current version of the white paper is online at <http://www.woodrow.org/nced/QLwhitepaper.pdf>.)

For purposes of discussion, the forum's white paper defines quantitative literacy (also called "numeracy") as the "quantitative reasoning capabilities required of citizens in today's information age." Speakers elaborated on this broad definition in various ways. Harvard mathematician DANIEL GOROFF illustrated QL with applications of Bayes' theorem to health policy; Yale mathematician ROGER HOWE emphasized the policy implications of understanding orders of magnitude and significant digits.

Retired General Electric engineer WILLIAM STEENKEN, citing the importance of "six-sigma" performance expectations in industry, said that business would be "ecstatic" if high school and college graduates were quantitatively literate. Limnologist DAVID BRAKKE, Dean of Science and Mathematics at James Madison University, spoke of the need to understand rates, risks, and variability in managing natural resources, and of the increasing role of quantitative reasoning in legal matters such as DNA fingerprinting and interpretation of laws about endangered species. "The most important constraint on

⁴ Copyright the Mathematical Association of America (MAA). All rights reserved. This article was first published in the February 2002 issue of Focus, the newsletter of the MAA; pp.8-9.

public policy," argued Johns Hopkins economist ARNOLD PACKER, "is public ignorance."

Despite occasional confusion about the curricular relations between mathematics, statistics, and quantitative literacy, participants spent relatively little time seeking a precise definition. Indeed, prior to the forum participants had studied a surfeit of proposed definitions, some provided by authors of nine background papers, others by the recent NCED volume *Mathematics and Democracy* (available from the MAA). Most of the discussion focused on implications for educational policy of a commitment to achieve the appropriate levels of quantitative literacy that RITA COLWELL emphasized in her remarks.

One challenge was conveyed by ANTHONY CARNEVALE, Vice President for Public Leadership of the Educational Testing Service (ETS). He asserted, with uncommon eloquence, that quantitative literacy is not so much about mathematics and democracy as about the "democratization of mathematics." Citing data from many sources, he argued that mathematics education has always been about separation - of rich from poor, of boys from girls, of elites from plebeians. Mathematics, reported CARNEVALE, is the "biggest barrier to upward mobility in educational attainment."

Business would be "ecstatic" if graduates were quantitatively literate.

Because of the strong association of mathematics with economic success, mathematics education has had the effect - if not the aim - of affirming existing social structures. CARNEVALE argued that the QL movement is really part of a much larger societal effort towards increased democratization. While conceding that a segregated economy headed by mathematically trained elites is efficient from a strictly economic perspective, he urged the QL movement to focus on egalitarian rather than economic goals.

A different challenge came from JANIS SOMERVILLE, Senior Associate with the National Association of (College and University) System Heads. SOMERVILLE described the incoherence of messages about mathematics conveyed in the transition from high school to college, where different tests (high school exit, college admissions, college placement) administered at different times for different purposes stress very different aspects of mathematics. For many reasons, these inconsistencies have disparate impact on students from different socio-economic groups so that by age 24, the proportion of youth from high-income families who have graduated from college is seven times that of those from low-income families. And, as CARNEVALE's data shows, mathematics is the biggest contributor to this differential.

SOMERVILLE cautioned participants not to make a bad situation worse by adding quantitative literacy to this mix without first resolving the dilemma that might be created if schools adopted two different tracks - algebra, trig, calculus for elites, quantitative literacy for others, most of whom will be either poor or minority. NCTM president-elect JOHNNY LOTT observed that in such a system the calculus-bound students might be the most ill-served since they receive a much narrower foundation in mathematics.

Several papers and participants added an international perspective to the forum's QL discussions. MSEB member JAN DE LANGE of the Freudenthal Institute in Utrecht argued in a background paper that **mathematical literacy** is a broader and better term than QL. Moreover, he asserts, if mathematics were taught as it should be taught - for reasoning rather than for mastery of algorithms - there would be little need for a distinction between mathematics and mathematical literacy. MICHEL MERLE of the University of Nice described plans of a commission in France to refocus school mathematics on four areas of contemporary importance: geometry, numeracy, statistics, and computer science. MOGENS NISS of Roskilde University in Denmark, former secretary of the International Commission on Mathematical Instruction (ICMI), described similar changes under way in Denmark in which the school mathematics curriculum will be defined not by a list of topics but by the characteristics of different levels of proficiency in relation to a core set of mathematical competencies (e.g., reasoning, argumentation, communication, modeling, representation).

Quantitative literacy is not a curriculum but an approach to pedagogy.

In a robust discussion, participants reacted to what they had heard in the context of what they know from their own experiences. LINDA KIME (University of Massachusetts) and DON SMALL (US Military Academy) suggested focusing QL efforts on college algebra because "that is what everybody takes." LINDA ROSEN, Vice President for Education of the National Alliance of Business, reminded participants of the "accountability juggernaut" that is bearing down on education, and urged advocates of QL to think more carefully about how to "scale up" to levels that can have a measurable impact. CHARLOTTE FRANK, vice president of McGraw Hill and a member of the New York State Board of Regents, pointed out that QL will not happen unless it is measured in assessments. GENE BOTTOMS of the Southern Regional Education Board (SREB) urged greater flexibility in mathematics instruction: "It shouldn't take 36 weeks to fail Algebra I." Arizona mathematician WILLIAM MCCALLUM said that other disciplines need to take ownership of QL, since QL cannot succeed if it remains only an initiative within mathematics departments.

Indeed, JEANNE NARUM opened the forum by suggesting how QL can support the "what works" philosophy of the science-oriented Project *Kaleidoscope* which she directs. GEORGE (PINKY) NELSON, director of AAAS Project 2061 - a major national K-12 program designed to bring science to all Americans - saw in QL an opportunity for much-needed increased cooperation between science education and mathematics education. He suggested that the social sciences may be best suited to take the lead in supporting QL across the curriculum.

In summarizing major themes of the forum, AMS President and former MSEP chair HYMAN BASS noted the nearly unanimous view that quantitative literacy must be taught across the curriculum (or perhaps "in the disciplines" which is not quite the same thing). While mathematics and statistics contribute central knowledge and skills, other disciplines provide the context so important for quantitative literacy. A second observation, echoed by many participants, is that quantitative literacy is not a curriculum (and certainly not a single course), but an approach to pedagogy. RUSSELL EDGERTON, former president of the American Association of Higher Education (AAHE) linked these observations together: "The more that QL education is about pedagogical practices (for example, the kinds of assignments students are given), the wider the possibilities are that many courses across the curriculum can contribute to students' quantitative literacy."

One outgrowth of the forum is a National Numeracy Network (NNN) that is being created to help support schools and colleges that are exploring ways to infuse QL into their curricula. The NNN will provide support in five areas: policy, practice, professional development, dissemination, and assessment. Several centers will serve as the core of NNN; current centers and directors include:

Trinity College: JUDITH MORAN, judith.moran@trincoll.edu

Dartmouth College: KIM RHEILANDER, kim.v.rheilander@dartmouth.edu

The Washington Center: EMILY DECKER, deckere@evergreen.edu

The K-12 TORCH program: RICHARD BENNETT, bennett@woodrow.org

SUSAN GANTER (sganter@clermson.edu) of Clemson University is director of National Numeracy Network.

Further information about NNN can be obtained from GANTER or from one of the NNN Centers; further information about the NCED initiative in quantitative literacy is available on the web at http://www.woodrow.org/nced/quantitative_literacy.html.

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The MET Summit: Some Personal Comments

Ann Watkins⁵

Along with many MAA members, Executive Director TINA STRALEY, Secretary MARTHA SIEGEL, and Past President TOM BANCHOFF, I attended the National Summit on the Mathematical Education of Teachers held near Washington, DC November 2-3. Almost everyone at the Summit already was committed to working with teachers, and many were very experienced in doing so. The small-group sessions where the presenters had research results to report on how to teach mathematics more effectively to teachers or where the presenters had successful practices to share were very well received.

For example, ROB GOULD of the Statistics Department at UCLA and CHRIS FRANKLIN of the Statistics Department at the University of Georgia presented an excellent session on "Teaching Statistics to Future High School Teachers." Both Rob and Chris have worked with teachers in the Advanced Placement Statistics program and have popular courses for preservice and inservice teachers on their own campuses. The audience was very interested in hearing how Chris has established a productive working relationship with the School of Education and how Rob designed his course with the help of experienced statistics teachers in Los Angeles. (One of the interesting things that has happened as a result of the AP Statistics program is that high school teachers have been seeking out statisticians who are known to communicate well with teachers, and asking them for special courses.) Chris and Rob also demonstrated some activities that work well with teachers and that they can use with their own classes.

I attended another well-received session given by DEBORAH SHIFTER of EDC. She showed videotapes of elementary school students working on problems designed to help them understand concepts about the decomposition of geometric figures so they eventually would be able to understand the geometric proof that the area of a triangle is half that of the surrounding rectangle. We read transcripts of teachers working on the same idea and having difficulties similar to those of the children. For example, some of the teachers did not see that the rectangle contained two pairs of congruent triangles, apparently since one congruent triangle was a rotation of the other, not the easier-to-see reflection across a line. Another teacher needed help understanding that base and height could be the same as length and width. The lesson I came away with was, once again, that something that seems very obvious to us, like this proof, requires prerequisite knowledge that must be built up carefully. The videotapes and transcripts demonstrated how that can be done. This was very valuable research.

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