

# References and Supplementary Materials

for David Klein's Presentation

Math Seminar

American Enterprise Institute

March 4, 2002

1. **Mathematically Correct** ([www.mathematicallycorrect.com](http://www.mathematicallycorrect.com)) is a grassroots organization, with zero funding, created by parents who were frustrated by the low quality math programs their children were getting in schools. The Mathematically Correct website has a variety of resources contributed by parents, mathematicians, scientists, engineers, educational psychologists, and other scholars. These include analyses and criticisms of "fuzzy math" books. Mathematically Correct is the leading national organization in the battle against "fuzzy math." Many of the programs criticized on the Mathematically Correct website were created with National Science Foundation funding, and they continue to be aggressively promoted by the National Science Foundation.

2. **The National Science Foundation Systemic Initiatives: How a Small Amount of Federal Money Promotes Ill-Designed Mathematics and Science Programs in K-12 and Undermines Local Control of Education**, by Mike McKeown, David Klein, and Chris Patterson. This essay is Chapter 13 of the book, *What's at Stake in the K-12 Standards Wars: A Primer for Educational Policy Makers*, edited by Sandra Stotsky, Peter Lang Publishing, Inc., New York, 2000. The chapter examines the damage to K-12 mathematics education caused by the Education and Human Resources Division of the National Science Foundation.

3. **An Open Letter to Former U.S. Secretary of Education Richard Riley** (<http://mathematicallycorrect.com/nation.htm>). In October 1999, the U.S. Department of Education released a list of 10 so-called "exemplary" and "promising" math programs that it recommended for the nation's 15,000 school districts. Six of these programs were created with NSF funding, and others were promoted and distributed with NSF funding. Parents and mathematicians have opposed and criticized these "exemplary" and "promising" curricula for several years. In response, 220 mathematicians and other scholars co-signed an open letter that was sent to U.S. Education Secretary Richard Riley in November 1999. The letter called upon the Secretary "to withdraw the entire list of 'exemplary' and 'promising' mathematics curricula, for further consideration, and to announce that withdrawal to the public." Among the signers

of this open letter were many of the nation's most accomplished scientists and mathematicians. Department heads at more than a dozen universities along with two former presidents of the Mathematical Association of America also added their names in support. Seven Nobel laureates and winners of the Fields Medal, the highest international award in mathematics, co-signed the letter. Ignoring the letter, the Education and Human Resources Division of the National Science Foundation continues to promote destructive K-12 math programs.

**4. Math Problems: Why the U.S. Department of Education's recommended math programs don't add up**, ([www.mathematicallycorrect.com/usnoadd.htm](http://www.mathematicallycorrect.com/usnoadd.htm)) by David Klein, published in the *American School Board Journal*, April 2000. This article explains what is wrong with the fuzzy math programs listed in the Open Letter to U.S. Education Secretary Riley (see item 3).

**5. A Brief History of American K-12 Mathematics Education in the 20th Century** ([www.csun.edu/~vcmth00m/AHistory.html](http://www.csun.edu/~vcmth00m/AHistory.html)), by David Klein, August 2001. This general reference gives an overview of the conflicts over mathematics education in the U.S. for the past century, focusing on the "math wars" of the 1980s and 1990s, up to the present. It includes detailed examples of NSF funded programs that undermine sound education.

**6. High Achievement in Mathematics: Lessons from Three Los Angeles Elementary Schools**, ([http://brookings.org/dybdocroot/gs/brown/bc\\_report/2000/LosAngeles.PDF](http://brookings.org/dybdocroot/gs/brown/bc_report/2000/LosAngeles.PDF)), by David Klein, a report commissioned by the Brookings Institution, August 2000. This paper gives examples of low income elementary schools, whose students are primarily African American and Hispanic. The students excel in traditional math programs that are essentially the polar opposites of the NSF/NCTM math programs.

**7. Big Business, Race, and Gender in Mathematics Reform** ([www.csun.edu/~vcmth00m/krantz.html](http://www.csun.edu/~vcmth00m/krantz.html)) by David Klein. This is an appendix to the book, *How to Teach Mathematics* (second edition) by Steven Krantz, American Mathematical Society, 1999. The second section analyzes claims about "learning styles" associated with race and gender.

**8. NCTM Math in the NCEE America's Choice Performance Standards** (<http://wgquirk.com/NCEE.html#high>), by Dr. Bill Quirk. This site gives a detailed analysis of, and a description of, the shortcomings of the math standards promoted by the National Center on Education and the Economy (NCEE). These defective math standards are used in New York City and are consistent with mathematics programs opposed by parents and mathematicians.

9. **TERC Hands-On Math: A Snapshot View** (<http://wgquirk.com/TERCSV.html>) by Dr. Bill Quirk. This webpage explains why parents are opposed to the **NSF funded K-5 program, TERC: Investigations in Number, Data, and Space**. From the website: *TERC students never learn about dividing fractions, and they never learn general methods for adding fractions. They do learn a hands-on method for adding two proper fractions with denominators less than 7, but this paper-folding method doesn't work if the denominator of the sum fraction isn't also less than 7.*

10. **Basic Skills Versus Conceptual Understanding: A Bogus Dichotomy in Mathematics Education**, ([www.aft.org/publications/american\\_educator/fall99/wu.pdf](http://www.aft.org/publications/american_educator/fall99/wu.pdf)), by Hung-Hsi Wu. *American Educator/American Federation of Teachers*, Fall 1999. This paper, written by a mathematics professor at UC Berkeley, explains the impossibility of separating basic skills from conceptual understanding in mathematics.

11. **Congressional Testimony of R. James Milgram**, February 2, 2000 ([www.house.gov/ed\\_workforce/hearings/106th/ecyf/fuzzymath2200/milgram.htm](http://www.house.gov/ed_workforce/hearings/106th/ecyf/fuzzymath2200/milgram.htm)) Dr. Milgram is a professor of Mathematics at Stanford University. This link gives his testimony before the U.S. House of Representatives Committee on Education and the Workforce. Dr. Milgram explained, *It was the use of TERC in one school system in Massachusetts, which prompted numerous members of the Harvard Mathematics Department to sign the open letter to Secretary Riley. The support for these programs in the Department of Education is ultimately the responsibility of the Education and Human Resources Department, EHR, at the National Science Foundation.*

## **NSF funded projects: Examples**

### **NSF funded Physics program meets resistance in San Diego**

Published in *La Prensa, San Diego*:

<http://www.laprensa-sandiego.org/archieve/july13/debeck.htm>

**July 13, 2001**

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### **San Diego Adopts a "Rigorous" College Prep Physics Program Using Textbook Dollars for Skateboards and Bathroom Scales**

**From the Office of John de Beck  
San Diego School District Board Member**

In a move reminding observers of the Defense Department expenditures for toilet seats, San Diego City Schools bought \$377,309 worth of instructional supplies to support a "rigorous"

high school physics program that has enriched one publisher to the tune of nearly \$3 million. Anthony Alvarado, the school district's imported educational guru from New York and the Chancellor of San Diego's Institute for Learning, said when he recommended the course to the board, "The course fully meets the University of California admission requirements for physics."

"If it does, then Classic Comics will meet their English Literature requirements!" chided Board of Education Member John de Beck, who adamantly opposed the proposal.

On April 24, in a span of less than three weeks, the San Diego Board of Education adopted the course which all high school freshmen will be required to take. Unrevealed at the time of the vote, the instructional supplies for the course included about 40 skateboards for each school, and such "scientific" equipment as brooms, bathroom scales, traffic cones, air pucks and safety goggles.

Ironically, the school district had worked for years to get a city ordinance passed that prohibits skateboards on school grounds. It states that, "No person shall ride on any skateboard, roller-blade, or similar-type device on any property owned by any school district that has a policy prohibiting such use and which displays a sign at the main entrance to the (school) property. (Municipal code 84.12)" The District policy is posted at every district school.

The instructional supplies for each science department for this one class exceeds the entire expenditure for all other high school science classes combined, according to district science department chairpersons. One award-winning science teacher at La Jolla High, Martin Teachworth, whose students regularly sweep local, state and national science fairs, stated that teachers were never consulted or allowed to review the course prior to its adoption by a 3-2 vote by the Board of Education.

Bud Hamilton, a veteran high school science teacher at Point Loma High said, "We don't have enough money for microscopes or high-tech science instruments, but we can spend valuable instructional dollars for brooms, skateboards and bathroom scales. What about precision scales, laser measuring instruments, hard-to-get specimens or expensive chemicals so that kids can do complex and challenging experiments?"

Board Member John de Beck, who was one of the two board members to vote against adopting Active Physics said, "The entire program is 'funny book' science! The board was never presented any information about the need to buy skateboards, nor were the high school science teachers given copies of the textbooks before we acted. When I forced the issue and got the books two days before the vote, I publicly stated that this work was too easy, and maybe appropriate for middle school or upper elementary kids. Only Fran Zimmerman believed me!"

The first time that de Beck heard of the skateboards was weeks after the adoption vote, when he received a query from a concerned citizen who wanted to know why the district was buying skateboards without getting appropriate safety equipment. "I hate being blind-sided and told about stupid district decisions by my community," he remarked. The query set him off on another study of the entire program. "I was against it when it passed, but was willing to accept the majority vote... until I found out how much information was withheld from the board at the

time of the adoption. This information omission is unacceptable staff behavior, and they will not hear the end of it. We wasted millions on this course, and now we will have all kinds of damage control and disingenuous explanations and finger pointing. I'll bet they even say the order for the skateboards was an error, even though it is included in Active Physics kits throughout the country!" According to estimates taken from staff reports, the total cost of the course adoption exceeds \$3 million, including staff training.

Numerous community members agree that this was a bad decision, and even the local newspaper (The San Diego Union-Tribune) which has repeatedly sided with Superintendent Bersin, urged caution about adopting the course in an unprecedented editorial.

In the days following the brouhaha over the skateboards, District Science Specialist, Kim Bess, was in full damage control mode after one high school refused to accept the skateboards. Nearly one month after the materials were received, she issued a cover-up memo directing school principals to make sure that the skateboards were to be used only by teachers to demonstrate Newton's Third Law of Motion. Upon hearing this, one teacher exclaimed, "Wow, now I know where to go this summer for staff training. I can join my son at the skateboard park! But what do I do with the other 39 skateboards?"

Marc Knapp, president of the local teacher's union said, "In San Diego, reform is an apple pie issue, and three votes are assured for anything with that label as long as Superintendent Alan Bersin recommends it. When you hire people who have never done the job they are supervising, you really can't expect them to make good educational decisions," said Mr. Knapp. "We have people with Ph.D's and advanced degrees in science being told what and how to teach by lawyers, politicians and self-proclaimed curriculum experts who aren't qualified, and don't have as much science education as most of our teachers do!"

Ron Ottinger, a supporter of all of the Superintendent's recommendations including the science class and the materials, continued his support and declared the course to be "just what was needed to bring kids up to the demands of the 21<sup>st</sup> century."

Board Member Frances O'Neil Zimmerman, who voted no on the adoption said, "The real tragedy is that the kids are being hurt, and resources are being wasted. We should be listening to the teachers... they know how to deliver high quality instruction! Something in San Diego City Schools has to change, and soon!"

# Sample 12th Grade Math Problem From NSF Funded Project

<http://www.educ.msu.edu/mars/>

[\[Services\]](#) | [\[Tasks\]](#) | [\[Materials\]](#) | [\[Clients\]](#) | [\[People\]](#) | [\[Contacts\]](#) | [\[Home page\]](#)



Balanced Assessment Project: Michigan State - Berkeley - Shell Center

Grade 12 - Sample Task 1 (Short version)

[Full version](#) ▶

## Toilet Graph

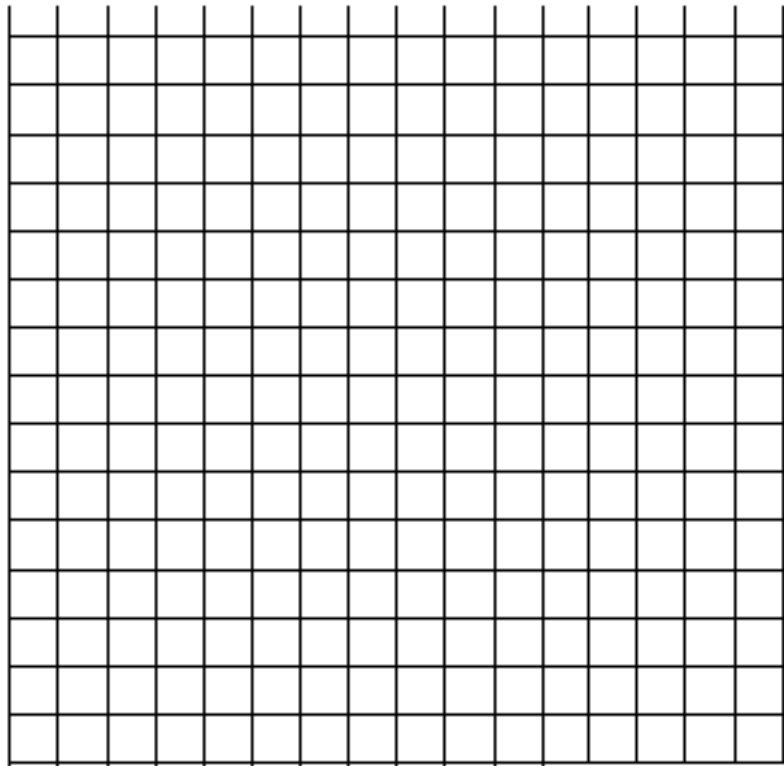
The aim of this assessment is to provide you with the opportunity to:

- Sketch a graph of the way a quantity varies with time.



In the situation below, identify a quantity that varies with time. (There may be more than one interesting choice.) Sketch a graph showing **how** the quantity varies with time:

The water tank of a toilet is full. Someone flushes the toilet. The tank refills.



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Here is [the full version of the task](#) including an overview, sample solution, instructions for classroom use, characterizing performance (scoring), and samples of student work (about 55K)

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▲ Index ▲

▲ Home ▲

Full version ►

**MARS**

Page updated 4 March 1998  
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**MARS**

# **Press Release Protesting Fuzzy Math from the New York City Parents' Group, NYC HOLD**

NYC HOLD Honest Open Logical Debate on math reform: A Coalition of Concerned Parents, Educators, Mathematicians and Scientists working to improve mathematics education in New York City schools.

FOR IMMEDIATE RELEASE

January 22, 2002

Contact: Elizabeth Carson, Co-Founder NYC HOLD  
phone: 212.529.1302 Cell: 917.208.7153 E-mail: [ecarson@nyc.rr.com](mailto:ecarson@nyc.rr.com)

**BOARD OF EDUCATION IGNORES PARENT'S AND MATHEMATICIAN'S PLEAS**

**PLANS TO APPROVE \$9 MILLION TO FUND INSTRUCTIONAL AND PROFESSIONAL DEVELOPMENT SUPPORTING FUZZY MATH**

At the next Calendar meeting, Wednesday evening, January 23, the NYC Board of Education will consider approval of two resolutions submitted by Chancellor Levy (agenda items #1 and #2 ) to approve over \$ 9 million in contracts funding, in large part, support for the National Council of Teachers of Mathematics (NCTM) Standards-based instructional development and programs (e.g. TERC, Everyday Math, CMP, Math in Context, ARISE, IMP, Math Trailblazers) and one contract to TERC, specifically, for professional development services to District #2, #10 and #15.

The list of selected Vendors, together with the Board's Request for Proposals (that outlines solicitation of constructivist NCTM based instructional and professional development (see RFP NUMBER: 1B647 excerpts at the end of this message) is a slap in the face to every parent who is or has spent untold hours tutoring their child, or spent thousands of dollars on private or institutional tutoring. It is a slap in the face to parents who have taken the time to articulate their experiences and concerns with district and Central Board officials, who have pleaded for better programs, and who have made good faith attempts to appeal to reason and common sense.

The Board's refusal to consider the expertise of highly distinguished mathematicians and scientists represents an incredible act of arrogance.

The Board's actions and pending approval of increased funding to support NCTM Standards-based programs and professional development in total represent a deliberate disregard for clear and compelling evidence indicating the NCTM Standards-based programs are failing our children; and a complete and utter lack of responsiveness and accountability to the NYC community.

The Chancellor and the members of the Central Board have received countless letters and heard compelling testimony from concerned parents. The Chancellor Board members and top education officials have received many references with which to inform them of the controversial nature of the NCTM Standards-based programs; the history of implementation, parental objections, and the program's ultimate failure in other communities across the country. The Chancellor and members of the Central Board have recently received letters and heard testimony from concerned mathematicians and scientists. The Board has chosen to completely ignore all communications.

The Chancellor and the members of the Central Board have ignored repeated requests for their attendance (or that of a representative) to hear concerned parents' and mathematicians' testimony to the District 2 school board regarding TERC, CMP and ARISE. The Chancellor and the members of the Central Board chose to ignore invitations to attend (or send a representative) the Math Forum held at the NYU Law School held last June, where a panel of distinguished mathematicians and scientists from Harvard, NYU, CUNY and the University of Rochester presented their analysis and concerns with the NTCM Standards-based programs now in place in over 50% of NYC public schools.

## **How Do Children Really Learn Mathematics? An Alternative to the NCTM/NSF Point of View**

The following passage is quoted from page 341 of the book, *How The Mind Works*, by Steven Pinker, professor of Linguistics at MIT :

The...way to get to mathematical competence is similar to the way to get to Carnegie Hall: practice. Mathematical concepts come from snapping together old concepts in a useful new arrangement. But those old concepts are assemblies of still older concepts. Each subassembly hangs together by the mental rivets called chunking and automaticity: with copious practice, concepts adhere into larger concepts, and sequences of steps are compiled into a single step. Just as bicycles are assembled out of frames and wheels, not tubes and spokes, and recipes say how to make sauces, not how to grasp spoons and open jars, mathematics is learned by fitting together overlearned routines. Calculus teachers lament that students find the subject difficult not because derivatives and integrals are abstruse concepts – they're just rate and accumulation – but because you can't do calculus unless algebraic operations are second nature, and most students enter the course without having learned the algebra properly and need to concentrate every drop of mental energy on that. Mathematics is ruthlessly cumulative, all the way back to counting to ten.

Evolutionary psychology has implications for pedagogy which are particularly clear in the teaching of mathematics. American children are among the worst performers in the industrialized world on tests of mathematical achievement. They are not born dunces; the problem is that the educational establishment is ignorant of evolution. The ascendant

philosophy of mathematical education in the United States is constructivism, a mixture of Piaget's psychology with counterculture and postmodernist ideology. Children must actively construct mathematical knowledge for themselves in a social enterprise driven by disagreements about the meanings of concepts. The teacher provides the materials and the social milieu but does not lecture or guide the discussion. Drill and practice, the routes to automaticity, are called "mechanistic" and seen as detrimental to understanding. As one pedagogue lucidly explained, "A zone of potential construction of a specific mathematical concept is determined by the modifications of the concept children might make in, or as a result of, interactive communications in the mathematical learning environment." The result, another declared, is that "it is possible for students to construct for themselves the mathematical practices that, historically, took several thousand years to evolve."

... constructivism has merit when it comes to the intuitions of small numbers and simple arithmetic that arise naturally in all children. But it ignores the difference between our factory-installed equipment and the accessories that civilization bolts on afterward. Setting our mental modules to work on material they were not designed for is hard. Children do not spontaneously see a string of beads as elements in a set, or points on a line as numbers. If you give them a bunch of blocks and tell them to do something together, they will exercise their intuitive psychology for all they're worth, but not necessarily their intuitive sense of number. (The better curricula explicitly point out connections across ways of knowing. Children might be told to do every arithmetic problem three different ways: by counting, by drawing diagrams, and by moving segments along a number line.) And without practice that compiles a halting sequence of steps into a mental reflex, a learner will always be building mathematical structures out of the tiniest nuts and bolts, like the watchmaker who never made subassemblies and had to start from scratch every time he put down a watch to answer the phone.

Mathematics is deeply satisfying, but it is a reward for hard work that is not itself always pleasurable. Without the esteem for hard-won mathematical skills that is common in other cultures, the mastery is unlikely to blossom. Sadly, the same story is being played out in American reading instruction. In the dominant technique, called "whole language," the insight that language is a naturally developing human instinct has been garbled into the evolutionary improbable claim that reading is a naturally developing human instinct. Old-fashioned practice at connecting letters to sounds is replaced by immersion in a text-rich social environment, and the children don't learn to read. Without an understanding of what the mind was designed to do in the environment in which we evolved, the unnatural activity called formal education is unlikely to succeed.

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# NCTM and NSF Denounce California State Mathematics Content Standards

The California Mathematics Standards, developed with the assistance of mathematicians at Stanford University, were adopted by the California State Board of Education in December 1997. The Fordham Foundation ranked the California Mathematics Standards the best in the nation. These standards, pitched at the international level, have already contributed to substantial improvement in mathematics education in California, and these standards have served as a model for other states. What was the reaction of the National Council of Teachers of Mathematics and the National Science Foundation to these standards? The NCTM newsletter below explains (read column one on all following pages, then column two on all following pages).

## News Bulletin Online

NCTM: News Bulletin: Feb 1998: Cover Story

### New California Standards Disappoint Many

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Mathematics education in California suffered a serious blow in December. Over protests from business, community, and education leaders, California's state board of education unanimously approved curriculum standards that emphasize basic skills and de-emphasize creative problem solving, procedural skills, and critical thinking.

The California standards omit among other things estimation, recognition of relationships among operations and concepts, the development of skills related to pattern recognition, and the use of calculators. Although teachers aren't mandated to follow the state standards, the statewide tests will be based on them. Protest and concern about the California standards came from all across the country.

In a letter to Yvonne W. Larson, president of the California state board of education, NCTM President Gail Burrill wrote, "Today's children cannot be prepared for tomorrow's

on such shows as NBC's Today Show and ABC's Good Morning America have helped highlight the importance of problem solving and the use of technology in conjunction with the understanding of basics.

But in informing the public, the Council has a formidable task. Recently, catchy but deceptive sound bites regarding NCTM Standards-based curricula have dominated headlines.

The public debate reveals that some people misunderstand what should go on in a truly Standards-based classroom. One of the most contentious areas is the idea of basics, which some people mistakenly claim the NCTM Standards throw out. Because the Standards emphasize problem solving, it is misinterpreted to mean that the basics aren't needed. Yet the Curriculum Standards explicitly states that students should "model, explain, and develop reasonable proficiency with basic facts and algorithms"(p. 44).

increasingly technological world with yesterday's content. While basic skills continue to be important, all students need access to content that will prepare them for a different world where ... important mathematics includes operations research, statistics, probability, and discrete mathematics.... The vision of important school mathematics should not be one that has no relation to reality, ignores technology, focuses on a limited set of procedures, and characterizes reasoning and thinking mathematically as following a set of prescribed steps. California's children deserve more."

Luther S. Williams, assistant director for education and human resources at the National Science Foundation, wrote, "The wistful or nostalgic 'back-to-basics' approach that characterizes the board standards overlooks the fact that the approach has chronically and dismally failed. It has excluded youngsters from engaging in genuine mathematical thinking and therefore true mathematical learning, and has produced a disproportionately mathematically illiterate citizenry."

Williams concluded, "We disagree, decisively, with the board's decision to systematically remove components from the standards that focus on problem solving and other elements of the rigorous and powerful use and learning of mathematics."

The revised California standards specify what students should know at varying levels and by subject for grades 8 through 12. This delineation isolates the teaching of subjects such as algebra and geometry.

William H. Schmidt, executive director for the U.S. Center for the Third International Mathematics and Science Study, noted that "teaching algebra and geometry during the same year, a common practice in virtually all the TIMSS participating countries ... recognizes that to isolate algebraic and geometric concepts into

Other concerns involve the use of calculators and computers. The Curriculum Standards says that tools such as calculators "do not replace the need to learn basic facts, to compute mentally, or to do reasonable paper-and-pencil computation" (p. 19). The Standards makes it clear that when used appropriately, calculators and computers enable students to explore new areas of mathematics and tackle many challenging mathematical problems that they couldn't otherwise try without such tools.

Standards phrases taken out of context in the public debate sometimes take on new, often false, meanings. Bill Jacob, a professor of mathematics at the University of California at Santa Barbara, observed the same phenomenon in his eight months working on the California Framework Committee. Committee discussions of reform efforts in California uncovered several misinterpretations. For instance, some misinterpret the idea of "the process is as important as the product" to mean "it's okay to get wrong answers as long as you have fun." Or the concept of "integrated math" to mean "teaching watered-down algebra and geometry." Or even the process of "estimation" to stand for "guess even when a precise answer is possible." Each of these is an exaggeration or misinterpretation. Jacob adds that "often such misrepresentations are accompanied by a classroom example that nobody would be happy with, and the example is used to obscure one's response to the real issue."

Among other NCTM plans, the NCTM External Relations Committee (ERC) is developing a resource kit that teachers can use in communicating with parents about the importance of mathematics for their children. The ERC also plans to assemble resource materials for state policy leaders (look for more information in future News Bulletins).

insular classes is to not help students recognize the connections among these concepts."

California's move to a more traditional education is largely seen by Standards supporters as a step backward for students. Accordingly, to convey the true message about the Standards, NCTM has become more vocal on the national level. Recent appearances by NCTM leaders

The continuing discussions--despite the disagreements--have the potential to be constructive. For regardless of differing opinions, all stakeholders share a common goal: to provide the best possible mathematics education to all our children--one that will enable them to succeed in the world outside the classroom.