

ALIGNING GOALS AND RESOURCES

FOSTERING NETWORKS OF SUPPORT FOR STANDARDS-BASED MATHEMATICS

SIGNIFICANT LEARNING

During a two-day meeting in a small Minnesota town, parents, community members, teachers and administrators gathered to learn about standards-based mathematics. As part of the Friday evening activities, the SciMath^{MN} mathematics project leader and Minnesota Department of Children, Families & Learning mathematics specialist facilitated a discussion about the nature of learning. They asked attendees to close their eyes and think back over the last year or two to a time when they had learned something at a high and significant level. Participants compared their learning experiences and, when asked, listed elements common to all their experiences. They said that significant learning meant that the situation was real, involved something that the learner really wanted to do or cared about, required their active, hands-on participation, had them working with others giving meaning to situations, included solving problems to the questions they named themselves, and required them to demonstrate solutions. Their learning drew directly from their experience and forced them to overcome barriers. They found that they were motivated to succeed as much from inside themselves as from outside pressures, they learned more when they worked with others, and learning was either fun or very satisfying.

The facilitators then asked participants to discuss with the others at their table how the learning they'd just described compared to the learning they did in school. When the comments were shared, one table said that none of them ever had hands-on, active involvement in learning. Another group said the best teachers engaged students in a similar fashion to the list they'd made. A teacher who had been using a standards-based curriculum said their schooling didn't include the qualities listed earlier, but they were learning to teach that way with their new mathematics curriculum materials. At another table some teachers reported that parents were wondering about the math because the kids were having so much fun, could they possibly be learning? Another teacher said that she no longer heard students asking "when will we ever use this?"

The facilitators closed the session reminding everyone that the real challenge of change was the risk teachers were being asked to take. They were being asked to teach in ways different from the way they learned as youngsters, and different from the way they were trained as young professionals, and in ways unfamiliar to the parents of their students.

"We have to stop fighting our political and cultural wars on the playgrounds of children. The first casualty is the truth; the second is the children."

GEORGE "PINKY"
NELSON, EXECUTIVE DIRECTOR OF
PROJECT 2061 AND NASA
ASTRONAUT FROM WILLMAR,
MN.

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"Authentic, standards-based reform has implications for every person, policy, and practice in a school system because it involves a complete abandonment of the bureaucratic, "seat time" approach to education and replaces it with a system of learning communities dedicated to helping all students reach their intellectual, social, and personal potential."

THOMPSON, S., 2001, *THE AUTHENTIC STANDARDS MOVEMENT AND ITS EVIL TWIN*, PHI DELTA KAPPAN.

"[We] need to bring an end to the shortsighted, politicized, and harmful bickering over the teaching and learning of mathematics. I will tell you that if we continue down this road of infighting, we will only negate the gains we have already made, and the real losers will be the students of America."

RICHARD RILEY, FORMER U.S. SECRETARY OF EDUCATION, 1998 (IN BECKER AND JACOB, 2000).

The comments from community members above draw a distinction between significant learning and schooling in the traditional sense. For many, school was an isolated, passive process involving subject content and exercises unconnected with anything they cared about. Learning mathematics, as a study participant reported earlier, was something "you just had to do." Today, based on over 30 years of research, national and state educational leaders know that anyone who is unable to reason mathematically is excluded from whole arenas of human opportunity; that without numeracy they are severely limited in the completion of even everyday tasks¹. Educational leaders understand that teaching mathematics more effectively will lead to greater proficiency in mathematics for all students. Others suggest that the imperative to provide all students with the quality of education needed for a rapidly changing world is not so much an economic necessity, but a moral obligation. While this is the goal of the authentic standards movement, the clarity of its vision has been clouded with confusion created by those who equate high-stakes testing with standards (Thompson, 2001)². The conundrum district leaders encounter is to create unified community support for educational policy in a climate mediated by fiery rhetoric, polarizing journalism and diversionary political debate. *How do administrators reconcile uninformed opinions, misinformation, and unconscious bias with the potential of mathematics curriculum grounded in current research on learning? How do they resolve competing pressures from community leaders and legislators with the complicating effects of changing demographics? How do they create a common vision for significant student learning?*

As elsewhere around the country, efforts by study participants to bring standards-based mathematics into classrooms was at times met with contentious public debate. It seemed that just when teachers, parents and students began to adjust to the demands of the new curriculum materials, newspaper headlines and editorials kindled emerging state and local debates on more than one occasion. Some school boards and administrators were caught between supporting decisions made by their mathematics curriculum teams and demands from vocal parents or disgruntled teachers. The ability of districts to weather these storms reflected the quality of networks that may or may not have been in place to support their education policy. As with any living system, each part affects the others. Study participants described the impact these unstable conditions had, both at state and local levels, and efforts they made to tighten the webs of support within their communities.

MIXED PERSPECTIVES

TAKE STOCK OF ATTITUDES

District leaders were sometimes surprised by the reactions to the proposed math adoptions from parents and segments of the community. Questions, concerns and outright opposition to the introduction of standards-based mathematics revealed a mix of often conflicting views and basic assumptions. Though disquiet was usually limited to small albeit vocal groups, the misinformation disseminated was often magnified rather than clarified by local papers and media outlets. In spite of their unwillingness to participate in authentic discussions, ideological critics had a dampening affect on some board decisions.

- **UNINFORMED** Administrators suggested that school board or parent unwillingness to change anything and general lack of understanding were the bedrock sources of resistance to standards-based mathematics curriculum materials. In one case the school board routinely hindered program innovation. “We were never supposed to be out in front,” said the curriculum director. Refusal to entertain new approaches to teaching mathematics ignored the reality that large numbers of students are short changed by the traditional emphasis on procedural competence. While school critics bemoaned low test scores, that in fact reflected the failure of traditional mathematics, they remained reluctant to endorse the new research-based methods “because they have not been tested.” Some argued against data simply because it wasn’t collected in Minnesota. Administrators also reported their efforts to bring current information to parents and community members was often met by indifference: “It’s just plain hard to get parents out of their houses to learn what is going on,” several said³. Even when public school parents were informed, programs were not secure. In one district, poor coordination between public and parochial schools further compounded the situation. Parents from the very traditional parochial school feared their children would be unable to adapt to the new curriculum. These parents showed up at meetings more often and in greater numbers than public school parents and had an influence on the decision. “We have a large parochial school system here, and we did a poor job educating them about what we are doing,” said the administrator.

- **MATH AS GATEWAY** When standards-based programs suggested all children could become proficient in mathematics, parents and community leaders, who grew up accustomed to sorting children by their math ability, expressed doubts. Said one administrator, “There is an attitude out there that if it is good for all kids, it can’t be good for my child.” Another administrator added: “Anything that helps all kids is seen as a

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“When it comes to efforts to improve public schools, Americans are like back-seat drivers. They express a deep commitment to public education and concern about what is going wrong, but because of time constraints and lack of expertise, they are unsure about taking the wheel to guarantee that all schools provide quality education to every child.”

PEN RELEASES “ACTION FOR ALL,”
APRIL 16, 2001, WASHINGTON POST.
See: www.publiceducation.org

“The goal of quality education requires an entirely different approach. We must begin with a vision of what it means to be an educated person; the means of assessment should follow from, rather than dictate, the ways in which we educate students....

The biggest cost of a system geared single-mindedly to test scores is that we virtually never hear any public discussion of what it means to use your mind well, to understand, to appreciate, to create knowledge, to be an educated human being. And so students can properly draw the conclusion that we do not care about these values.”

HOWARD GARDNER JANUARY 10, 2001, *TEST STRESS*, ST. PAUL PIONEER PRESS.

threat.” In the American imagination, math has traditionally been the subject that sets apart the really smart children from the rest of the student population. One administrator suggested that opposition from a few sectors of the community was driven by fears that some students who used to be on top would now have to compete more with other children. “I believe there is a bias in our community toward those who succeeded in the traditional math. There is a class bias going on whether it is conscious or not, and that no one really wants a program that is really democratic,” she conceded. In addition, some parents were concerned that their children’s SAT or ACT scores would suffer, or that college admissions offices would not recognize the new curricula—even though area newspapers reported that colleges believe standards-based mathematics prepares students well. Another set of parents wondered whether the higher expectations of the new curriculum materials make it harder for their children to get into college.

In the end, it appears that as students get closer to graduation, parent concerns become more focused on test scores than mathematical understanding. A school board member in one district withdrew his support for the curriculum after his daughter, a “concrete sequential” who used to get As in math, began struggling with the new curriculum materials. “No one appreciated that kids who grew up with drill would naturally need time to adjust,” said one administrator. In addition to including parent representatives of all perspectives in their early discussions, especially those who had concerns about high-achieving students and students who are challenged, administrators said, people need to know that change comes at a price. “Parents and school board members also need to know that there will be some pain; they all want change and improvement, but just don’t want it when my kids are in school,” administrators warned.

• **IDEOLOGY** Opposition based in ideology was among the harshest, administrators said. “When it was least expected, reactionary rhetoric popped up.” In one district, administrators invited a very vocal opponent to lunch and asked him to join the conversation but were turned down, they think, because the critic “was fearful of being co-opted.” They said, “We keep trying to identify and invite people with a variety of perspectives, but the strategy of some groups appears to be not to join the discussion.” One person said, “We’ll sit back and watch and then nail you when you make a mistake.” When administrators were successful in bringing critics into contact with parents who had other views, opinions moderated. When inclusion was unsuccessful, administrators reported that “the far right tended to have a strategy of confusion. They linked Graduation Standards, Goals 2000, and School-to-Work with the NSF mathematics initiatives, claiming these programs are all part of a great government conspiracy to turn

our kids into something else.” Under these conditions honest conversation became difficult because “the critics only had to confuse parents and the public with random facts out of context,” and so, no matter what educators offered, they sounded defensive. Local newspapers exacerbated this effect. In general, study participants observed that “unless there is controversy it doesn’t get in the paper” and if they, as district leaders, offered a position, it was often taken as somehow being defensive. Said one administrator, “The editor of the local paper is not very supportive and though the reporter does a good job of getting the facts straight, the editor edits her work and then writes an opinion questioning what we are doing.”

MAKING OTHERS PART OF THE SOLUTION

- PARENTS** One administrator said that “unfortunately, parents are not seen as part of the solution, so when something new appears, their first tendency is to rip it apart. Parents naturally wonder, ‘What’s going to happen to my child?’” Parents have seldom been asked to define what it is they really want, but when they are asked, their hopes are very similar to what school leaders propose. In one district, school leaders offered parents a choice of several dates and locations to learn about the new mathematics curriculum. At those meetings parents said they wanted children to be able to see the relevance of mathematics to their lives and to feel that they were competent in math, especially the girls. They hoped that math would be more than memorizing theorems; that students would be able to identify and apply math concepts to complex life problems. In particular, they wanted all students, not just a select few, to be given the opportunity to master high-level mathematics, to be encouraged to study math. These expectations not only echo the responses to “The Beloved Child” exercise described in part one of this report, they are consistent with the goals of standards-based mathematics. When parents got beyond their concerns and started listening to each other as real people, they were able to hear new ideas, assess information and begin to entertain different possibilities.

- BUSINESS AND COMMUNITY LEADERS** Some administrators believed greater effort to inform business and community leaders would have been very helpful in bringing the message of change to the school board and parents. One school district did just that. Before they brought the curriculum materials choice to parents, they invited business and civic leaders, whose professional lives involved mathematics, to a discussion about the curriculum. “We wanted them to experience the content in light of what they knew about mathematics in the workplace,” said a math teacher. Among those

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“Today’s mathematics classrooms look quite different from classrooms of 20 years ago. Outreach to parents and others in the community is essential.... Parents and caregivers should know why an extensive and rigorous mathematics education is essential for their children and what options are available... Community members need to understand the changing goals and priorities of school mathematics and must be involved in the process of improving mathematics education”

NCTM, 2000, PRINCIPLES AND STANDARDS FOR SCHOOL MATHEMATICS: AN OVERVIEW, p. 20.

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COMMUNITY MEMBERS
LIKED (SAMPLE):

- RELEVANT MATH:
 - Evident how it applies to real world.
 - Seems relevant.
 - It's useable math!
 - I like the practical application of math.
 - Easier for students to see the value. Easier to see how to use math.
 - Relevancy to kid's world.
- PROMOTES PROBLEM SOLVING:
 - I would hope that this will foster an attitude that math can answer questions.
 - A strong connection to investigations used in science and economics.
 - Good problem solving content.
- RIGOROUS
 - Integrated approach.
 - More higher level thinking.
 - I wish this had been around when my two boys were in school; really solid.

who attended were a certified public accountant, a technology reporter from a metropolitan paper, the former CFO of a major insurance company, the current president of the Chamber of Commerce, as well as a physician, dentist, realtor, writer of technical training programs, and two high school seniors taking AP math courses. One community leader summarized the overall response: "I wish you could turn the clock back 12 years so my boys could experience this method of teaching and learning." Beyond their endorsement, suggestions from these community leaders helped district administrators and teachers shape effective parent presentations. Among other things, district leaders learned to have more research available for parents to take home, and to allow more time for questions.

Public attitudes encountered by study participants reveal a range of views on education's broader goals which shed light on the spectrum of positions regarding standards-based curriculum materials. The expressed concerns indicate deep beliefs about the purpose of schooling and sometimes show that both parents and community leaders themselves hold contradictory views and so are unclear about the value of standards-based education⁴. District leaders who created spaces where parents and community members could reflect together on the purpose of their schools, helped them connect accessible mathematics to the democratic and economic values most espoused. They used knowledge to strengthen the web of parent and community influence within their districts and so provided school leaders with the best insurance against public misinformation. In two cases, however, school boards backed down under public pressure. Because they lacked broad-based parental and community support, their solution was to diffuse the storm.

STABILITY: GOALS AND POLICY

Besides competing attitudes locally, education leaders reported that mixed messages from policy makers complicated efforts at the district level. Being accountable for higher student achievement, many districts explored and adopted standards-based mathematics curriculum materials to help their students meet the state's standards. Unfortunately, the larger debate over standards reignited and spawned high levels of uncertainty. On the one hand, for over ten years enormous energy and political capital had been invested in defining state standards and bringing them into law. Many districts began early to lay the groundwork that brought their teachers up to date with standards. On the other hand, continued political challenges to the standards weakened the authority of district leaders, and lack of sustained financial investment in schools left

them without adequate resources to provide necessary professional development to fully implement new policies on standards.

• **STATE STANDARDS – AN IMPETUS** For all the participating districts, Minnesota’s Graduation Standards proved a mixed blessing. Because the state’s mathematics standards were in sync with the standards described by NCTM, they strongly encouraged some districts to look into standards-based mathematics curriculum materials funded by the NSF. Other districts who had already begun to explore those programs found the Graduation Standards served as an added “selling point” for teachers and parents to consider the new curriculum materials. Much of the work of “embedding the standards” into student lessons had already been done by the authors, which was a benefit to teachers. Teachers reported that they no longer had to search for activities that would spark interest and help students see the connection between mathematics and the real world. With the new curriculum materials, that work had already been done which saved teachers valuable time. More importantly, they thought the curriculum materials themselves were better: “I think they translate to teaching in general. They’re all about how to work with kids, to help them talk about how they think,” said one teacher. Because the mathematics standards are threaded throughout all of the courses, the curriculum materials made it possible for students to cover all of the state standards in three courses. “This was a great advantage to students who wanted to take calculus or other advanced courses,” a teacher explained. In addition Graduation Standards gave district leaders the leverage they needed to align curriculum across grade levels and from building to building. One district had two high schools, each with its own culture and approach. The administrators said conversation about mathematics standards and their curriculum choice has changed teacher thinking. District leaders reported teacher conversations now included a bigger picture; “they understand the need for clear articulation between the middle schools and high schools.”

• **STATE STANDARDS – INSTABILITY** State standards came with a price, however, because the implementation of the Graduation Rule was flawed. Thinking they would provide an impetus for districts to adopt standards sooner, an incentive of \$15 per pupil was promised to every district that had standards fully implemented within the year. Revenue-starved districts rushed through their implementation processes leaving angry teachers and confusion in the wake. The resulting uproar rekindled heated debate and threatened the stability of state education policy. Administrators said pressure from business leaders, the legislature, and parents were often in conflict with one another. While they all wanted improved student achievement, agreement about what that meant

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“The graduation rule provides a clear mandate with clear implications for classroom instruction in every school house in Minnesota. The rule has aligned key learning K-12 with guideposts along the way...The best research has demonstrated again and again that students learn most effectively when they are active participants in the learning; not passively receiving knowledge or information.”

Dale Strom in an interview with the MSBA Journal, January 1, 1998.

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“Specifically, *Quality Counts* found, state tests are overshadowing the standards they were designed to measure and could be encouraging undesirable practices in schools. Some tests do not adequately reflect the standard or provide a rich enough picture of student learning. And many states may be rushing to hold students and schools accountable for results without providing the essential support.”

Education Week on the Web, 2001.

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Speaking about policy makers' very stringent passing scores, Gerald Bracey writes: "In my opinion, the reason is that the movement toward high-stakes testing is not about education; it is about power and control and ideological agendas. A number of people feel that, in Virginia, the state board deliberately adopted tough standards to make public schools look bad and thereby to grease the skids for voucher legislation."

BRACEY, G., 2000, *LITERACY FOR THE INFORMATION AGE*, PHI DELTA KAPPAN, P. 92.

and how it was verified was "not there yet." Powerful groups both within Minnesota and across the nation pushed school reform. Among the leading voices were business leaders who wanted high school diplomas to have some meat behind them. "The whole standards movement was an effort to deliver a diploma backed by solid education statewide," said one administrator. Minnesota's Graduation Standards, along with standards-based mathematics curriculum materials, moved schools away from emphasis on seat time and rote memorization, and toward active engagement in context-rich learning. In Minnesota, standards made challenging education accessible to all children leading them toward intellectual capability and holding them responsible for their own learning. Even with solid backing for the educational value of Minnesota's Graduation Standards from all of the state's educational leaders, the standards policy came up for debate each legislative session since it was passed into law in 1998, undermining district authority to realize the goals in their buildings. As some legislators pushed to eliminate the standards, they also attempted to replace it with a back-to-basics curriculum or a high-stakes testing accountability plan.

• **UNEVEN FINANCIAL SUPPORT** Even as legislatures across the country, including Minnesota, push for higher student achievement, their disagreement on what student achievement means is compounded by uncertain support for the costs associated with their expectations. One administrator echoes sentiments of most: "Legislators have raised the bar on test scores but do not give teachers time, tools nor the training they need to accomplish the goals set forth." Financial support for Minnesota schools resembles a roller coaster. The \$15 per-pupil standards implementation support described above lasted only one year, though progress to full implementation will take five to seven years. In another year, three student contact days were added to the schedule without funds to support the additional time— most districts covered that cost by cutting professional development, which is more necessary than ever during the change to standards. In another year money was added to reduce class sizes only to be cut the next year. This history of funding instability made teachers leery of investing their time and energy in the new mathematics programs which required ongoing cost of consumable materials and manipulatives. They asked if their districts and school boards would continue to support the program in lean years. One district, already suffering from a dramatic decline in student enrollment, chose to order only the most essential materials and to share manipulatives between grade levels and classes, making the program more difficult to implement completely.

Ambiguity in state policy on standards combined with uncertainty in school funding undermines improvement in student achievement⁵. While authentic standards that call for educational practice that makes challenging education available to all students compelled study participants to adopt standards-based mathematics curriculum materials, the constant rehashing of old arguments weakened their ability to bring teachers and parents along. The ups and downs of school finance further compounded the situation, resulting in some districts' inability to support the curriculum materials with professional development and all the needed tools and materials. The challenge these leaders faced was to unite their local stakeholders around a common vision for student achievement but without having the stability of coherent policy and adequate resources to realize that policy. Some would suggest that district leaders need to make sure their various publics—parents, teachers, community leaders and legislators— have current facts on public school success. For example, on the one hand more Americans (84 percent) finish secondary school than Japan (70 percent), United Kingdom (68 percent), and France (52percent) and more receive bachelor's degrees than anywhere in the world. On the other hand the United States spends less per capita on K-12 education than 9 out of 16 industrialized countries 14 percent less than Germany, 30 percent less than Japan, and 51 percent less than Switzerland (Anderson et al., 2001)⁶. Dispelling some of the “myths” born from the politics of education can strengthen the network that supports learning for all children.

ALIGNMENT: GOALS AND RESOURCES

Unsettling as the standards debate and school funding has been, study participants' commitment to improve student achievement continues. One district described a conscious effort to capitalize on their mathematic implementations to create a model for best practice teaching and parent involvement. Because they saw the potential of the standards-based curriculum to help teachers grow in their professional practice, they focused professional development around the mathematics implementation and aligned available resources to achieve the goal of increasing student performance in mathematics, understanding that the learning would spill into other areas of the curriculum.

- **CREATING A COMMON VISION FOR LEARNING** Early on during their mathematics implementation, curriculum and staff development leaders realized they had to be consistent with their understanding of learning. The overriding question they posed to each other, to principals, staff and parents was, “How do we improve student

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IMPACT OF NEW MATH CURRICULUM

“The kids take the data from their investigations and construct graphs with greater facility than they used to. I don't spend nearly the time teaching students how to represent their data as I used to. They can take their data and know which type of graph will serve them best and they interpret that data with greater confidence. It appears to be second nature. They know where the dependent and independent variables go without asking.”

PHYSICAL SCIENCE TEACHER

IMPACT OF NEW MATH
CURRICULUM

"I think students in my classes today do a lot better with map reading and charts than the ones I had four years ago, before we had integrated math. Now students are able to analyze what maps and charts mean instead of just reading what it says in the caption. For example, we were discussing the north pole being at a 90° angle in relation to the plane of the equator. Students saw the link to protractors and they understood that at 45° the sun would be half way between the north pole and the equator. They also have a lot better understanding of what we mean by population density. They draw inferences from the data, for example, comparing England's population and Russia's in relation to land mass. Their proportional reasoning is much better than with students I had earlier in my career. Students come to us now with a much better sense of spatial relations and other key concepts."

GEOGRAPHY TEACHER

learning?" Regardless of which of their multiple publics they addressed, they knew they had "to model what they wanted to see happen." For committee members and parents this meant changing their idea of mathematics from "a bunch of tricks and strategies" to one that has children able to demonstrate their understanding of the mathematical concepts behind the strategies. Because the research confirmed that teacher professional development had the highest correlation to improvement in student achievement⁷ administrators invested their time and energy in bringing new knowledge to the staff, and providing ongoing training as they worked through the new curriculum materials. As they looked at the various curriculum materials, they asked themselves, Which one was going to help our teachers learn the most? That was a key ingredient. Which one would strengthen their knowledge and improve their instructional skills? If that happened district leaders knew student learning would also improve.

• **PAIRING PROFESSIONAL DEVELOPMENT WITH CURRICULUM REVIEW** The committee recognized that changing the math curriculum was a big-ticket item and so they considered which of the standards-based mathematics curriculum materials would leverage the most learning for everyone— keep challenging those who already excel, and provide the opportunity to learn significant mathematics to more students. Because principals are accountable for the level of learning, they too were deeply involved in the implementation process, attending not only teacher staff development sessions, but providing professional development during staff meetings in partnership with piloting teachers. Success of the math implementation rested on everyone's shoulders. "We had to create a seriousness about what it was we were doing. We were looking at someone else's children's learning so we wanted to get it right," they said. Committee members reported that there wasn't much discussion about the books themselves, but "we talked about what they meant, and what opportunities they provided to make learning happen." For teachers, looking at an implementation in terms of professional development was a whole shift from the way it was done in the past. In terms of parents and community, teacher leaders and principals included them very early and then often throughout the process. They shared their belief that all children can learn challenging mathematics, that standards would align the curriculum in the district, and that students learned best when mathematics was an active and collaborative process. Even after full implementation, principals and district leaders continue to keep the question alive. "Everyone has a different learning curve. We must remind ourselves over and over why we are doing this math and what it means for kids, and what is required to be successful," said one principal.

• **ALIGN INVESTMENT WITH DISTRICT GOALS** As was expected, cost was a perennial issue—for the curriculum materials but more so for the staff development required. The district curriculum director admitted that at first she could not put a price tag on this marriage of staff development and curriculum implementation, “because I saw this was evolving, it was rolling out and unfolding.” The district decided to take it one step at a time, keeping their eye on the big picture. They matched their implementation to what people could manage and what the district could afford, working within certain parameters. “We couldn’t afford to do K-12 all at once. That’s just the truth of the matter. You take what you can and make it work. You set priorities.” Among other things they aligned school improvement plans with district goals and directed district dollars to those efforts. Instead of trying to do everything, spreading their professional development resources thinly across 12 strands, they invested mainly in graduation standards and mathematics curriculum training. “Eventually I think teachers appreciated the focus because now they weren’t being asked to do 10 million things all at once,” the staff development coordinator said. And, instead of sending people out to get that training, they brought the training into the district. The district administrator said, “Talking with colleagues in other districts, I find myself saying, maybe we don’t do everything anymore. Maybe we give up on other things, but we choose what we are working on, decide what is important, and that is where the dollars go.”

• **CONNECTING TO STATE STANDARDS** All districts in the study consciously connected their standards-based mathematics curriculum adoptions to the state standards. Where some implementations may have failed is in connecting changing curriculum and graduation standards to student success. One administrator said, “Whether it is grad standards or math curriculum, people need to see the connections to where it is all going. If we don’t help them do that, it seems like just another brick thrown into a sack.” The success of the mathematics curriculum materials depended on public understanding about the curriculum’s relationship to higher student achievement in mathematics—the knowledge that “today’s students will spend most of their lives in a super-symbolic society in which knowledge is the most coveted commodity and the essence of power,” (Spector, 1993). When teachers and school leaders focused on student needs, they were able to move beyond old patterns and reach out to peers, parents and community. “The math teachers are in a different place regarding the amount of effort it takes to win support for their program,” said one administrator. As a result there is a high level of cooperation

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IMPACT OF NEW MATH CURRICULUM

“My kids have done well in the integrated program because they don’t always come to the answer the same way I would, and it is good for them to see how other people would arrive at their answers. It makes them think. In this curriculum bright kids are stretched more.”

HIGH SCHOOL PARENT

“I think my kids are realizing that they can figure out how to solve some very complex problems. My kids have learned to do that. Now math is not just rote formulas and I see they are willing to tackle the unknown.”

MIDDLE SCHOOL PARENT

“I work with kids that have learning disabilities and they are doing well, but they almost always get tripped up with the writing or reading. It is fun to see them shine when they get the reading help. I am interested in how this works. The math is more concrete and they’re really interested. They’re so much more successful when math is hands-on. If they just had the formulas most of them would lose interest.”

PARAPROFESSIONAL

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STATES WITH SUCCESSFUL
STANDARDS-BASED
REFORM HAD—

- One or more highly skilled leaders who played a central role in the reform effort; had good working relationships at different levels of the system.
- Leaders who built local and national connections to support their efforts (grants, partnerships).
- Leaders who focused primarily on the educational issues without losing sight of the political realities; they worked to build consensus among stakeholders (spearheaded long term focus).
- Leaders who worked to build the infrastructure to make standards real (dollars, expertise).
- Leaders who saw national goals as a focal point, not something to be implemented
- Leadership who saw how state and district standards align with policies; assessments aligned with the shared vision for learning.

ADAPTED FROM A DRAFT REPORT
PREPARED BY INVERNESS
RESEARCH ASSOCIATES, 1996.

between the secondary teachers across the districts that include conversations about student progress, sharing supplementary lesson materials, and articulation from one level to the next. It is not unusual in that district for the secondary teachers to help during parent nights for middle school parents. Other districts reported a similar cooperation between math teachers and building levels to do parent and community information nights.

Standards-based policy in Minnesota should provide an incentive to districts to move ahead and implement mathematics curriculum materials consistent with the policy. The fact that the policy is re-debated each session makes it a doubled-edged reality, diminishing district leaders' authority to maintain their efforts to improve student learning. Along with a lack of sustained financial investment in schools, district leaders in the study had to set their own priorities. Today, district leaders must consider working two fronts. As at least one district did, they need to make a conscious effort to capitalize on their mathematic implementations to create a model for best practice teaching and parent involvement as a strategy to stretch their limited resources. Translating graduation standards into the district goals, they encouraged principals to outline building plans focused on student mathematical proficiency and directed their resources to professional development and materials support. As participants in the study reported, student learning in other areas improves along with the mathematical understanding students demonstrated.

NETWORKS OF SUPPORT

The clash of two distinct world views is no more clearly evident than in the challenges confronting education today. As the stable, linear, step-by-step, mechanical description of how the world works gives way to an appreciation of the non-linear, organic, interdependent, process of dynamic, living systems, successful leaders are adopting a new mindset. They view their work as a system or web of feedback loops, each providing information that affects the outcome of organizations as a whole (Stacy, 1992, p. 75-79).

The urgency to prepare children for participation in an unknown future underlines educational leadership's crucial role in creating networks that understand and support the necessity of providing a quality education for all students—one that includes high levels of mathematical proficiency as well as literacy. As confusion over the meaning of standards persisted, study participants suggested that it was up to them to clarify the state goals, and in this case, the meaning of standards-based mathematics for

their communities. Reasoning that anyone who is unable to think mathematically is automatically excluded from whole arenas of human opportunity, curriculum leaders and mathematics committees researched and identified curriculum materials with the greatest potential to help all students achieve proficiency in math. In the course of their implementation, it became clear that parent and community support for the curriculum was essential. Some district leaders strengthened their networks by keeping the needs of students in public view and relating curricular decisions to those needs with current data⁸. They focused their work two ways. First, in spite of legislative ambiguity and uncertain financial support, they *related their curriculum choice to the state standards and focused their professional development resources* on the implementation of standards-based mathematics. They found that the new math curriculum was successful in framing best practice teaching methods in very concrete lessons, enabling them to create a common vision for learning in their schools. While district goals and building improvement plans focused on mathematics, they had larger pedagogical implications. The payoff was improvement in teacher practice and student achievement across subject areas. In doing less, they accomplished more. Second, they made a conscious effort to *keep community leaders and parents in the loop about the changing needs of students*, and they did it often. As educators grow more convinced that graduation standards make sense, that standards-based mathematics will help students become proficient in mathematics and therefore have access to opportunity, they are also growing in the realization of their obligation to arm parents and community leaders with the knowledge they need to support challenging education for all children.

School boards and administrators, caught between supporting decisions made by their mathematics curriculum teams and demands from parents, face difficult decisions. The price of backing out on support for authentic standards, such as those for mathematics, jeopardizes the fundamental reason for education. In a time when schools are being held to higher levels of accountability, education leaders need to stand their ground for what they have learned it takes to educate children. They must resist the temptation to revert to a model used in a different era, that grouped children according to test scores, limiting opportunity for many⁹. Just as parent and community support is a necessary component of any system level improvement of education, their participation is critical to a successful standards-based mathematics adoption. Without balanced information, that support is vulnerable; winning that support is no small task.

"The main point here should be the urgency of learning more about these [structural] issues in many school districts and in many different settings. This requires pressing hard for more concrete knowledge about how large-scale improvement processes work."

ELMORE, 2000, BUILDING A NEW STRUCTURE FOR SCHOOL LEADERSHIP, P. 36.

Now, more than ever before, school district leaders need to be sure that their publics—parents, teachers, community member and legislators— have the facts about the ability of public education to raise student achievement — and the urgency of doing so. In his address to educators in 1999, George “Pinky” Nelson said, “For our species to survive in the next century, we must, through deliberate education create a universally literate society...Achieving true literacy in mathematics, science and technology is not an option for students in the 21st century, it is a necessity. And preserving the educational status quo won’t help any of our children reach that goal.”

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“You gain strength,
courage and confidence
by every experience in
which you really stop to
look fear in the face. You
must do the thing you
think you cannot do.”

ELEANOR ROOSEVELT

DISCUSSION QUESTIONS

1. What are some of the major characteristics of your community? How would you describe the people of your community to others? Given this information, what feedback/reactions might you expect from your community when you begin your adoption and implementation process for standards-based mathematics programs?
2. What are the goals for mathematics and mathematics education in your community? How do you know or how will you find out?
3. What networks are currently available for support in your community? What new networks need to be established for you and your district leadership to be successful in adopting and implementing a standards-based mathematics program?

END NOTES - ALIGNING GOALS

1. In his book *Radical Equations, Math Literacy and Civil Rights*, Robert Moses and co-author Charles Cobb claim “the most urgent social issue affecting poor people and people of color is economic access. In today’s world, economic access and full citizenship depend crucially on math and science literacy.” They acknowledge that lasting change must come from communities of people who organize to make demands, and in the process transform themselves.
2. Thompson distinguished authentic standards from test-based reform:

AUTHENTIC STANDARDS are concerned with equity, departing from the tracking, factory-style schooling of the past. Standards hold high expectations and provide high levels of student support for all teachers, students and educators. Assessments are aligned with standards and student performance is evaluated in a variety of ways over time.

TEST-BASED REFORM measures student progress by a single indicator that has high stakes attached, such as moving to the next grade or receiving a diploma. The effect of high-stakes tests is to narrow the curriculum, reducing instruction to “test prepping.” Ultimately, test-based reform leads to higher drop-out rates and equity becomes the casualty. A politically warped version of what is arguably the most promising school reform, testing suits political expediency for rapid, quantifiable results (that the public can digest without much thought) and so poses a threat.
3. Although Americans suggest that public schools are the heart of their communities, and one-fourth of them define their community by their local school district, 25 percent say they take little or no responsibility for the quality of their schools and “51 percent say they are not involved in making schools better themselves” (*Action for All, Washington Post*, April 16, 2001).
4. David Labaree (2000) suggests that people who think schools should produce competent citizens draw on the familiar belief that education opens doors to democratic equality; they appreciate the potential standards bring in terms of cultural competence and the reduction of the differences between the advantaged and disadvantaged children. Those concerned about training productive citizens, believe schools serve as an efficient mechanism to maintain an appropriate labor pool; they are likely to endorse standards because they raise the level of human intellectual capital in the work place. Both of these views see education as a public good. When people see education in terms of social mobility, however, they see it as a private good and want to maintain a system that allows some children to gain a competitive edge over others. Whether acknowledged or not, the goal of this perspective “is to preserve the advantages and increase the distinctions that arise from the way individual consumers currently work the education system.” Today’s standards movement aims to raise the level of learning in schools and overcome the “intense game of ‘how to succeed in school without really learning’” that has been prevalent for so long (p.28-33). Comments from parents in this study suggest that many hold all three views and so are conflicted; they want both the public and the private good.
5. Elmore (2000) writes that accountability requires a reciprocal relationship; that authority cannot require others to do something without providing the necessary means to make that responsibility possible (p. 21). In this case, state legislators who require achievement standards but do not support stable policy or adequate funding appear to fall short on their side of the bargain.
6. For a downloadable document filled with current graphs and data about the success of public education, see the publication, *Do You Know the Good News about American Education?* It can be found at www.ctredpol.org.
7. The Glenn Commission report, *Before It’s Too Late* (September 2000) states: “The most direct route to improving mathematics and science achievement for all students is better mathematics and science teaching.” Students do better when their teachers are fully certified and when they majored in the subject they were teaching (p.18). More recently, an article titled *Teacher Quality and Student Achievement: Recommendations for Principals* (BULLETIN, The National Association of Secondary School

Principals, Nov. 2001) says that "teacher preparation is a stronger correlate of achievement than class sizes, overall spending, or teacher salaries, and accounts for 40% to 60% of the total variance in achievement after taking students' demographics into account. The article cites extensive literature on the subject.

8. Test data in Minnesota is beginning to show the same positive results seen in other states. Students prepared with standards-based mathematics curriculum materials do well, but it will take a few years before Minnesota's pattern is fully revealed. A sample of the results so far include the following:

- Districts that participated in the study are gathering data on student achievement that they will share with their districts. For example, one participating district, after its first year with standards-based mathematics curriculum materials showed a marked improvement in its Iowa Test of Basic Skills (ITBS) scores. Both in second and fourth grades, scores went up between 7 and 14 points in both mathematics and reading, though the only curriculum change they had made was in their math program.
- Other districts participating in the study reported that not only has the percent of students passing the Minnesota Basic Skills Test (BST) gone up, but they are passing with more correct answers than in the past.
- A few years ahead of study participants, Minneapolis data reveals several insights. During the 1996-97 school year, nine middle schools in Minneapolis implemented the *Connected Math Project* (CMP) curriculum materials (Winking, Bartel, and Ford, 1998). Of the nine schools, five fully implemented CMP and four partially implemented CMP (i.e., routinely used other mathematics curriculum materials as well as CMP or the teachers did not receive professional development) with forty teachers participating in the study across the nine middle schools. The study evaluated student academic performance in mathematics and changes in attitudes of students and teachers about teaching and learning mathematics after one year.

Among the key findings of the Minneapolis study was that most eighth graders in full implementation CMP schools scored significantly better than their non-CMP peers on the State Basic Standards Mathematics Tests.

Also, seventh-grade CMP students in the full implementation schools "scored significantly better than their non-CMP peers on the CAT/5 Math Concept Subtest" (Winking, Bartel, and Ford).

The study also notes that students in partial implementation CMP schools "scored no better or worse than their non-CMP peers on all measures."

The study findings also showed that after using CMP, students were less likely to make negative comments about math and that teachers' beliefs tended to change to be more consistent with the philosophy underlying the CMP curriculum.

- The North St. Paul, Maplewood, Oakdale school district (District 622) was not a participant in our study, but has done extensive tracking of their students' achievement. Since implementing standards-based curriculum materials, there has been a marked increase in scores on the Iowa Test of Educational Development (ITED). In a comparison of the class of 1997 (who took the ITED in the fall of 1994) with the classes of 2002, 2003, and 2004, there is a clear pattern of significant achievement. While the class of 1997 had only 17percent of its student scoring at the 76th percentile or higher, the classes of 2002, 2003, and 2004 had between 52 -55percent of students in that top quartile. On another measure (the PLAN test which is similar to PSAT test and is taken by sophomores before they take ACT college test), students in this district did significantly better than the national average. While nationally only 4% of the students scored in the 24-32 range, 11 percent of the students from District 622 scored in that top range.
9. "When Bill Jacob denounced the 1987 [California] framework draft at the committee's final meeting, saying it was a return to the curriculum of the 1960s, he was corrected by another math professor on the committee who told him that the framework represented the curriculum of the 1950s and that he was proud of it. With \$500 million already appropriated for the new materials, we think all citizens should be concerned that California's students will begin the 21st century preparing for the job market just as their grandparents did." Becker, J and Jacob, B. (2000).