



Harvard Family
Research Project



FINE Forum

Family Involvement in Mathematics

Family Involvement Network of Educators
Harvard Family Research Project

Issue 6, Spring 2003

For questions or comments about this paper,
email hfrp_pubs@gse.harvard.edu

About the Family Involvement Network of Educators: Harvard Family Research Project's Family Involvement Network of Educators (FINE) is a strategic effort to strengthen family and community engagement to support children's learning and development. FINE brings together thousands of educators, practitioners, policymakers, and researchers dedicated to strengthening family-school-community partnerships. Members get the latest information about family involvement research, as well as the opportunity to connect with others in the field.

To become a member of FINE, visit our Subscription Center at www.hfrp.org/Subscribe.

© 2003 President and Fellows of Harvard College. All rights reserved. May not be reproduced whole or in part without written permission from Harvard Family Research Project.

Harvard Family Research Project · Harvard Graduate School of Education · 3 Garden Street · Cambridge, MA · 02138
www.hfrp.org · Email: hfrp_pubs@gse.harvard.edu · Tel: 617-495-9108 · Fax: 617-495-8594

From the Directors

“All young Americans must learn to think mathematically and they must think mathematically to learn.” This statement from the National Research Council underscores that today's students will live in a world where the requirements for mathematical proficiency will be substantially higher than they are today. A solid mathematical foundation is not only important in gaining access to college and math and science related careers, but also necessary for full participation in social and economic life.

This issue of the FINE Forum focuses on promising practices to engage families and communities in supporting students' mathematical proficiency. A common thread throughout the issue is the effort to bridge the mathematics of daily life with the mathematics of the classroom. In addition, the learning experience must be engaging—puzzling, fun, and challenging. Two parents organize a math night and invite a truck driver and seven other community residents to share the math in their work. A teacher invites pilots to mentor students on the mathematics of flying airplanes. An educational researcher encourages teachers to go out into the community and learn how parents use math in their homes and at work.

Program Spotlight draws attention to the social and cultural practices in which mathematics is embedded. Using the notion of “funds of knowledge” Marta Civil and her colleagues at the University of Arizona have developed two programs that strengthen parents' roles as parents, learners, and teachers, and equip teachers with the skills to integrate home mathematics in the curriculum. In Questions & Answers Civil continues to expand on the opportunities and challenges of applying funds of knowledge in mathematics education.

The importance of families and communities in supporting mathematical excellence is reflected in the new National Council for Teachers of Mathematics (NCTM) standards. In *Lessons From Leaders* NCTM's president, Johnny Lott suggests that everyday math is a good starting point for parents and children to learn to think mathematically—to go beyond counting and into problem solving.

NCTM and the National Association for Education of Young Children (NAEYC) also developed a joint position statement on early childhood mathematics. Marilou Hyson, NAEYC Associate Executive Director for Professional Development, shares how teachers and families can work together to help children know and love mathematics. This is especially relevant as we celebrate the Week of the Young Child (April 6–12).

The richness of family-school connections is explored in two sections of the Forum. Parent Perspective describes how Kentucky parents have initiated projects to support schools in the implementation of state standards in mathematics. Teacher Talk features

five expert teachers who identify critical factors in successfully integrating families' into their mathematical projects. Finally we have a Related Resources section, which includes a teaching case on family involvement in mathematics.

Happy Reading!

Heather B. Weiss, Ed.D.

Founder & Director

M. Elena Lopez

Senior Consultant, FINE cofounder

Holly M. Kreider

Senior Researcher, FINE cofounder

Maggie Caspe

Research Analyst

Program Spotlight

Two projects developed at the University of Arizona, Project BRIDGE and MAPPS, demonstrate a “funds of knowledge” approach to children’s learning. This approach, initially conceptualized by Luis Moll and his colleagues, proposes that to increase the effectiveness of schools, the resources, experiences, and knowledge residing in the family and community must be placed in the foreground of children’s school and educational experiences (Moll, Amanti, Neff, & Gonzalez, 1992).

The funds of knowledge reframes school-family relationships to make communication, interactions, and curriculum development a two-way process. It differs from one-way approaches that attempt to replicate and transmit school values and activities to the home, regardless of the cultural relevance these values and activities have for the families and communities they try to influence. In the funds of knowledge, learning is understood as the result of social interactions among the individual, society, and culture. It is particularly relevant for transforming practices in schools that serve minority, immigrant, and poor children, whose school performance lags behind white, middle-class students. The approach suggests that disadvantaged children can succeed in school if classrooms are reorganized to give them the same advantage that middle-class children always seemed to have had— instruction that puts their knowledge and experiences at the heart of learning (Roseberry, McIntyre, & Gonzalez, 2001).

Project BRIDGE

In Project BRIDGE (Linking home and school: A bridge to the many faces of mathematics) (hedgehog.math.arizona.edu/~bridge), faculty researchers and teacher researchers explore students’ and families’ mathematical experiences and knowledge as learning resources in school. Their approach stresses children’s own construction of meaning and connections to their outside worlds. Although BRIDGE ended in 2002 its structure and content provide important lessons for applying a funds of knowledge perspective. (See Questions & Answers in this issue.)

Program Components

BRIDGE is divided into four main components of mathematical learning: household ethnographic analysis, parents as learning resources, teacher researcher study groups, and classroom implementation.

Household Ethnographic Analysis

Teachers visit the homes of some of their students to learn about household funds of knowledge. They use ethnographic questionnaires on family structure, parental attitudes towards child-rearing, labor history, and household activities to guide these home visits. Teachers uncover a wealth of household knowledge and skills on topics such as farming, construction, use of herbs for medicinal purposes, mining, repair, budgeting, cooking, sewing, etc. Teachers also “unlearn” many of their preconceived notions about working class, minority families.

Parents as Learning Resources

Many schools continue to provide working class, minority parents with static roles such as monitoring the cafeteria, helping to organize teacher's papers, or cutting paper for art activities. BRIDGE reframes family involvement by considering parents as experts who not only participate in school discussions, but also go into classrooms to teach what they know. Parents are involved in BRIDGE through home visits, mathematics workshops, and occupational interviews.

Home visits give families the opportunity to share their “everyday mathematics” and collaborate with researchers to provide a better understanding of the various forms and places in which mathematics occurs.

The workshop engages a core group of parents in a two-way dialogue about the teaching and learning of mathematics. It enhances participants' understanding of mathematics while exploring their own use of everyday mathematics.

Occupational interviews allow researchers to tap into other ways parents use math in their professional and every day lives.

Teacher Researcher Study Groups

The study groups consist of teacher-researchers and university-based researchers coming together to discuss the different aspects of their work. They meet biweekly in alternating schools to debrief on household visits and engage in explorations of mathematics based on the teachers' interests and needs. Study groups also cover readings on research on everyday cognition and mathematics, ethnomathematics, culture and mathematics, language and mathematics, and inquiry-based approaches to mathematics education.

Classroom Implementation

Classroom implementation varies depending on teacher circumstances and interests. For example, the household ethnographic information can be a catalyst to change pedagogy, with teachers using their new insights to engage students in a discussion of mathematics. The household visits and occupational interviews can provide a foundation to develop a curriculum unit as well as activities that are aligned with the district mandated curriculum.

MAPPS

Math and Parent Partnerships in the Southwest (MAPPS) is a K–12 family involvement program being implemented in Arizona, New Mexico, and California. MAPPS is based on three principles: (1) the National Council of Teachers of Mathematics (NCTM) standards that stress raising parents' awareness of the fundamental changes recently made in mathematics teaching and learning, (2) social constructivism in which the learner has an active role in creating knowledge and learns through hands-on group activities, and (3) dialogic learning in which knowledge is co-constructed and built on the relationships of people who form a learning community in which everyone contributes equally.

Program Components

MAPPS provide three kinds of activities for parents that strengthen roles as parents, learners, and teachers.

Math Awareness Workshops

These are two-hour sessions around a single math topic. They offer parents a chance to work with their children in cooperative, hands-on problem solving. Bethel Martinez, a MAPPS parent says, “During workshops each family works together, each coming up with their own solutions to problems. They teach us math through working with our hands. It’s more than just numbers on a board.” (See box below.) Unlike other types of parent workshops which transmit information, MAPPS facilitates inquiry and gives voice to parents’ ideas and concerns about their own and their children’s mathematical experiences. The workshops support multiple strategies of problem solving and draw on the funds of knowledge of parents and students.

In these workshops parents share their approaches to mathematics and compare them with those of their children. Parents’ home-based mathematical knowledge can differ from their children’s school-based

math. The workshops establish a dialogue in which the parents and the children see that it is constructive to talk about mathematics.

The workshops also help parents make connections between math activities, real world applications, and access to careers. For example, *Styles in Tiles* starts with a geometry exploration of tiling a table. Parents work out the costs involved for an owner of a tile store. Workshop leaders ask parents whether they picture the owner to be male or female. The discussion then explores gender equity issues in employment such as pay and access.

From Bethel Martinez

What is most important to me is that MAPPS is a program for the entire family. It makes all the difference because we can stay close, learn together, and take home with us what we learn collectively. During workshops each family works together, each coming up with their own solutions to problems. They teach us math through working with our hands. It’s more than just numbers on a board. What stands out is that classes are in both English and Spanish. This is especially important for my husband. He isn’t able to speak a lot of English, but knows a lot of math from when he went to school in Mexico. He is able to speak out and be a real resource for my children. For me, math is hard, but especially so in English. In both languages I feel more confident to speak out and ask questions.

I not only participate in workshops, but I am also a teacher for other parents. I sometimes teach as many as 60 parents, implementing the things we have been learning in MAPPS workshops and stressing the importance of family involvement in education. The first time I did the lesson it was difficult and a big risk, but now I feel more confident. This was a big step in my life. In the eye of my kids I also changed. My daughter came with me and she said, “Mommy I never knew you were a teacher!” I felt very proud.

Math for Parents Mini-Courses

Parents can take five mini-courses that cover algebra, whole numbers, fractions, geometry, and organizing data. Each course includes eight two-hour sessions. The mini-courses are designed to give parents confidence and understanding in math so that they can help their children, families, and friends with mathematics. Luz Dominguez, also a MAPPS parent says, “As a student myself going to college, I had difficulty with my math courses. I found out about MAPPS and took the workshops. I learned that everyone has different learning styles. In MAPPS we explore how each one of us works on our math problems and then we all teach and learn from one another.”

From Luz Dominguez

As a student myself going to college, I had difficulty with my math courses. I found out about MAPPS and took the workshops. I learned that everyone has different learning styles. In MAPPS we explore how each one of us works on our math problems and then we all teach and learn from one another. For example, in division, we discovered five different strategies that are acceptable in arriving at the correct solution. This is totally different from the courses I was taking in college, where teachers have just one way of solving problems that they want you to follow. If you do not use their method, then you will have a difficult time. MAPPS allows us to explore a problem at our own skill level and to arrive at the solution following our own reasoning, but of course, the solution must be the correct one!

For example, a session on organizing data focuses on collecting and representing data, attributes of good surveys, and different ways to present data. The course also covers the uses and misuses of data in everyday life.

Leadership Development Sessions

These sessions develop parent and teacher leadership skills to recruit participants and facilitate math awareness workshops. Participants learn the rationale and content of the workshop, and how to facilitate it through discussion questions, a timing schedule, and use of materials. They learn to support parents' funds of mathematical knowledge and the multiple strategies of arriving to

solutions of mathematical problems. MAPPS parent JoAnn Valerani-Knoblich says, “The parents are the most important part of MAPPS. It definitely makes a difference that parents conduct the workshops. Teachers can be intimidating even if they do not mean to be. You feel more comfortable asking questions from other parents.”

For example, training for Giant, a workshop in proportional reasoning, prepares parents to connect a standards-based lesson in mathematics with diverse learning styles and equity issues. Parents and teachers learn to facilitate problem solving through hands-on activities around finding the height of a giant who leaves footprints all over the classroom. They review mathematical concepts on proportional reasoning as well as the research on learning styles. They learn to guide a discussion of how different learning styles are accommodated in the Giant activity and how parents can become aware of their children's learning style. This conversation then leads to a brief discussion of equity in the classroom by posting the NCTM standard, “All students should have access to an excellent mathematics program that provides solid support for their learning and is responsive to their intellectual strengths.”

Evaluation

The evaluation plan for MAPPs includes both formative and summative methods. The data collection is multifaceted, consisting of parent interviews, focus groups with parent leaders, teachers, students and parent participants, participant observation, mathematical autobiographies of parent and teacher leaders, and videotapes of workshop and leadership training sessions.

The program evaluator Martha Allexaht-Snyder prepares annual evaluation reports for the program's funder, the National Science Foundation. This evaluation information has also assisted the program's principal investigators in understanding parents', teachers', and staff members' perspectives on project activities. In addition, one principal investigator and the evaluation team have formulated an exploratory research agenda to understand parent and teacher leadership in mathematics education, and adult learning in mathematics in predominantly Latino communities. This research, in turn, has informed the development of the evaluation agenda.

Implications for Teacher Preparation

Marta Civil, a Principal Investigator of both BRIDGE and MAPPs, offers advice to other faculty about how to bring family and community knowledge into teaching and research.

Get into and learn about the community. It doesn't matter how. I'm not saying you have to do household interviews. For instance, I meet parents once a week for the MAPPs project, in which parents train other parents and children in school mathematics.

I also recommend conducting classroom observations with parents. I take a group of MAPPs parents to observe different math classes and then we meet and debrief. It is enlightening because we have a conversation about aspects of mathematics as well as issues of respect, and whether the teacher cares for the students or not. These are issues that are very important yet often overlooked.

From JoAnn Valerani-Knoblich

I have been with MAPPs four years now. I mentor other parents who facilitate MAPPs workshops. At the beginning, it can be scary for them to be in front of other parents for fear of doing something wrong. I tell them that if you're not sure, then that's what you tell parents and say, "Let's see how we can figure this out." The hardest part is learning how to stand up in front of other parents just like yourself to let them know, "I wasn't good at math and this class helped me, and you can do the work, too, and it's okay to do things differently than the way I do it."

The parents are the most important part of MAPPs. It definitely makes a difference that parents conduct the workshops. Teachers can be intimidating even if they do not mean to be. You feel more comfortable asking questions from other parents. Teachers have college degrees and have been trained to teach, while parents haven't. Parents take what they've learned in school and in life to share with other parents. You couldn't do the workshops without the parents; it would then just be another class.

I've learned so much by listening to families. How you integrate this knowledge into your own teaching follows from here. I know I've changed my teaching style. I've become more of an advocate of knowing what's going on before coming to conclusions.

References

Moll, L. C., Amanti, C., Neff, D., & González, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect home and classrooms. *Theory Into Practice*, 31, 131–141.

Roseberry, A., McIntyre, E., & Gonzalez, N. (2001). Connecting students' cultures to instruction. In A. Roseberry, E. McIntyre, & N. Gonzalez (Eds.), *Classroom diversity: Connecting curriculum to students' lives* (pp. 1–13). Portsmouth, NH: Heinemann

Parent Perspective

The Commonwealth Institute for Parent Leadership (www.cipl.org) promotes parent leadership in school reform. It is based on the belief that parents need information, skills, and support to be effective advocates. During their training, parents learn to use school achievement data to understand how schools are performing and to take action. Each participating parent obtains a copy of the comprehensive school improvement plan to see what the school is doing to improve performance. The parent uses the data to identify a need in school and designs and implements a project to address this need.

Three parent leaders share projects related to involving parents and strengthening children's mathematical skills.

From Dora Ahmadi:

Being an involved parent is beneficial to the parent-child relationship. Your child sees that you take time to dedicate to the school and that's important. I feel that I have a talent and can make a contribution, especially when it comes to math, for it's easy for students to be turned off.

I was a Commonwealth Leadership for Parent Leadership participant a couple of years ago. I had the opportunity to review school records and found that consistently, not just in my child's school, but in other schools, geometry and algebra scores were lower than in other math areas. I teach mathematics at the college level and I started an enrichment program at my child's school at the fourth grade and continued at the fifth grade.

I talked to the principal and she was very supportive. I then went to the counselors of the school to identify students for the project. I also connected with the teachers in my daughter's classes. To this day I work with one teacher at the elementary school where my daughter went. I provide problems for the teacher to give to students to take home, and the students can work on these problems with their parents. The teacher has a newsletter where she describes the math enrichment activities and that's how she promotes parent involvement. She teaches all the math courses at the fourth grade level.

Presently, I collaborate with another parent who is developing a project at the middle school. We are promoting Math Counts (a math competition club) and hold sessions in the morning before the regular classes begin. We hold Math Counts with seventh and eighth graders twice a week and with sixth graders three times a week.

From Deborah Prevetite:

My philosophy is that if I can't give my child and the children in this community the best education then I have failed my child and society. Parents want to get involved in their children's education, but sometimes just don't know how, especially when it comes to math. Many parents, including myself, have grown up not liking math or having negative experiences with math.

It all began when another parent leader, Sharon Venable, and I discovered that in the schools we chose for our projects, the school report cards and the state accountability test scores showed that children needed help with math. So we decided to combine our efforts. We wanted to work with parents to show that learning math could be fun. The first project, Math Multiplies in the Community, for families with second and third graders, was hosted at one of our local churches. We had two Title I teachers help us with the activities that night.

For the second project, Math Matters in Careers, we invited the fourth and fifth graders and their parents. The workshop was held in one of the local hotels. We invited different people in our community to talk about math in their jobs. Eight volunteers set up a table and emailed us a math question ahead of time. We had a truck driver, a dialysis nurse, a chemist, a doctor, a housewife, a farmer, and a veterinarian technician. The children had to visit each station that was run by each of the community members and answer the question they had posed. For example, the truck driver asked, “my semi truck holds 100 gallons of gas, and I have 75 gallons, how many more gallons do I need to fill it up?” The chemist showed how to make the chemicals that go into the making of a bowling ball, the farmer talked about how many hours it takes to disk his field, and the dialysis nurse talked about how to take fluid from a body safely, since there's only so much you can take safely at one time. They all brought hands on things the kids could see.

We wanted to break down as many barriers as possible, so we chose more convenient community locations. Everyone is spread out here and the two schools are 15 miles apart. We provided supper and child care. We gave away door prizes. We removed every obstacle we could think of. It rained cats and dogs on that second workshop and still 100 people showed up.

From Sharon Venable:

When parents think math is important so does the child. It's critical that parents convey to their children the value of math and have a positive attitude about it. We developed our math programs to show children and families that math is fun.

The feedback we received was quite positive. Parents enjoyed the experience and felt that, along with their children, they learned a lot. One mother wrote how the event had motivated her to take more math classes. Participants also noted the feeling of community. The schools also appreciated our efforts and asked us to speak at the principal's meeting.

In order to make anything successful you have to find the barriers and break them down. From this experience we learned you can never communicate too much. We had a large turnout in part because we publicized the event so much: we had advertisements on television and the radio, we sent home flyers with the kids, and the principal announced it and put it in the school's newspaper and the calendar. We bombarded the community with communication.

We also billed it as a fun activity that people wouldn't want to miss. It wasn't at school and was not mandatory. There were no expectations.

Also, the more hands you have in on it the more success you're going to have. We formed many allies to help make it happen. We received a number of donations from different programs, business, and organizations in the community. If you try to do something on your own, people may or may not jump on board. But if you have 10 people involved in starting a program, then those 10 people know another 10 people and it will just grow. It's also important to invite the teachers and principals and make sure they feel like they have ownership in it.

Teacher Talk

Toyota's Investment in Mathematics Excellence is a grant awarding teachers up to \$10,000 for innovative projects that enhance mathematics education within a school. It is sponsored by Toyota Motor Sales, USA, Inc. through its partnership with the National Council of Teachers of Mathematics and its Mathematics Education Trust Board.

Five grant recipients identified critical factors in successfully integrating families' into their mathematics projects:

Communicating Frequently

Communication with families not only lets them know about what their children are learning, but also creates opportunities for parents to give constructive feedback.

Barbara Kissling from Kinawana Middle School in Michigan writes, "I integrated a local cemetery into my sixth grade math curriculum. I used a PowerPoint presentation about my project at Open House and referred families to team and grant websites. As families became more informed, they came up with ideas to enhance my efforts and their ideas became a part of the project."

Making Mathematical Links to Everyday Life

Learning about mathematics can be a two-generation activity that connects children to the work of their parents.

Sherrie Martinie from Wamego Middle School in Kansas reports, "I started a 'field experience' program that involved trips to various places in the community, such as the local grocery store, bank, post office, car dealership, and mall. Students would perform various tasks at these locations. For example, tasks involved using the scale in the produce section, determining the fraction and percent of the original price given the sale price of an item, and calculating the late fee in terms of percent of the cost to rent the video. These trips allowed the adults in the community to observe the students as they worked as well as to work with them. In addition, these adults were often parents of the students. Bringing the child to the parent, allowed for the parent to be able to assist the child and perform a task that was comfortable for them."

Exploring and Celebrating With Parents

Parents are likely to participate in math activities that excite their children. Innovative projects act as a hook for both students and their families.

Sharon Daniels from Golfview Elementary School in Rockledge, Florida explains, "I brought pilots from the Young Eagles Organization and the Experimental Aircraft Association to mentor students on how to build airplanes and the mathematics involved in flying. The Fly-Off was the culminating activity where students attach their gliders to a catapult at a local airport and launch them. They measure the distance flown to see who the winner is and then we used the measurements in the classroom to study statistics and

measurement as well as the mean, median, and mode of their flights. The pilots also take the students participating in the project for airplane rides. Parents were encouraged to attend and participate in any and all of the activities.”

Developing Connections to the Community

Communities provide tremendous yet often underutilized resources to motivate students to learn about math and science.

Another project involved Louise Audette from Somers High School in Connecticut, who writes, “My project made concrete connections among mathematics, forensic science, and the community. Students gained experience incorporating mathematical concepts to understand blood spatter analysis, how to measure alcohol content, and assess car collision skid marks. Parents and community members in different occupations came to visit the class and discuss their experiences. For example, the resident state trooper discussed his experiences investigating actual crash sights. The director of Travelers’ Engineering and Forensic Lab offered us an open tour and demonstration of his facility.”

Hosting Family Events

Family math events provide additional math understanding for students and create a learning community that involves parents.

Gary Piercey from Westbury Christian School in Houston, Texas organizes various family events for his middle school. “Math Mystery Night is an event of intrigue where Ace Vinculum Math Detective has been hired to help solve the case of the missing wildcat (our mascot). Ace calls different ‘pre-training’ math detectives, students, and parents to help him solve the case using different logic strategies. Students, aided by their parents, are introduced to different math terminology and are taught critical thinking using logic.”

Lessons from Leaders

Johnny Lott and Marilou Hyson talk about how their organizations are promoting family involvement in mathematics through standards and position statements.

Johnny W. Lott is president of the National Council of Teachers of Mathematics (NCTM) and an avid quilter. As president of the world's largest math organization, he has traveled to many classrooms in the United States and Canada. During these visits he has talked with students of all ages about the fun and beauty in math, and has often used quilting to illustrate how math is interwoven in everyday objects.

Lott believes that family involvement in a child's math studies can be the most important element in helping a child to build a positive relationship with math from an early age.

Families can establish learning environments at home that enhance the work initiated at school.

- Families can make learning math a fun routine at home. Parents tell us that they read to their children, but had not thought about doing math games or problems with them. NCTM helped create Figure This! (www.figurethis.org), a set of problems and activities that show middle school students and their families the math that is found all around us in the real world.
- Families need to know that mathematics learning goes beyond counting. Most families will count with children who are young and then stop doing math because they may not know what else to do. Children need an awareness of how parents use math in their daily activities—from grocery shopping to calculating the best buy on CDs to balancing checkbooks—to know that knowledge of math is necessary for adults.

Communicating about math goals, students' learning, teaching, and programs helps families and other caregivers understand the mathematics learning in which children are engaged.

- Teachers need to practice communicating with families in a language that the families understand. Math educators have their own language that may not be commonly understood outside the profession. We may miss communicating with the family audience if we use only the language of mathematicians.
- Educators should recognize that parents judge the source of information. In piloting Figure This! we discovered that families were more likely to do the math activities at home with their children if those activities were recommended by teachers.

Teachers and administrators should invite families, other caregivers, and community members to participate in examining and improving mathematics education.

- Schools should develop activities that encourage a dialogue with children. NCTM's Principles and Standards for School Mathematics includes learning activities based on real-life situations. For example, how long would you have to stand in line for a concert ticket if you were the 300th person? The problems relate to the NCTM Standards for teaching and learning math, but also send a message that math goes beyond what you usually find in a textbook.
- Schools should invite members of the community to share their math knowledge with students. This activity would enhance communities' appreciation of their schools and enable the volunteers to view them less as isolated institutions. It would also bring families directly into their children's school-day worlds and allow the children to see their families in a different light. Jane McAllister, a fifth grade teacher in Missoula, Montana, developed a yearlong quilting project that ties to other disciplines. A part of a day each week is set aside for parents and community volunteers to work with students and share their quilting and discuss the concepts being studied.

Marilou Hyson is Associate Executive Director for Professional Development at the National Association for the Education of Young Children. She believes that teachers and families can work together to help young children know and love mathematics.

Today more than ever, all children need to be both comfortable and competent in mathematics. Beginning early is important. Families, early childhood programs, and communities are part of a team that together can provide the kind of experiences that will interest young children now, and will build foundations for future learning. In 2002, the National Association for the Education of Young Children and the National Council of Teachers of Mathematics developed a new position statement, *Early Childhood Mathematics: Promoting Good Beginnings*

Many barriers block children's achievement of mathematical competence. Adults' own negative experiences with mathematics—parents and teachers alike—may get in the way of building children's enthusiasm. Adults may also need resources and support to create interesting, worthwhile curriculum for all young children, and to take advantage of everyday opportunities at home.

The position statement makes a number of specific recommendations, based on research and professional consensus about what is needed both within and beyond the classroom. In brief, we need to work together to:

Support young children's natural interest in mathematics, within the context of their families, languages, and communities.

Families and teachers can notice and build on children's curiosity about shapes, number, size, and patterns in the world around them. Children are trying to make sense out of their personal, social, and cultural worlds, and mathematics is one important tool.

Go beyond rote counting to help children develop problem-solving and reasoning skills, and to help them represent and communicate mathematical ideas.

I wonder how much water we need to fill this pitcher. Can you tell Marie about the picture you drew of everyone in your family? Let's see if your family has more children than Marie's family. Experiences and discussions like these challenge children's thinking and help them begin to see mathematics as a coherent system that also connects to other subjects.

Allow enough time for children to focus, explore, and integrate mathematics into their activities, projects, and play.

Mathematics isn't learned in quick, scattered lessons, but through sustained involvement in important ideas, thoughtfully sequenced. Teachers and parents can respect children's need to visit and revisit ideas, using play as an especially important way of learning. Pretending to cook, building with blocks, creating designs with paper, and yarn-rich mathematical opportunities can grow out of all of these and more.

Be active supporters and promoters of children's mathematical development.

Mathematics is too important to be left to chance. Young children love mathematics, but they do not just pick it up automatically. Teachers can help children build on their natural interest by pointing out and investigating mathematical ideas—planning as well as taking advantage of spontaneous happenings.

Advocate for the resources needed by teachers, programs, families, and communities to support all children's mathematical competence.

Just as in literacy development, teachers and families play different, but equally important roles in building mathematical understanding. Resources are critically needed for professional development and appropriate curriculum materials for early childhood staff, for materials and practical tips for families to use at home, for public awareness campaigns, and, most importantly, for an adequately funded, high quality system of early childhood education. Without these supports, disparities in children's mathematical foundations will widen and not all children will have the opportunity to know and love mathematics.

Related Resources

Status of Mathematics in the U.S.

Barthe, P. (Ed.). (2002, Summer). Add it up: Mathematics education in the U.S. does not compute [Entire issue]. *Thinking K-16*, 6(1).

Kilpatrick, J., Swafford, J., & Findell, B. (Eds.). (2001). *Adding it up: Helping children learn mathematics*. Washington, DC: National Academy Press.

Kilpatrick, J., & Swafford, J. (Eds.). (2002). *Helping children learn mathematics*. Washington, DC: National Academy Press.

National Center for Education Statistics. (n.d.). *Mathematics*.

Family Involvement in Mathematics

Bal, S. A., & Goc, J. D. (1999). *Increasing parent involvement to improve academic achievement in reading and math*. Chicago: Master's Action Research Project, Saint Xavier University. (ERIC Document Reproduction Service No. ED438027)

Carr, M., Jessup, D. L., & Fuller, D. (1999). Gender differences in first-grade mathematics strategy use: Parent and teacher contributions. *Journal for Research in Mathematics Education*, 30, 20–46.

Crane, J. (1996). Effects of home environment, SES, and maternal test scores on mathematics achievement. *Journal of Educational Research*, 89, 305–314.

Edge, D. R. M. (Ed.). (2000). *Involving families in school mathematics: Readings from "Teaching Children Mathematics," "Mathematics Teaching in the Middle School," and "Arithmetic Teacher."* Reston, VA: National Council of Teachers of Mathematics.

Pezdek, K., Berry, T., & Renno, P. A. (2002). Children's mathematics achievement: The role of parents' perceptions and their involvement in homework. *Journal of Educational Psychology*, 94(4), 771.

Teaching Case From HFRP

In the teaching case *What's going on with Tomásito?*, Ms. Brady, a second grade teacher, belatedly realizes that Tomásito, a model-behavior Latino student performing at grade level, is experiencing math difficulties. Formal parent-teacher conferences are over, summer is fast approaching, and Ms. Brady needs to connect with Tomásito's family to understand his math difficulties.

- Ma, X. (2001). Participation in advanced mathematics: Do expectation and influence of students, peers, teachers and parents matter? *Contemporary Educational Psychology*, 26, 132–146.
- Moses, R. P., & Cobb, C. E. (2001). *Radical equations: Math literacy and civil rights*. Boston: Beacon Press.
- Moses, R., Kamii, M., Swap, S. M., & Howard, J. (1989). *The Algebra Project: Organizing in the spirit of Ella*. Retrieved March 25, 2003 from <http://www.cpn.org/topics/youth/k12/algebra.html>
- Muller, C. (1998). Gender differences in parental involvement and adolescents' mathematics achievement. *Sociology of Education*, 71, 336–356.
- McGrath, D. J., & Kurlioff, P. J. (1999). The perils of parental involvement: Tracking, curriculum, and resource distortions in a middle school mathematics program. *Research in Middle Level Education Quarterly*, 22, 59–83.
- Peressini, D. D. (1998). The portrayal of parents in school mathematics reform literature: Locating the context for parental involvement. *Journal for Research in Mathematics Education*, 29, 555–582.
- Schwartz, W. (1999). *Family math for urban students and parents*. New York: ERIC Clearinghouse on Urban Education. Available at: eric.ed.gov/ERICDocs/data/ericdocs2/content_storage_01/0000000b/80/2a/2e/26.pdf.
- Shaver, A. V., & Walls, R. T. (1998). Effect of Title I parent involvement on student reading and mathematics achievement. *Journal of Research and Development in Education*, 31, 90–97.
- Starkey, P., & Klein, A. (2000). Fostering parental support for children's mathematical development: An intervention with head start families. *Early Education and Development*, 11, 659–681.
- Westat & Policy Studies Associates. (2001). *The longitudinal evaluation of school change and performance (LESCP) in Title I schools* (Vols. 1–2). Washington, DC: U.S. Department of Education, Planning and Evaluation Service. Available at: www.ed.gov/offices/OUS/PES/esed/lescp_highlights.html.

Funds of Knowledge

- Civil, M. (1998, April). *Bridging in-school mathematics and out-of-school mathematics*. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA..
- Civil, M. (1998, July). *Parents as resources for mathematical instruction*. Paper presented at the ALM5 conference, Utrecht, Netherlands.
- Civil, M. (1998, July). *Linking home and school: In pursuit of a two-way mathematical dialogue*. Paper presented at the conference of the International Group for the Psychology of Mathematics Education, Stellenbosch, South Africa.
- Civil, M. (2000, July). *Parents as learners and teachers of mathematics: Towards a two-way dialogue*. Paper presented at the ALM7 conference, Medford, MA.
- Harvard University-Smithsonian Center for Astrophysics. (Producer). (2000). *Mathematics: A community focus* [Workshop 2 in video series, Looking at Learning ... Again, Part 2].
- Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice*, 31(2), 132–141.
- Office of Educational Research and Improvement. (Ed.). (1994). *Funds of knowledge: Learning from language minority households*. Washington, DC: Author. (ERIC Document Reproduction Service No. ED367146).

Early Childhood Mathematics

- Coates, G. D., & Gothberg, B. (Eds.). (1997). *Family math for young children*. Berkeley, CA: Equals.
- Copley, J. (Ed.). (1999). *Mathematics in the early years*. Reston, VA: National Council of Teachers of Mathematics.
- Fromboluti, C. S., & Rinck, N. (1999). *Early childhood: Where learning begins—Mathematics, mathematical activities for parents and their 2–5 year old children*. Jessup, MD: U.S. Department of Education.

Standards and Position Statements

National Association for the Education of Young Children and the National Council of Teachers of Mathematics. (2002). *Early childhood mathematics: Promoting good beginnings*. Washington, DC: Author.

National Council of Teachers of Mathematics. (n.d.) *Principles and standards for school mathematics*. Reston, VA: Author.

Harvard Family Research Project. (n.d.). *Family-school-community partnerships: A compilation of professional standards of practice for teachers*. Cambridge, MA

Programs

The Algebra Project is a national mathematics effort created by Robert Moses to support the mathematical achievement of low-income students and students of color. The project has developed curricular materials, teacher professional development support, and community involvement activities for schools.

Family Math is an after school family involvement program that provides elementary school children and their parents with opportunities to develop problem-solving skills and understanding of mathematical concepts in an enjoyable way. It was developed by EQUALS, Lawrence Hall of Science, University of California, Berkeley, CA.

Figure This! is a joint project of the National Council of Teachers of Mathematics, the National Council for Minorities in Engineering, and Widmeyer Communications. It is designed to provide a family-friendly way to become more involved in learning math.

MAPPS (Math and Parent Partnerships in the Southwest) is a four-year project funded by the National Science Foundation and administered by the University of Arizona's Department of Mathematics. It engages parents as partners in improving learning and teaching of mathematics at their local schools.