

**FAMILY MATH AND FAMILY SCIENCE: Parental Involvement Encourages
Early Math and Science Experiences for Girls**

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FAMILY MATH and **FAMILY SCIENCE** are early intervention programs that address the need to enlarge the pool of would-be scientists and engineers. They stress parental involvement and hands-on activities as necessary sparks to light the interest of all students, especially female and minority children, in their understanding, enjoyment and success in mathematics and science.

Ask educators who has the most influence in determining whether a child succeeds academically: the answer almost always is parents. Yet many schools do not treat parents as equal partners, but often make them feel unimportant and even unwelcome in the school. Parents, too, are to blame. Many parents leave their children alone too much after school, fail to discipline them, fail to motivate them to learn, and sometimes take too little interest in their daughters' mathematics and science education.

Until recently, there has been a lack of attention to the role of parents in education. Even in *A Nation at Risk*, the first and most famous of the school reform reports, the role of parents was mentioned only in a postscript.

However, the rapidly changing dynamics of American families are having reverberations throughout society and, certainly, in the schools. For example: 60% of today's students live in families where both parents -- or the only parent, work outside the home. By 1995, four out of five school age children will have mothers in the labor force.

Changes in family structure have made the many mechanisms and ideas of the past for working with parents obsolete. Few families, poor or otherwise, have the time or inclination to participate in traditional school-based volunteer activities, e.g., PTA meetings, back to school conferences, helping with class activities or, holding bake sales. Working parents cannot take time off for afternoon conferences or PTA meetings; and single parents may find evening meetings difficult to attend or not a priority. As a result, many teachers tend to write off parent participation, especially

of poor or minority parents, assuming they cannot or will not contribute to their children's education. But research has found that most parents care deeply about their children's education, but do not know how to help. All parents want what is best for their children. And, when parental involvement is focused on how to work with their own daughters and sons at home in ways that will encourage and help them to succeed, most parents will participate in school activities.

Parents are motivated, if the focus is on the child. And parental behavior and involvement in schools has been consistently linked to higher student grades and test scores, more positive student behavior and improved school climate. It follows, therefore, that parental support and encouragement can be vital to their daughters' as well as their sons' mathematical and scientific development and success in school and, ultimately, to their future careers in math and science. The social, economic, or educational status of parents does not have as important an impact on their daughters' achievement as what parents do with and expect from their daughters.

If we agree that all children, but especially females and minorities, must have an education that will enable them to function effectively in a world where mathematics and science are necessary for an ever increasing number of career options, we must then involve parents. Job opportunities for women in the next century will require the ability to solve problems, to develop models, to ask questions and to apply specific skills to real situations. It is important for parents to understand this and to make clear to their daughters, at an early age the relevance and importance of mathematics and science to their futures.

Two successful parental involvement programs to encourage girls in math and science in the elementary school are New Jersey **FAMILY MATH** and New Jersey **FAMILY SCIENCE**.

FAMILY MATH was developed by EQUALS at the Lawrence Hall of Science, University of California, Berkeley, in the early 1980's and introduced to New Jersey schools by the Consortium for Educational Equity at Rutgers University in 1985. It is a program for parents and children to learn math activities together in an enjoyable, non-threatening atmosphere. It provides teachers, parents, and children with positive attitudes about mathematics and increases parental involvement in their children's education.

In many cases, parents' expectations for their children vary based on the child's sex and race. Substantial evidence indicates that many parents expect their sons to do better in math than their daughters, demand higher grades of their sons, and are less willing to allow sons to drop math in high school when it is no longer required. They are more likely to buy computers for their sons than their daughters and enroll them in special computer programs. **FAMILY MATH** challenges these limited parental expectations by demonstrating the necessity and importance of math skills to girls' futures. In addition, new immigrant parents frequently lack the money, or

the opportunity, or the awareness of the need for special math resources for their children. A component of **FAMILY MATH** is the inclusion of Spanish-language books, materials and activities to facilitate the participation of Spanish-speaking families; and the use of high school students proficient in other languages to translate the materials, directions, and philosophy of the program for non-English speaking parents.

In the New Jersey **FAMILY MATH** program, elementary teachers welcome parents into the school and to their class, work with parents and children together informally and enthusiastically, in order to improve both children's math skills and parents' understanding of math concepts. **FAMILY MATH** stresses the importance of continued math study for all children's futures. Special emphasis is placed on encouraging the participation of families of female and minority students because, on average, these students have a disproportionately high incidence of underachievement and underrepresentation in math.

The teaching emphasis is on the doing of mathematics. Time is not spent on worksheets or in a lecture format. Inexpensive materials of all kinds -- beans, blocks, bottle caps, toothpicks, coins -- are used to help people figure out ways to solve problems. Children and adults, parents, grandparents, sisters, come together once a week for six weeks to do mathematics, and then practice at home the ideas they learn in class. Babysitting is provided by the school in order not to exclude any families. Families are encouraged to talk about ways they are solving problems; girls are especially encouraged to be actively involved. In class most activities are done in small groups with two or three families working together cooperatively, the teacher acting as a facilitator. To date, 175 New Jersey teachers have been trained in **FAMILY MATH** by the Consortium staff and are presently conducting one **FAMILY MATH** class a year in their elementary schools.

FAMILY SCIENCE is a similar outreach program designed to teach science skills; children, especially female and minority, and their parents learn and enjoy science together; and, ultimately, both the teaching and the curriculum of elementary science is improved. **FAMILY INVOLVEMENT IS THE KEY TO THE FAMILY SCIENCE PROGRAM.**

An outgrowth of the **FAMILY MATH** program, the **FAMILY SCIENCE** materials have been developed by Northwest EQUALS at Portland State University in Portland, Oregon and fieldtested in Oregon and Washington in 1987-88; in San Francisco, Washington, DC, and the 12 New Jersey school districts in 1988-89. **CHEVRON, USA** is sponsoring the development of a **FAMILY SCIENCE** book scheduled for publication in 1991. In 1989-90 the Rutgers University program was expanded to 13 more schools in New Jersey and a cadre of **FAMILY SCIENCE** mentor-teachers were trained to assist new teachers in conducting their **FAMILY SCIENCE** classes.

In the New Jersey **FAMILY SCIENCE** program, as in **FAMILY MATH**, teachers are trained to use hands-on activities as they conduct classes for students and their families in their local schools in the early evening hours. The **FAMILY SCIENCE** syllabus consists of experiments, activities and games that enlarge the elementary science curriculum by including math-based physical science and chemistry in addition to the more traditional biology and botany. All of the activities are open-ended, and use inexpensive, readily available materials which encourage extension by girls as well as boys in kitchens or in backyards.

Each school schedules six two-hour **FAMILY SCIENCE** sessions serving an average of 15 families, about 20 adults and 20 children. In these sessions, parents are given overviews of scientific topics and concepts taught in school; then parents and children work together in small groups to share insights, to solve problems, to "talk and do science," to play with scientific principles in a supportive, cooperative atmosphere reinforcing the relevance of science to a student's future. The program's goal is to utilize imaginative, hands-on learning activities to enlarge the pool of future scientists by stimulating female and minority students' interest in science and to improve their self-image as learners of science. After class, the discovery and fun can continue since materials for activities are given to families to take home.

While all **FAMILY SCIENCE** sessions stress the skills of scientific investigation, the fifth session specifically focuses on career and societal applications. Women and minorities in science-based occupations are invited to talk about their work and demonstrate the role science plays in career choices. Other activities in this session emphasize the importance for girls to continue math and science in high school and beyond, in preparation for exciting fields of study and work. Throughout the program special emphasis is placed on debunking the stereotype of a scientist as a white male, absent-minded nerd.

In order for all children and their parents to enjoy science together and to discover the applicability of science to daily life, the focus of **FAMILY SCIENCE** classes is hands-on and experiential. For example, children and their parents play with "inertia" by moving marbles from the bottom of a bowl to the rim; they learn that, when water is poured sideways down a string, the attraction of water to the string as well as to itself is greater than that of gravity; families observe, describe and recognize physical and chemical properties of matter, using vinegar, iodine and baking soda; they estimate and predict magnetic force, using everyday objects and magnets; they discover several different ways to light a flashlight bulb, constructing circuits and circuit boards; they learn about air pressure using balloons, and warm and cold bottles of soda.

While everybody is having fun, girls as well as boys are actually learning science by interacting with materials, equipment and phenomena from their everyday surroundings. They are using the process skills of science: observing, inferring,

classifying, measuring, predicting, hypothesizing and experimenting. Finally, as they complete the investigation, they interpret the data, and draw conclusions. They are learning that science is more than just facts; it is a structured and directed way of asking and answering questions. The stuff of science is curiosity, inventiveness, critical thinking and persistence. Curious girls and boys and their parents poke and probe, sniff and feel, study and read.

FAMILY SCIENCE can help all children, especially girls and minorities, to like and to succeed in science. It is especially effective in increasing the competence and confidence of elementary teachers as well as parents who often feel uncomfortable with their own lack of scientific knowledge; and, thus, do not know how to encourage their female students and their daughters to enter the pipeline of future scientists and engineers. In **FAMILY SCIENCE** teachers and parents learn to recognize the importance of encouraging questioning skills in girls, and thereby, nurturing a pool of potential talent traditionally overlooked and, often neglected.

One New Jersey teacher's comments underscores the importance of **FAMILY SCIENCE** for young girls:

"We have had an enthusiastic response from parents and young girls to our **FAMILY SCIENCE** program. We have seen real creativity and cooperative group effort in activity problem solving. We have encouraged real trial and error thinking and have seen girls and minority children and their parents take real ownership of their ideas. We can feel the excitement in the air. It will be through experiences like this that more young women will trust to find the sciences interesting and worth becoming involved in."

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