THE BILL MEYERS GROUP

Math Paths

The New Equation

8th Grade Girls + Algebra = Real-World Success

America's Two Distinct Math Classes

They said I tested off the charts when it came to spatial relations. Growing up near Stanford University in the 1950's, the daughter of a brilliant mathematician and a pre-med student, I reveled in learning and always made a place for numbers in my brain. When I received my master's degree in cybernetic systems – as one of the few women in an interdisciplinary graduate engineering program – it felt good and right. And as the mother and wife of three brilliant, but verbal, learners, I came to understand the crucial importance of a quantitative underpinning.

But these skills are not – and should never be – exclusive to those of us with numeric DNA. Whether they think in symbols or words, all students should receive the tools and training that enable them to grasp the essence and essentials of math. And teachers must impart this material in more than one way for more than one audience. Truly, when it comes to math, we must leave no child behind.

Unfortunately, two separate and distinct math classes form in America when students enter 8th grade and encounter the abstract of algebra – the quantitative haves and the qualitative have-nots. Before this intellectual tipping point, many verbal learners succeed by memorizing arithmetical facts; but mechanical repetition fails them when confronting algebraic concepts.

Too many students, parents and teachers get swept away by the tidal wave of equations, the flood of variables, and the cascade of expressions and functions. Verbal students, for example, feel inadequate at a time when pre-adolescent self-esteem is at a premium; teachers feel unfulfilled because half their pupils are dazed and confused by algebra; and parents feel frustrated because they're paying for an educational product – enriched algebraic understanding for their children – but aren't getting their money's worth.

These negative feelings were echoed time and time again in a series of group conversations we conducted about math education over the course of several years. Indeed, when it comes to algebra, almost everybody feel stymied and short-changed.

Coming to Terms with Girls' Algebra Antipathy and Anxiety

But perhaps the most disenfranchised group of all is 8th grade girls, who have a highly-charged and ambivalent emotional relationship with algebra.

On one hand, these bright and intuitive young ladies know solving for x helps develop life skills that will enhance their college educations and careers. On the other hand, they feel tension and stress and exhibit negativity when they engage in math beyond arithmetic. Simply put, they don't like it much – and they don't get it enough.

Even if they comprehend algebra, 8th grade girls feel self-conscious because they are in the minority and working with equations is perceived as the uncool province of dorks, nerds and geeks. It's also hard for 13-year-old girls who are hitting the "wall of femininity" to compete in math against boys who have been preoccupied by computers since the age of eight.

The very nature of math – with its rules and one right answer per problem – makes 8th grade girls uncomfortable. They are creative and self-expressive young people at this age, and algebra feels rigid and restrictive. Unlike language arts classes, which reinforce 13-year-old girls' social need to collaborate and connect, math classes seem isolating and less participatory. The key take away is that 8th grade algebra does not usually relax or reward these sensitive and needy adolescents.

So, how do we help 8th grade girls overcome their algebraic antipathy and anxiety? Like verbal students, they are not disabled learners. They just need to be better understood and accommodated. Pointing fingers and playing the blame game here is hardly constructive and definitely not our intention. There is no crisis of culpability. But it's clear that we need to involve all relevant audiences – teachers, educational administrators, parents and government and business leaders – to help guide more girls through algebra's rough passage and out into the ocean of real-world opportunities that awaits them.

This complex mathematical navigation should be financially feasible and cost-effective. Imagine the impact that a full generation of math-literate boys *and* girls could have on American culture, society, business and competitiveness over the next five decades. Keeping that in mind, we must go forward and wade into this issue – even if the currents are strong and the waters are choppy.

Girls and Algebra: Addressing Three Core Issues

In an improved world, algebra would be viewed by 8th grade girls as engaging, energizing and empowering. The average 13-year-old girl studying this frequently tormenting subject would say: "Algebra is challenging and makes me think. It helps me deal with my life in a way that puts me in control – now, and in the future." And, as a result, algebra would play a positive role in helping these young female students deal with three crucial issues as they came of age:

- Coping With the Confusion of Adolescence
- Boosting Self-Esteem
- Preparing for "Real" Life

Shifting the deeply ingrained negative attitudes toward algebra – and transforming its reputation so that it is seen as rewarding rather than restrictive – represents a monumental challenge. And it means reversing decades of societal conditioning and gender stereotyping that has, too often, become a self-fulfilling prophecy because of the power and persuasiveness of the media.

Technology deployment, private-sector involvement and teacher commitment are critical to this process of intellectual change. Without these three components, it will be difficult to communicate and converse with 8th grade girls in a comfortable language they understand, and it

will be nearly impossible to convince them that algebra is beneficial and worth embracing. In every case, solutions must be seen by classroom educators as helpful, non-intrusive and value-enhancing. Overtaxed and overburdened 8th grade math teachers do not need – and cannot handle – additional work, given the expansive and exhaustive curriculum they are required to impart in a compressed period of time.

Augmenting the traditional linear approach to algebra with greater interactivity, collaboration and self-expression is the first step toward winning over the hearts and minds of 8th grade girls, who respond more readily to emotional – rather than rational – teaching techniques. As one of the young female algebra students with whom we spoke said, "When you're working together with your friends, you just have a lot more ideas … it makes it a lot more fun, and it's easier to learn."

To foster group learning of algebra among 8th grade girls across the country, serious thought should go into developing a peer-to-peer information-sharing Web site that would encourage real-time dialogues about math problem-solving. The prospect of 13-year-old girls instant messaging each other about quadratic equations boggles the mind, but it isn't too far-fetched, and it just might smooth the edges off algebra's sharp image.

Picking Up on Algebra's Rhythms

Relevance is also essential. We must find ways to connect algebra to real-life case studies that are part of a 13-year-old girl's day-to-day world – like shopping, for instance. Or music. And speaking of music, why not create music videos that teach algebra in a hip way and can be downloaded onto a PC, iPod or cell phone? Listen, again, to one of the young female algebra students we talked with: "At our school, music kind of defines who you hang out with and what kinds of groups are attached to you, so it determines your social life."

If packaged, articulated and distributed properly, algebra can not only be a meaningful part of a pre-adolescent girl's life, it can actually help calm, center and stabilize her topsy-turvy teenage existence. One female algebra student, who has had some success in the subject, told us: "Math puts everything in order for me. It makes me happy because I understand something."

In an effort to work things out in their own minds, many girls at this age keep a daily diary or journal; "It's my safe place to go," said an 8th grade female algebra student in a recent conversation with us. So why not persuade these young ladies to keep a digital algebra journal to record their innermost thoughts – their ups, downs and in-betweens – about this vexing subject?

Once we get them traveling – albeit uneasily – down the math path, 13-year-old girls need role models to encourage and exhort them to complete the journey to algebraic excellence. Boosting self-esteem and a true sense of "girl power" in the face of sometimes excruciatingly abstract equations or expressions is an absolute requisite. We must try to eliminate the negative personal feelings and damaged self-worth that often take over when an 8th grade girl feels defeated by algebra.

One young lady we spoke with was especially hard on herself when talking about her inner struggle with algebra: "Some of this makes me cry," she lamented. "It makes me mad. I'm really frustrated. It takes a lot of brain waves to solve anything." But another 8th grade girl, who was progressing more easily in algebra, had a different and more robust self-image: "Math can be something amazing," she gushed. "You can be passionate about it."

Each of these 13-year-olds would benefit from a multimedia public-service advertising campaign – on the Internet, in movie theaters, and at the mall – in which recognizable and appealing female celebrities extol the virtues of sticking with algebra and "getting it."

That message should resonate with many 8th grade girls, who understand that success in algebra can pave the way for professional success later in life. In other words, getting math means getting ahead in fun, interesting careers that range beyond science and technology. One female algebra student was clear with us on this subject: "Math relates to our life in the future." And another looked over the horizon in much the same way: "Our algebra teacher is always telling us to pay attention really, really closely because everything is going to help us later in life."

Technology Solution: Developing an Internet Algebra Portal

Our goal is to help 13-year-old girls appreciate algebra as a stimulating and stabilizing subject that has near- and long-term benefits for them both personally and professionally. This is clearly a major undertaking, and one that we'll undoubtedly return to in future communiqués. In the meantime, we believe it's important that this adolescent audience has the opportunity to learn math in a suitable and comfortable manner that meets its distinctive needs. Digital tools can make a huge difference with this technology-centric group. And that's why we propose five Internet-based initiatives to help make algebra a more meaningful part of 8th grade girls' lives:

- A peer-to-peer information sharing Web site for algebra problem-solving
- Music videos to teach algebra in an appealing and relevant way
- Digital algebra journals to encourage greater math self-expression
- A supportive "pro-algebra" public-service campaign involving female celebrities
- An online resource guide and blog for algebra teachers and the parents of young female algebra students seeking to reinforce their daughters' efforts

Ideally, these Web programs would be bundled on one Internet portal, so that all constituencies – students, teachers and parents – could take advantage of their collective educational power. If this digital site were built, inquiring minds would almost certainly follow; and America might see happier, more confident 13-year-old girls as well as the first glimmer of a solution to its math literacy crisis.