

PARENTS LEAGUE OF NEW YORK

# Review

# 2011

Essential Articles on Parenting and Education

# The Math Classroom

## Where Diversity Matters

Marisha Plotnik, *Teacher, Rudolf Steiner School*

Diversity is, at long last, a subject of interest in every independent school and independent schools are now deeply committed to opening their doors to students of color. We well know that separate is not equal; our children should look around their classrooms to see faces that look like theirs and faces that do not. At the same time, we sell ourselves short if we allow our concept of diversity to stop at opening the door to a range of skin tones. What happens on the other side of that door bears careful consideration.

If I am to make good on a promise of genuine diversity, I must go with my students past the place of tolerating differences towards a profound appreciation of what each human soul brings to this world. When I value diversity, I value learning what you have to teach me. We transcend simple competition and engage in the much greater challenge of collaboration. Over the years, I have grown ever more conscious of the rare possibilities that a math class offers in this regard.

One of the great gifts of mathematics is that you and I can arrive at the same answer and, despite all of our differences, we both know that answer is true. Most beautifully, we can arrive at that same answer along very different paths, and we can follow each other's path. As I follow your clear thinking, I see the world through your eyes. We both know when a mathematical thought is true and when it is false. Here in the mathematics lessons we find a refuge from warring opinions: opinion melts away in the face of truth.

With the shared truth before us, as the common ground to which we return time and again, we are safe to listen to each other's ideas. A few months ago, secure in the knowledge of how to calculate an arithmetic

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mean, the sixth graders had a wonderful conversation about averages. One girl described how she thought of an average as a compromise: when two numbers had a disagreement, they would meet in the middle. Another child thought about it as sharing with your friends: if the class went apple picking, we could pool all our apples together at the end of the day, divide them

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evenly among all the pickers, then each child could take home the average number of apples picked. A boy explained how you could use an average to make a prediction: if you knew you averaged 50 mph on long car drives, you could estimate how long it would take you to drive the 900 miles from New York City to

Atlanta. The children were eager to listen to each other, delighted by how many ways there were to understand such a simple arithmetical procedure.

The mathematics lesson is a safe place to take good risks. We learn to risk a wrong answer, to make ourselves vulnerable. We learn to speak up, for we never know whose question will take us on a wonderful journey, whose idea will lead us forward. The quietest child in the room might reveal the very thought we needed. In a recent eighth grade class in solid geometry, we were considering our friends Ant and Bug who live on the most distant vertices of a cube and counting the number of ways to get from A to B along edges. Then someone wondered what was the shortest way to get from A to B while remaining on the surface of the cube. I put my lesson plan aside and we got to work calculating the lengths of different paths across the faces of the cube.

Here is leadership training in practice. In this kind of moment, when a student asks a question whose answer is not obvious to me, we become a community of truth-seekers. As the teacher, I still have a role in keeping us on the path, but the new direction can come from anyone in the room. I need to listen carefully to my students to understand their original thoughts. One student may have an excellent idea but will need the help of another to make that idea understandable to the rest of us. We are co-creators, working together towards a single goal, united in our efforts.

When mathematics is a collaborative enterprise, the more diversity we have in the class the better. Some students can picture a relationship geometrically, others understand it numerically. One might have an intuition,

but another can help him put it into words. As part of their work for some courses in my school, students create their own books. By eighth grade they are increasingly independent in how they make these pages, and they are always amazed to see the diversity of ways in which their classmates present an idea. They come up with explanations I had never thought of, and a student can often explain an idea more convincingly than I can.

For me, a genuinely diverse classroom includes not only a variety of ethnic, religious and racial backgrounds, but also a diversity in skill. Parents sometimes wonder if the less skillful students will get lost in a diverse class. On the contrary, I have found that they often learn the most by seeing good math modeled for them. And once a class gets going on a good problem, the enthusiasm in the room tends to sweep up even the most timid and reluctant ones. Making the switch from

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high school to middle school has reminded me that nothing fundamental in mathematics ever goes away. It is tremendously effective to teach in a small school where I know I will teach these same students many times over the next six years. There is time to build a relationship with each one, and the opportunity to consider the long-range plan. If a young student doesn't have the intellectual maturity to grasp a difficult concept this year, I can let it quietly sleep in his imagination, like a seed over winter, and let it sprout when the conditions are ripe. We can work hard without rushing in an atmosphere of enthusiastic seriousness.

As the students collaborate with their classmates over time, they see that ability is no fixed quantity meted out at birth in some quotient of intelligence. Rather they see how their classmates' intellects mature at different rates and experience how each one leaps forward as they reach developmental milestones at different times. Most importantly, they experience how their own effort, effectively applied over time, earns them the ability to do what they could not do before. We learn patience, waiting in respectful and encouraging silence, for someone to work through a difficult thought, and we learn perseverance, for there is no giving up in class. We know that every person will be called upon to do something difficult: that is simply what happens in math class. We learn not to judge and label each other's capacities, but to recognize each other's unlimited human potential.

In my visits to other schools, I have observed wonderful collaboration.

I have also observed math classes where no learning has taken place. Those classes seem to be a place where you perform: you hand in the homework and write the tests and only raise your hand when you know the correct answer. Students used to that way of working will tell me that they cannot learn in school and they will learn it after school with their tutor. But what the tutor can never offer is collaboration in a diverse community of learners. The rhetoric of competition has overwhelmed the political conversation about education. But what a powerful paradigm shift to demand collaboration instead. A genuinely collaborative community is a rigorous and demanding one: I cannot help you if I have nothing to offer. And I cannot work with you if I have no understanding of who you are. Math, that most inward and individual of pursuits, can be at the same time a profoundly social deed, one that strives to transform the rhetoric of diversity into a living reality.

*Marisha Plotnik teaches mathematics and physics at the Rudolf Steiner School in New York City. In 2008-09 she was a Joseph Klingenstein Fellow at Teacher's College, Columbia University where she earned a master's degree in private school leadership.*