

Things I Learned In School Last Year

By Jim Loats

Be at work by 8am, every day. Observe the dress code. (Dress code!?) Have a cubicle as an office, but be out in the schools most of the time. Update my phone message every day. Carry a cell phone. This is definitely NOT the life of an academic. But it was my life during the year I spent, away from my job as a mathematics professor, as a Mathematics Coordinator for the Denver Public Schools (DPS).

The district's decision to move towards Standards-based curricula in grades 4 – 8 increased my desire to step out of my comfortable academic routine. *Everyday Mathematics* and *Connected Mathematics Program* are well-designed, field-tested, sophisticated Standards-based curricula. When they are used effectively, students will gain a broad, deep and connected understanding of mathematics. To use them well, teachers must have a solid understanding of the important mathematical concepts and be prepared to take on different roles in the classroom. I had changed my own teaching methodology in most of my college courses and was excited to help others make similar transitions.

During the mid 1990's at Metropolitan State, I was co-P.I. and Mathematics Team Leader of our NSF-funded Rocky Mountain Teacher Education Collaborative. In this role I helped to hire middle and high school teachers to work on-campus side-by-side with college math and science faculty on curricular revisions. I became good friends with one of these Teachers-in-Residence, Rosanne Fulton, who had since become Director of Curriculum and Instruction at DPS. One July evening last year she phoned. "Why don't you take a year's leave from Metro and park your car at over here at DPS where the real work is?" I decided it would be a great opportunity, and my department chair and dean concurred. DPS could benefit from my expertise and I'd learn a lot about public schools ... really fast!

My coworker, Debbie Hearty, had been doing this job for several years and was an expert. I studied her closely while I hastily learned a whole new culture. As Mathematics Coordinators we directed the Math Team, a group of nine teachers who had been newly chosen to be district Mathematics Specialists. Together with the Team, we designed and presented curriculum implementation workshops for over 300 fourth–eighth grade mathematics teachers. Debbie and I regularly worked on math problems with the specialists and supported them in the work with their teachers. We created curriculum pacing guides and visited classrooms with school principals.

We had additional tasks. We conveyed the district's new vision of mathematics instruction to various stakeholders: superintendents, principals, parents, school board members, the press, vendors, professors at various local colleges and universities and colleagues on national grants. We explained the new curricula at meetings with administrators and teachers from special education, gifted and talented programs, counselors, technology, summer school, English language acquisition, career education, alternative schools and student records. I had no idea how much effort was required just to inform all the non-teaching staff of the implications that came with the changes in mathematics curricula.

What I Learned About The Schools

I learned that helping schools to improve requires very sophisticated thinking and excellent management skills. The problems are complex and resistance to change is huge. Successful interventions took time to plan and the right people in the right places making good decisions to carry them out. There are no easy solutions.

Everyday Mathematics and *Connected Mathematics Program* place enormous demands on teachers, both in terms of their content knowledge and their pedagogical flexibility. Providing adequate support for them in both areas will require a significant effort for all of us for years to come.

I learned that mobility of teachers is a problem, especially in urban districts like ours. The teacher turn over within a building can be quite large from year to year. This underlying fluidity is very different from my experience in higher education. It cuts both ways in the schools. On one hand, school change efforts can lose momentum when the players change. On the other, it can help, because some of the troupe maybe different next year.

I learned that the schools are not in charge of themselves. Many stakeholders know best about what should happen. What happens inside schools is often defined outside of the schools. For example, I talked with parents who did not want mathematics instruction to change and yet they admitted that their own school math experiences were not particularly effective.

Each school exudes a unique culture and individual personality. You can feel it the moment you walk into a building. This culture influences the nature and amount of learning that takes place. While this culture has considerable inertia, a strong principal can impact a school and change the learning/teaching experience for teachers and children.

The daily workload of K-12 teachers is “impossible”. Almost no one has enough time to do their job really thoroughly, although most do outstanding jobs! Their work schedules, the conflicting push-pulls and the slow pace of change conspire to divert their attention from the business of teaching children. Administrators must be as wise and thoughtful as they can be, considering their hectic schedule and breadth of responsibilities. After working with them for a year, I have profound respect for all of these people and the work they do.

Tracking

I was most disturbed by the consequences of tracking students. It may seem like common sense for a third grade teacher to group children based on how fast they read. Small, seemingly obvious decisions like this one lead over time to the following situation I observed across this diverse urban district: Mostly white and affluent students in the honors and AP classes and mostly poor students of color in the regular and low track classes. I was (and remain) very troubled to learn about this reality in our schools, not just in Denver, but all across our country.

The issue is the balance between serving the needs of the whole classroom with what is best for any particular child. There is good news. Schools that adopt these new sophisti-

cated curricula acquire a tool that has been specifically designed to address this and other equity issues while teaching good mathematics, all without discriminating against whole groups of kids. These Standards-based curricula work especially well in classrooms that contain a broad spectrum of students. They rely on the rich variations of student experiences to provide multiple means to view and understand the mathematics that arises. They have multiple entry points to provide access for students with different backgrounds and learning styles.

What I Learned About Me

I enjoyed spending time with teachers, both in their classrooms and at the workshops. I loved helping principals and other administrators understand the design of these new curricula. I felt like I was making a difference. I liked working closely with a team and pulling off nearly impossible missions. My work life as a professor is usually more isolated.

I valued being personally challenged in a series of workshops on equity. Using protocols from the National Center for Equity in Education, forty of us started facing our biases around race, gender, class, and sexual preference and became close friends.

I was proud to be working for leaders who were smart and pushed the system to change as fast as it could. I respect the district's administrative team, especially the Superintendent, Jerry Wartgow, the Chief Academic Officer, Sally Mentor Hay, and my supervisor, Rosanne Fulton. I trusted that they were making wise, strategic decisions even if the details of implementation at my level occasionally seemed hurried or impractical.

I truly fell in love with the people of the Denver Public School system. They love the children and give their best, often in less than optimal situations. Our mission was to provide excellent schooling to "Every Child Every Day." It was truly inspirational and compelling to be working with people who took that to heart day in, day out.

I often felt ineffective because very few things changed directly or immediately as a result of my work. Back on campus, the feedback from students was always more immediate and direct

Coming from the classroom, I was caught off guard by the work life of an administrator. I was not in charge of my time. I was always on-call and accountable to my boss, fellow curriculum teammates and the public. My schedule for the day was fluid and unpredictable. There was always something new to do. The tasks could not be done as fast as needed. Any decision inevitably led to unforeseen consequences. I missed the structure, predictability and freedom of my academic routine.

What this means for our work as mathematics professors.

First, I urge us all to continue rethinking our mathematics courses so that our students finish them with in-depth conceptual understanding that makes sense to them and sticks with them long after the final examination. Further, in each of our classes, we must regularly take time to examine with our students how learning happens in the class. For ex-

ample, take brief moments away from the content to make public and explicit what we are doing to help them learn.

I write this after observing over 100 middle and high school classrooms teachers who have been teaching for many years. Many “facts and skills” they learned in their college mathematics classes have probably faded away. Nevertheless they model their own classes on recollections of their experiences in college mathematics classes. For most, that meant listening and taking notes; answering, not asking, questions; working alone and mistrusting opportunities for collaboration; memorizing “how” to do a problem and not worrying “why” it works; and, importantly, rarely being asked to write cogent explanations of their own understanding of the important ideas of the class.

Imagine it is a year after one of your classes. Wouldn't it be cool if the students could explain the central big ideas in the class and understand how they fit together? Even better if they had an explicit understanding of what you did as their teacher to help them learn. For all of our students, but especially the future teachers, it would send a strong message that mathematics is about understanding and making sense; and that their task as students is to build, with our help, their own coherent, connected structure of the fundamental ideas.

Data from the recent Third International Mathematics and Science Study (TIMSS) video study show that teachers in the United States, *unlike every other country*, always convert problem-solving opportunities into procedural tasks and teach their students to do them that way. Somehow, in our college and university courses perhaps, these teachers have learned that mathematics is about recalling and performing procedures to the exclusion of thinking, conjecturing and problem solving.

These new school curricula require teachers to have the habit of asking, “*Why does this work?*” not just “*How does it work?*” Most of the teachers I observed had difficulty leading discussions about why things work. The prospective teachers in our classes need to see these types of discussions modeled in their college and university classrooms by “real” mathematicians.

Second, it is important that we as members of higher education mathematics community work to understand the important, difficult work of the K-12 teachers and then be public with our support and respect for them. Too often we are silent while less informed voices get the sound bites and column inches.

Third, I urge each of you to find a way to help raise the math content knowledge of our public school teachers. Many teachers would really appreciate the attention of a mathematician who would support them in asking and answering the questions they have about the mathematics they are teaching. Enjoy the opportunity to share the mathematics you know and value so deeply. Initiate a relationship with them. You can find them just down the street.

The author is once again professor in the Department of Mathematical and Computer Sciences at Metropolitan State College of Denver. He is an avid sailor, skier, musician and co-author of Algebra Unplugged and Calculus For Cats. He'd enjoy responding to inquiries at loatsj@mscd.edu.