

# Profile of District B

## CONTEXT

This small district is located in a historically working class, lower income Bay Area community which in recent years has become more professional and, at the same time, more ethnically diverse. The city's population is about 65% Caucasian, 12% Hispanic, and 8% Asian. District-wide, only 6% of the families are under the poverty level. Average household income is about \$40,000.

District B provides services for grades K-8, with just 660 students divided among two elementary schools (both K-5) and one middle school (grades 6-8). There are 38 FTE teacher positions in the district, and as a result of the small number of students, there are several classes of combined grades in the elementary school. The average class size in grades K-3 is 18 students, and 28 for grades 4th -8th.

The two elementary schools in District B draw from rather different neighborhoods. One elementary school serves children primarily of Caucasian, middle-income families, and enjoys a high rate of parent volunteerism. On the "other side of the hill," the students who attend the second elementary school tend to come from families that are more ethnically diverse and lower-income – nearly half the students in this elementary school are English language learners or have parents whose first language is not English. At this school, parents work long hours (often with multiple jobs) to support families and tend to have less time to participate in the life of the school.

The middle school facility houses grades 6-8, and provides space for the district offices as well. Despite the wide range of student backgrounds and abilities, the middle school adheres to the District B's policy of not "tracking" students into different classes or groups according to academic performance or any other criteria. A recent Program Quality Review process led the middle school to departmentalize. The main part of the curriculum is divided into two core classes: Math/Science and Language Arts/Social Studies.

## LEADERSHIP

The governing structure of this District B consists of the Superintendent supported by the principals of the three schools – each of whom also teaches for up to half the day. The Superintendent arrived in District B seven years ago. He describes the district he inherited as very traditional, a place where textbooks defined the curriculum – quite the opposite of his own philosophy which advocates for an integrated curriculum and for the most part, eschews textbooks. Without mandating any sort of radical changes, the Superintendent has persistently put forth his vision and supported teachers in moving towards it – particularly through staff development initiatives and additional materials resources. The Superintendent stated that the

change process is very slow, but that he is now beginning to see a critical mass of teachers sharing and implementing his philosophy. Interactions with teachers in District B confirm this observation.

In terms of math leadership, District B has received grants from a local foundation to fund reform-based improvement in mathematics, centered largely on teacher training and the implementation of performance-based assessments at the district level. These grants also support a team of three Math Coaches (one for each school) – these are full-time teachers who have been given 10 release days each year to support their colleagues at the school-based level and promote high-quality mathematics instruction district-wide. This is the second year that the Math Coaches have been in place. So far, there has been no turnover among the team – one coach took maternity leave this year and currently fulfills her duties as a consultant to the district.

The Math Coaches receive special leadership training through a series of meetings throughout the year sponsored by a local foundation, where they not only learn about how to support math improvement in their district, but also have the opportunity to collaborate with other lead math teachers in similar positions elsewhere. In addition to working one-on-one with teachers at their schools sites, the Math Coaches in District B also serve as master teachers and/or principals for the Summer Math Labs, organize district-wide math planning meetings, and facilitate regular math-focussed staff meetings at their schools. More than once they have arranged to have a well-known speaker, whom they met as part of their training, come speak to all of the teachers in District B.

All three of the Math Coaches indicate that it is the Superintendent who has made their work possible in this district. One coach described the Superintendent's role as planting seeds here and there and then letting the support for change build from the bottom up. Teachers are well-aware of the Superintendent's philosophy, and may or may not share it. However, even those who rely largely on traditional practices attend math meetings in their schools and district-wide professional gatherings. They hear success stories from those who have embarked on the reform path; they have the chance to peruse new materials; they observe Math Coaches demonstrating a new idea or method; and they have become more interested as time goes on. The math leadership in District B provides the example and the support for change that is not mandated, but persistently pursued.

## **VISION**

According to the Superintendent's educational philosophy, mathematics should be integrated with other subjects rather than taught in isolation. He envisions a K-8 program in which no subject is determined by a textbook or a standardized test—instead, he wants inquiry and thoughtful, connected activity to drive the curriculum. The superintendent's style is not to dictate, but to state clearly his position (for example, students should engage in lab work rather than memorizing theories), and to find resources that support it. From his experience, it is the 2nd-6th grade teachers who have been the most willing to change their practice and embrace his vision as the district's, and their own, vision. However, the middle school also shows signs of

being willing to follow his lead – as one middle school teacher told us, “It’s nothing new to ask kids to explain why they approach their work the way they do, but the administration is telling us this is what they *want* us to do – to ask students to explain their thinking as part of our assessment of their work.”

The Math Coaches at each school are instrumental in fostering this shared vision of mathematics instruction among their colleagues. They are working towards creating an integrated program and feel strong support from the Superintendent in promoting reform-minded methods and materials. Their training as math leaders for the district exposes the Math Coaches to many of the current leaders in mathematics reform who are working to infuse K-8 mathematics instruction with a spirit of investigation and discovery. They also learn about new materials that support these ideas and share this information with other classroom teachers in District B. All feel that they have the freedom and financial support to bring the best of what they learn back to the district – other structures such as district-wide staff meetings and regularly scheduled site-based math meetings assure that they will have ample opportunity to do so.

These regular meetings also make it possible for all teachers in District B to come together and develop a common language around the direction in which they are heading – to hammer out the nuts and bolts of what it means to deliver thoughtful math instruction. For example, last year, one of the main topics of discussion was the use of non-standard, student-generated algorithms for addition and subtraction. The effort to support students in creating their own algorithms was developed mainly in the second and third grades, but it affected the entire district. When our research team met with the middle school teachers, they stated that they know the importance of investigating non-standard algorithms at the elementary level and were interested supporting it at their end. Nonetheless, the middle school teachers feel considerable conflict between the evolving district vision and the pressures put on them by the state’s SAT 9 test – not to mention the state’s mandate that all 8th graders complete Algebra. How this mandate might fit in with the Superintendent’s vision of a fully integrated curriculum remains uncertain.

## **PROFESSIONAL DEVELOPMENT**

Since the arrival of the current Superintendent, District B has developed a tradition of supporting its teachers through common professional development experiences. In addition to district-wide in-services, all teachers in the district have received one week of training in Integrated Thematic Instruction from the Susan Covolic Educational Associates. The Superintendent makes arrangements for all newcomers to have a similar opportunity as part of their orientation to the District.

The most significant piece of staff development related to mathematics education in this district is supported by grants from a local foundation (the same grant that supports the Math Coaches) with which District B has now been involved for nearly five years. With this funding, the district also hosts a summer “Math Lab,” providing summer school for students, and a professional development opportunity for teachers. In this setting, mathematics serves as the core content area and the vehicle of integration for other subjects. The Math Coaches receive two weeks of

special training prior to the Math Lab and then provide a one-week workshop to Math Lab teachers prior to the summer school's opening. In addition to that week of professional development, the teachers who serve as instructors for the Math Lab benefit from team-teaching with a colleague and attending daily after-school debriefing sessions with the entire Math Lab teaching staff. Thus, the Math Lab offers time to collaboratively pilot new ideas in a classroom setting in a way that would not be possible during the regular academic year. The Math Lab has been in place for the last three summers, and in that time, about one-third of the teachers from the district have participated.

In addition to district-organized professional development events, teachers in District B know they have the support necessary (i.e., funding and substitutes) to attend essentially any workshop or conference that interests them. One teacher commented, "The administrators are always throwing opportunities at us." Among the other teachers the research team met, one told us about how she had been involved in many courses and workshops related to computers in hopes of becoming the technology coordinator for the district. Another learned math content and theory while attending the week-long training of trainers for "Winning Equations," a professional development program authorized under California's legislation AB1331.

Math Coaches provide teachers with regular on-site encouragement and mentoring. This is an essential component of the math professional development that District B makes available to its teachers. Prior to the instatement of Math Coaches, the district struggled to establish any sort of momentum around improving math instruction. The lack of time to meet and collaborate made an already difficult task – namely changing classroom practice in mathematics – seemingly impossible. However, last year, as the Math Coaches began to organize more regular meetings, teachers started asking important questions about specific teaching practices that would support the learning needs of their students. At one elementary school, the staff chose to focus on student math work in two areas: the language of math and multiple representations of mathematical ideas. Teachers brought to these meetings examples of student work which they then shared and analyzed collaboratively. The Math Coach at this school saw a noticeable change in the staff's attitude towards math reform – not because of any mandate, but as a result of consistently setting aside time to confer together, and a growing desire among the teachers to teach for understanding.

## **CURRICULUM**

Up to six years ago, the elementary math curriculum in District B centered around use of the *Mathematics Unlimited* textbook. At that time, a number of veteran teachers began raising concerns that the District's changing student population was having more difficulty with the traditional math curriculum than students had in the past. After the current Superintendent took his position, the district faced a math adoption which resulted in the selection of *Mathland* for grade K-6. This remains the official elementary text for District B. Prior to its implementation, teachers received a series of trainings from the publisher.

During the first few years that *Mathland* was in place, the district's overall standardized test scores declined. While scores on the problem solving portions of the tests in grades 2-5 indicated a marked improvement, many teachers were still nervous about the ramifications of low scores in other areas. The lower scores led teachers to judge the new text as inadequate, and they turned back to their old textbooks.

Currently, the district is in a state of flux regarding its math curriculum. The more recent district standards document was published in 1991. About three years ago, the district began revising its math standards, strongly influenced by the NCTM standards and the Third International Math and Science Study (TIMMS). In the midst of finalizing this document, the state of California published its new State Math Standards which departed quite drastically from the approach that District B had taken. At present, the district math standards remain a work in progress, somewhat useful for designating topics for each grade level and for mapping out a plan for the year, but not yet fully aligned with the State Standards. Revisions are now aimed at finding common ground between on the State Standards, the Japanese math curriculum (gleaned from TIMSS documentation), and the previous (1991) district math curriculum guide.

In the meantime, teachers in District B make use of a sizeable collection of materials and resources at all grade levels and continue to craft their vision of what a good K-8 mathematics program should be. While they have not yet fashioned a coherent year's instruction, much less a coherent course through all the grades, they know that they do not want a curriculum driven by a traditional textbook – one that covers far too many topics, and thereby sacrificing depth for breadth. Instead, during district in-service meetings that took place in June and August 2000, the teachers of District B chose to focus on only four major mathematics topics per grade level during the 2000-2001 school year. Teachers have the freedom to select their own materials – a task that can be liberating as well as daunting and burdensome. Those teachers we encountered report drawing on many different sources as they piece together their programs. They have yet to find a single program that fits their philosophy and covers everything in the State Standards. Moreover, the textbooks that appear on California's state-approved standards-based lists do not fit their philosophy.

Under these circumstances, the Math Coaches have proven instrumental in getting high quality math materials into the hands of teachers. Through their leadership training, the Math Coaches have many opportunities to explore new publications and talk to other math teacher leaders about what they are using. Some of the resources that the Math Coaches have encouraged teachers to use at the elementary level are the TERC *Investigations* materials (published by Dale Seymour), and a collection of Marilyn Burns replacement units: *Math Their Way*, and *Everyday Math*. Other materials include the Creative Publications' *Problem Solver* (a source of daily challenge problems) and *Math at Hand* (an encyclopedia-like resource for students and their parents). At this point, for example, the TERC materials are used in nearly every classroom, but as an additional resource, not as complete units.

At the middle school, teachers have the additional challenge of teaching a combined math/science core. It is not clear to what extent the subjects are integrated – this appears left to the discretion of the individual teacher. The middle school math/science core teachers meet

monthly to coordinate their curriculum as a department. Their goal is to structure a program such that “the road leads to Algebra,” the impetus for which comes from a recent state mandate that all students to be enrolled in Algebra by the 8th grade. The middle school teachers feel great pressure from this mandate – it is arguably the strongest influence on what they choose to teach. This is perhaps the most apparent in the 6<sup>th</sup> grade, where teachers, since the publication of the State Standards, feel forced to teach pre-Algebra that they might not have taught before. In keeping with the educational vision that is slowly permeating this district, their classroom strategies include the use of hands-on activities, group work, and problem solving, as well as traditional textbooks for basic skills – all of which assist in meeting the demand of Algebra readiness. A wide range of materials and resources are being used at the middle school level, such as Glencoe *Algebra* and *Pre-Algebra, Activity Resources*; Dale Seymour for hands-on activities, *Mathematics Unlimited*; and Glencoe *Interactive Mathematics*.

Students at the middle school are heterogeneously grouped in all classes. However, within the math/science core, each teacher has two or three ability groups within the class. For example, the 8th grade Algebra class, with a traditional textbook curriculum, begins with a trimester of pre-Algebra review, then the class splits into a group continuing with pre-Algebra, and a group studying from the Algebra text. An additional after-school Algebra class is in place for students who want to receive high school credit and prepare for the Golden State Algebra Exam. In the sixth and seventh grade classes, teachers speak of a class having a small group of students doing supplemental studies more advanced than what the bulk of the class undertakes, and a small group which needs additional assistance because of deficiency in basic skills.

Overall, the California State Standards and Algebra mandates are clearly influencing teachers’ math programs in District B, more so at the middle school level than the elementary. Still, the standards and mandates are not the only thing influencing teachers. As a district, teachers have selected the four big ideas for each grade level around which they try to initially organize their math curricula – turning to the State Standards as a check for what might be missing. Teachers are encouraged to consult the Math Coaches for additional materials, and there are several resources from the State-approved supplemental textbook list which are being used in this district, including *Math at Hand*. Inherent in this strategy is the belief that focusing on conceptual understanding and developing powerful mathematical thinking among students will address the challenge of State Standards and standardized tests without abandoning their vision of what is best for students.

## **ASSESSMENT**

Assessment is a fairly recent area of interest and professional focus for the teachers and administrators in District B, particularly in mathematics. Prior to the grant that funds the Math Coaches, District B had no district-wide assessments in place outside of the state’s standardized tests. However, as part of the same grant, the district is presently in the process of implementing the MARS test. Use of this assessment is technically voluntary, but with encouragement from their local funder, all three schools have now purchased and administered these tests. As a result, the MARS test now serves as the district’s primary mathematics assessment instrument. There is

strong support from the Superintendent to de-emphasize the state's SAT 9 test scores in favor of the MARS exam. Math teachers report feeling little pressure to do well on the SAT 9 – believing that good instruction will foster understanding, and thus good performance on the standardized tests, as well as the new district assessments.

MARS is currently given at every grade level, but only scored at a few. Scores are determined based on an analytical rubric, and are compared with other schools in the Math Assessment Collaborative that take the test. The Math Coaches indicate that the next step will be to use the MARS assessment to drive instruction – a tool for examining what kids can do in math and how well they can explain what they're doing. Among the elementary teachers, sample items from the MARS test are sometimes given as classroom assignments, and the student work discussed in staff math meetings.

At the individual school level, there is little indication of coordinated school-wide assessments, although one of the elementary schools recently asked teachers to administer some pre- and post-assessments related to problem solving at the beginning and end of the academic year. By and large, teachers choose their own classroom assessments, and judging by the freedom of choice in District B, it is likely that the assessments vary widely across teachers. Although teachers express interest in using performance-based assessments, one of the Math Coaches also talked about using timed multiplication quizzes to encourage mastery of basic computation facts. In the middle school, teachers generally give mid- and end-of-unit tests. Some of these classroom tests are admittedly computation and skills only. However, one middle school teacher claimed that recent district discussions about non-traditional algorithms and the importance of ascertaining student thinking, combined with the culture of support for innovative assessment, have caused her to redesign her tests and quizzes to include several opportunities for students to explain their ideas and methods.

## **INSTRUCTION**

Our research team observed only elementary mathematics lessons in District B, but had the opportunity to visit several classrooms. We saw a fourth grade class in which students worked collaboratively on a teacher-generated worksheet that contained a place value activity. In the first problem, students were asked to select from given numerals to create two two-digit numbers whose sum was as close as possible to 100. Other problems on the worksheet dealt with the value of coin combinations. The students spent a great deal of time puzzling over the first problem. When one child had difficulty, the teacher reminded her of an activity the class had done previously with digit cards. Throughout the lesson, the teacher provided assistance to individuals and announced the success of one student or another in getting very close to or right on 100.

Another fourth grade class was using the digit cards referred to above to play a target-sum game. The game worksheet bore the Dale Seymour copyright. Both activities in these 4<sup>th</sup> grade classrooms were based on the TERC *Investigations* materials. The lessons took place in the

same school where the two 4<sup>th</sup> grade teachers were attempting to coordinate portions of the mathematics curriculum.

In another example, a classroom of second graders diligently worked to solve a real-world problem that the teacher put before them on Election Day. Using a map that showed the number of electoral votes allotted to each state, they were asked to look for combinations of states that would give either candidate the requisite 270 electoral votes necessary to win the election. Students worked collaboratively in groups and made posters demonstrating their reports. Afterwards, the teacher called all of the students up to the front of the room where they sat in a semi-circle in front of the chalkboard and watched while different groups presented their results. The process of reporting out generated much talk about how to combine numbers and add them. Students made mistakes, but their work was impressive nonetheless, particularly in the rich variety of strategies and the confidence with which the students shared them. The teacher had designed the lesson and indicated that it demonstrated well the district's idea of curricular integration.

In a third grade class involved in an ongoing study of family, we observed another example of this notion. Students were asked to write on a piece of paper how many people were in their family, and an estimate of how many people might be in the largest family. It took more than ten minutes for the students to get clarification of the task. Once they had finished, the teacher asked how many children they thought would be in the largest family ever. Following a flurry of student guesses – some reasonable, some not – the teacher told them the number of children in the largest family according to the Guinness Book of World Records. The next portion of the activity involved solving a subtraction problem: how many more children would need to be in your family to match the size of the largest family?

Though there was great range in the type of activities and the depth of math content in these classrooms, the lessons we observed shared many attributes in common. Most notably, students were not using a textbook. However, a variety of sources were present on the teachers' shelves – we saw *Mathland* as well as *TERC Investigations*, boxes full of manipulatives, and so on. Students in all of the lessons worked collaboratively and dealt with problems that required them to think mathematically. None of the lessons would be categorized as traditional instruction. Instead, the classroom observations confirmed our impressions of District B as a small district trying to cultivate a common vision of curricular integration and beginning to achieve critical mass as it proceeds down the path of reform.

## COMMENTARY

We departed District B feeling that, thus far, this district is still struggling to make concrete its vision for a fully integrated K-8 math program. We saw elements of high quality instructional practice in mathematics and evidence that a lot of conversation is happening about the direction the district has begun to take. We also sensed that little of this would be going on without the support and encouragement that District B gets from the local foundation that backs its math improvement effort. Undoubtedly, the Superintendent's leadership and philosophy play a critical

role in the reform effort. However, he has yet to articulate or promote a vision specific to mathematics. As we understand it, this task falls to the Math Coaches – and they are still working on this challenge.

The Math Coaches are designated math leaders, as opposed to emergent ones – people who were interested in the role, as opposed to having particular math talent. They have received extensive professional development support and in doing so have become part of a larger math leadership movement. Their experience gives them credibility, some degree of authority, knowledge about reform, role models, and the support of colleagues in other districts. However, they remain full-time teachers – and as such, have serious limits placed on the time they can devote to promote reform in their district. These circumstances aside, they continue to do all they can to support best practices among their colleagues and to bring the latest materials to their district.

In the absence of a coherent math curriculum, teachers in District B gather activities from a variety of sources, many of which are new to them. They have the added pressure of the demanding California Standards and the highly publicized SAT 9 tests – something they deliberately try to put on the back burner. Administering, scoring, and reflecting on the MARS test provides a strong counter-example to the state’s norm-referenced exam. There is a sense of confidence (mostly expressed by the Math Coaches) that thoughtful, student-centered instruction will lead to improved achievement. However, the District can only go so far without a carefully articulated and detailed K-8 program. And, while the process has begun – the road ahead remains a long one.