

### **Three Lessons about Mentoring from the Revitalizing Algebra Program [hd1]**

REvitalizing ALgebra (REAL) was a National Science Foundation Math and Science Partnership between San Francisco State University (SFSU) and five local school districts. The goal of REAL was to improve the performance of all students, particularly minority students, in algebra, both in grades K–12 and in college, by changing instructional practice to ensure that students were more engaged with, and challenged by, the work. The participants at SFSU hoped to inspire lasting changes not just in the practice of individual teachers but also in the working cultures of school mathematics departments. SFSU faculty members worked directly with two teams of lead teachers for the first year of the project. During the second year, release time was provided for the lead teachers and three to four of their colleagues to enable them to work together daily to address issues of teaching and learning. The following sections describe the three most important lessons learned about mentoring and encouraging teacher change.

*1. Teachers' desire to change their practice is insufficient to bring about such change. Teachers need to believe that they are at least partly responsible for their students' failure. [hd2]*

Change is difficult. Change in teaching practice is doubly difficult because when things go wrong, teachers can lay blame in a number of places. We can bemoan unresponsive school administration or complain that students are unmotivated, or poorly prepared, or come with too wide a disparity in skills and aptitude. We can grow angry at parents or at economic injustice. For the schools in which we worked, some of these

Empowering the Mentor of the Experienced Mathematics Teacher  
Section 7: Lessons Learned

complaints had some basis in fact, but the teachers who changed their practice were the ones who believed that despite these factors, their own approaches and use of resources might be partially to blame for their students' poor performance. Their belief that they were contributing to the problem became their conviction that they could be part of the solution.

In choosing partner schools for REAL, we tried to avoid departments that seemed to embody a culture of complaint about students' problems. We were only partly successful in this effort, however, because most teachers do not openly admit or even realize that they blame students for their own failure.

A number of teachers in the REAL program felt a daily sense of desperation as they worked with inner-city students. Teachers knew that they were capable of implementing more reform-based practices, and they knew that their at-risk students required and deserved better instruction. In the previous decade, one school had experienced significant faculty turnover, with the side effect that the mathematics department had slowly built up a core of committed teachers who held the common belief that they could make a difference. These teachers knew that all students are capable of learning and that the teacher is responsible for finding ways to promote learning. They felt a social and moral obligation to improve their teaching practices, and this climate created a receptive environment for mentoring.

Of course, motivation was not the only factor in bringing about change. Readiness for change and timely observation with follow-up support played a role in both how and

## Empowering the Mentor of the Experienced Mathematics Teacher

### Section 7: Lessons Learned

when changes began to be evident. Teachers' readiness for change varied greatly. Some teachers felt confident teaching a whole lesson through the student-groups approach during the first year. For other teachers, such a lesson seemed threatening, but they tried short group activities as part of larger lessons. We saw many teachers who did not try anything new during the entire first year, then began the next year with major changes. They may have needed a fresh start at the beginning of a school year to try new ideas or time to mull over novel approaches during the summer.

Despite our best efforts, at some school sites, a number of teachers did not believe that the changes we encouraged would benefit their students. Some teachers tried to ask more probing questions but had difficulty knowing how to react when the students' responses differed from what they expected. Some may not have known how to take the first steps toward change, or they may have felt intimidated by the magnitude of the changes they were asked to make. In some instances, these teachers were uncomfortable with the changes because they could not believe that they did not need to walk students through every step in a mathematical process. When asked to reflect on their teaching practice, they focused on why their students could not succeed. We also worked with some teachers who had already made important changes in their teaching. We were unable to convince these teachers that additional changes could further improve their students' success rates. Finally, some teachers seemed to have the potential for making positive change, but they may have needed a different mentoring program. No one mentoring arrangement is successful in every situation.

*2. Working on mathematics together can build trust for working together on*

Empowering the Mentor of the Experienced Mathematics Teacher  
Section 7: Lessons Learned

*teaching.*[hd2]

The change in department culture advocated by the REAL program required that department members communicate with one another openly on sensitive topics, such as the roles of race and gender in learning and their own differences in mathematical expertise. Clearly, trust must be established before people can discuss their fears or failures with others, and some direct work on building a safe community can help in this regard. Scheduled social time was an important ingredient in establishing a sense of community in some departments. Premeeting “snack times,” monthly lunch meetings, and all-day retreats with time for both professional and personal conversations served to build community among teachers already committed to improving their practice.

Perhaps less obvious in its contribution to building trust is the activity of working together to gain mathematical understanding. During the first year of the REAL program at Mission High School, in every weekly session, the lead teachers worked in groups on rich mathematical problems. The problems were challenging but accessible to all and had multiple possible approaches that compelled group members to work together. During these problem-solving sessions, many teachers admitted that they did not know certain concepts and learned new mathematics from others. Their honesty inspired their colleagues to be equally candid. Through these activities, the teachers learned to listen to others’ ideas and developed mutual respect, a foundation for building further trust.

Often, productive collaborations are prevented by teachers’ inhibitions about doing mathematics in “public,” even mathematics that is in the curriculum for students. But any nontrivial curriculum will include problems that require higher-level thinking

Empowering the Mentor of the Experienced Mathematics Teacher  
Section 7: Lessons Learned

and can be addressed from different perspectives. The culture of all mathematics departments should encourage teachers to discuss their area of specialization among themselves.

We also found that the trust and camaraderie built while working together on mathematics extended to other areas for the teachers in the REAL program. The directors worked with the lead teachers not only on mathematics and pedagogy but also on issues of equity, race, gender, and culture. These sensitive issues were difficult to discuss in a productive, evenhanded manner, but teachers became more open to sharing their assumptions and practices after a sense of community had been established from working collaboratively on mathematics.

At Mission High School, during the second year of the REAL program, teachers participated in a variety of activities to build community and trust in the mathematics department. Each member of the department was asked to lead a meeting to discuss an area of personal interest. Some teachers chose to work with mathematics problems; others addressed pedagogical issues, such as group work; and others chose to explore issues of equity. The department had regular snack times and monthly lunch outings. Teachers got to know one another better, both personally and professionally.

In working with their departments, some teacher-leaders in other schools did mathematics problems regularly in meetings and some did not. Those who did so succeeded in building a stronger sense of community. Some departments did not do any group mathematics because the activity seemed to make members feel uncomfortable;

Empowering the Mentor of the Experienced Mathematics Teacher  
Section 7: Lessons Learned

those departments showed the least change in classroom practice. The correlation between collaborative work on mathematics and teacher change suggests that requiring all departments to do some mathematics together might have been beneficial for the program.

*3. Seeing is believing. Models of reflective and successful practice are essential to fostering change.* [hd2]

Many different models proved to be important in the REAL program. The successful teacher-leaders were those who questioned their own teaching and modeled humility and moral conviction. This modeling created a safe atmosphere for the leaders' colleagues. Visits to the classrooms of other teachers in the same school also served as a form of modeling. When carefully planned, with a specific focus and reflection time following the observation session, such visits were beneficial, enabling the observer to see the successes and challenges that others had experienced with students from the same demographic groups. Seeing effective teaching practices served as evidence that change for the better was possible. The Mission High School mathematics teachers scheduled monthly peer observations for pairs or triads of teachers. Preobservation meetings determined a focus for the sessions, and postobservation conversations allowed for reflection by all parties. The whole department agreed on an open-door policy that allowed teachers to visit one another's classrooms at any time.

Visiting other schools that were having more success with their students was also helpful for teachers. Although some visitors believed, and often rightly so, that the more successful schools had certain economic advantages, the visitors could see firsthand the

Empowering the Mentor of the Experienced Mathematics Teacher  
Section 7: Lessons Learned

enactment and reinforcement of new ideas, such as techniques for facilitating group work. The need for consistency and constant enforcement of classroom and mathematical norms was clearly illustrated.

Videotaped lessons served as additional models. Program participants contrasted the behavior of two teachers using group work in different ways, then discussed techniques that seemed to be effective in both approaches. They also watched a successful whole-class discussion and analyzed the teacher's actions. Unfortunately, few videotapes are available showing secondary school mathematics classrooms, especially those with minority students, in which reform techniques are used.

Educational journals and articles also provided models of teaching practice. At Mission High School, teachers read journal articles together and discussed how they could incorporate the ideas into their teaching. Articles about equity encouraged teachers to reflect on their personal feelings about issues of gender, race, culture, and class and to discuss how their perceptions affected their treatment of students.

Finally, in the first year of the REAL program, university faculty members provided models for the teacher-leaders for every aspect of the change process envisioned by the program, including planning and teaching mathematically rich problems using a group-work approach, doing mathematics together, reading and discussing articles on the role of race and gender in learning, and facilitating group work. We believe that the modeling component, combined with motivation to change and collaborative work in mathematics, was one of the essential factors in the success of the REAL program.

Empowering the Mentor of the Experienced Mathematics Teacher  
Section 7: Lessons Learned

—*Eric Hsu, Kentaro Iwasaki, Judy Kysh, Katherine Ramage, and Diane Resek*

**Acknowledgments** [hd1]

This material is based in part on work supported by the National Science Foundation under grants 0226972 and 0347784. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.