
Improving Teacher Practice: Can Policy and Peer Mentoring Help Teachers Do Better?

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Policymakers and educators at all levels of the system are crucial to creating reforms in education, but teachers are the key agents when it comes to changing what happens in the classroom.

This paper examines teachers' efforts to change their teaching practices to comply with state and national instructional reform efforts. Specifically, it looks at incentives and opportunities for teachers to learn about practice and at teachers' capacity and will to reconstruct their mathematics practice.

In this paper, I compare teachers who changed the core of their teaching practice with those who did not. Based on this analysis, I develop the idea that teachers' "zones of enactment" play an important role in their implementation of reform. The zone of enactment is the "space" in which teachers apprehend reform and work out its implications for their practice. Some teachers have a very narrow zone of enactment limited to their own individual classrooms and their personal experience and training. Others have zones that include professional colleagues, experts, professional organizations, and others. I conclude that teachers with a broad zone of enactment are more effective in implementing real changes in teaching.

Study and research methodology

This paper is based on a 5-year study (1992–96) that examined the relationship between state and local policy and mathematics and science teaching in Michigan.

In our study, we surveyed all third- and fourth-grade teachers and all seventh- and eighth-grade mathematics and science teachers in nine Michigan school districts in the fall of 1995. Our overall response rate for the survey was 62%.

We observed and interviewed a subsample of 25 teachers who said they had changed their teaching practices to fit with the reformers' proposals.

The mathematics reform and patterns of practice

We found evidence of reformed practice—more emphasis on problem solving, efforts to tie mathematics to the real world, the use of manipulatives, and new textbooks—in all 25 classrooms. However, only 4 of the teachers had revised the core of their mathematics practice extensively.

By the core of instructional practice, I mean the emphasis placed on mathematical principles as distinct from mathematical procedures (Greeno, Riley, & Gelman, 1984; Lampert, 1986; Leinhardt, 1985). Procedural knowledge centers on computation and following predetermined steps to compute correct answers. Principled knowledge involves key mathematical ideas and concepts that can be used to construct procedures for solving mathematical problems. Procedural knowledge dominates the K–12 curriculum (see Romberg, 1983). Reformers want students to understand mathematical activity as something more than manipulating numbers to compute right answers (Ball 1993; Cobb, 1988; Lampert 1990, 1992; NCTM, 1989, 1991; Simon, 1986).

Here’s an example of a problem that centers on principled knowledge:

Jessie said that $\frac{3}{4}$ and $\frac{5}{6}$ are the same size because they both have one piece missing. Do you agree? Explain. Use pictures to make your argument clear.

The task embedded in this problem was designed to get students to think about a key idea about fractions—that fractions are always a reference to a whole or unit and this whole is critical when comparing fractions.

In contrast, this is a problem that emphasizes procedure:

At Tuff’s diner you get a free lunch after 8 lunches you buy. If you ate the lunch at Tuff’s 45 times last year, how many of those lunches were free?

This problem is primarily about performing a long division operation. Both these problems were used in classrooms where teachers in the study said they were implementing mathematics reforms. Obviously, these two teachers had very different ideas about what reform meant.

Reformers want students to understand mathematical activity as something more than manipulating numbers to compute right answers.

In 4 classrooms, we observed tasks and student conversations that centered on principled mathematical knowledge. In these classrooms, teachers pressed students to develop conjectures, explain their reasoning, and justify their answers. In 10 classrooms, we observed more modest changes to the core of instructional practice. Although the tasks in these classrooms also centered on principled mathematical knowledge, there was opportunity to understand the underlying mathematical concepts and to experience what it means to do mathematics in school and in the real world. These teachers had made changes, but they were not as significant as changes made by the other 4 teachers.

In the remaining 11 classrooms, instruction remained firmly grounded in procedural knowledge and computational skills. Although we observed “new” tasks related to problem-solving and applying mathematics to real-world situations, these tasks did not engage students with big mathematical concepts. These tasks represented doing mathematics as computing right answers using predetermined formulas and procedures.

External influences and incentives

All 25 teachers had paid extraordinary attention to the mathematics reforms and reported that state policy, particularly the Michigan Educational Assessment Program (MEAP), influenced their efforts to revise their mathematics practice.

The attention teachers reported giving to state policy is not surprising considering that the state had made student performance standards a requirement for school accreditation. Schools that failed to have 65% of their students score in the “satisfactory” range on MEAP tests would not receive state accreditation.

In addition, nearly every teacher mentioned that other professional associations—formal, informal, or both—had a strong influence on their mathematics teaching.

None of them said anything to indicate they were ignoring or resisting mathematics reforms. All expressed a willingness to reform their instruction in ways they understood to be consistent with reform proposals.

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The role of enactment zones

How can we account for the fact that only 4 of the 25 teachers actually made extensive changes?

One plausible explanation is that the four teachers who revised the core of their mathematics instruction were already teaching in ways that approximated the reforms.

The case of one of these four teachers, Ms. Yarrow, lends support to this explanation. Ms. Yarrow, as part of her undergraduate preparation in mathematics education, learned many ideas about mathematics instruction that were consistent with the reforms.

At the university, we had a good math department and the professors there modeled how they wanted the math taught. So we were taught the math the way they wanted us to teach it.

Moreover, Ms. Yarrow was an active user of reform and a risk taker, constantly in search of ideas to improve her practice. She was willing to learn and claimed that change was not difficult for her. Her undergraduate education, coupled with her disposition to learn and take risks, meant that Ms. Yarrow did not have to unlearn a lot of what she understood about teaching to enact the reforms.

However, this explanation does not hold for the other three teachers who made significant changes. All three were veteran teachers with between 9 and 18 years in the classroom. They reported having taught mathematics in very traditional ways until 4 or 5 years earlier. None experienced the sort of mathematics teaching reformers advocated. They were not people who gravitated naturally toward instructional innovations. Two claimed they were not even especially interested in or knowledgeable about mathematics.

Teachers' zones of enactment

I contend that the explanation for the substantial differences in what was being taught in these 25 classrooms can be found in the teachers' zones of enactment.

Some teachers' enactment zones were very individualist and mostly private spaces—isolated classrooms. Others teachers had much broader enactment zones that included many formal and informal interactions with professional colleagues.

The case of the Riverville trio

These three teachers (referred to earlier in this paper) reported teaching in rather traditional ways for much of their careers. Two of them claimed they were not especially interested in or knowledgeable about mathematics. Yet, all had made extensive changes to the way they taught mathematics. And all of them had enactment zones that went beyond their individual classrooms.

First, their efforts to enact the mathematics reforms included ongoing deliberations with colleagues and experts from inside and outside the district. As one teacher remarked, "I think teachers are talking more to each other about curriculum than they used to."

Second, these three teachers participated in ongoing discussions and deliberations about the reform ideas and their efforts to enact these reforms in their classrooms. They read and discussed the NCTM standards. They viewed and discussed videotapes of attempts to enact the standards. They talked about their day-to-day attempts to enact the reform ideas in their classrooms. One teacher remarked:

Well, we do a lot of talking together. There [are] three of us at fourth grade. And so you know, [we talk] when we have recess or we have lunch, or last year we had a math study group, too. We talk a lot about what is going on.

Another teacher said:

So I think some of it is me watching other teachers. I've been to a couple of workshop situations and we sit around and watch a teacher teach a class so that we can see a different idea of what is going on and having conversations after either watching them on videotape or watching live sometimes . . . sitting down as a staff and talking about different ideas.

Third, these teachers created opportunities to use resources of local expert teachers, university academics, and curriculum developers and of materials consistent with the reform ideas. One teacher described how these materials facilitated their discussions about mathematics practice:

We . . . lifted the [NCTM] standards, and tried to study the standards and go to presentations about them. We've looked at Marilyn Burns tapes, we've looked at Deborah Ball . . . and a couple of our people here

Those teachers who made extensive changes participated in ongoing discussions about their efforts to enact reform in their classrooms.

have . . . taken course work about math, and so we try to share all that information.

Mathematics educators at a local university piloted a new middle school mathematics curriculum in the district. One teacher remarked:

I think that we have gotten a lot of training because of the piloting that we are doing for the Connected Math Project and that is reinforced by the workshops that we attend and it's reinforced by the conversations that we have as a staff, as a district math team.

The Investigations Math curriculum, a curriculum that is consistent with the mathematics reforms, was purchased for all elementary grades. These materials helped teachers teach in ways advocated by reformers. More importantly, the materials guided their conversations about mathematics instruction and provided common points of reference.

According to these three teachers, study groups and coaching contributed to their efforts to revise their mathematics practice. All three teachers said they learned a great deal from their opportunities to talk with their colleagues and people outside the school district.

These formal and informal discussions also created a powerful incentive for teachers to revise their practice. Teachers developed a sense of obligation to improve practice in specific ways as a result of ongoing conversations with colleagues. In addition, their classrooms became less private. Peer pressure motivated teachers to reform their practice.

Mandy . . . [was] just dragging us along. She dragged Kathy and got her involved, and Kathy dragged Charlene, and now we're all dragging others. I guess because, you know, it was a teacher-initiated kind of thing and teachers are willing to get busy and get involved in it.

Observing how students responded to the changes provided another incentive. Using new material and approaches with her students, one teacher noticed significant changes in students' learning. She claimed that her expectations for what her students were capable of doing mathematically changed.

I think so because I see it with the kids. They just come up with things that, years ago, we probably wouldn't have thought they were capable of. They have a lot more mathematical sense than what we give them credit for.

One teacher said that because the reforms pressed her to listen more to her students' ideas, she became more aware of what she needed to learn about mathematics and mathematics instruction.

I am a better listener. I listen to what the kids have to say. . . . one of the things that I have learned is that there is a lot that I don't know, a whole lot that I don't know. About mathematics . . . and maybe about the teaching too.

Peer pressure motivated teachers to reform their practice.

These three teachers' enactment zones extended well beyond their individual classrooms. They had replaced the norm of privacy that dominates most schools, with a norm of collaboration and deliberation about practice.

The case of Ms. Yarrow

Ms. Yarrow's case was different. As described earlier, she was a risk taker, well disposed to change. Her own education equipped her with the skill and knowledge to understand and to teach in ways advocated by reformers and to find and use a variety of resources to construct an enactment zone that extended beyond her classroom and local school district.

Although her school district paid attention to the mathematics reforms, its initiatives focused entirely on surface features of the reforms. Moreover, Ms. Yarrow reported a complete lack of support from colleagues for her ideas about mathematics instruction.

People are resistant to change. They have been doing things that they have been doing for 15, 20, 30 years. And why change what they think in their head is right, "Why should I try and change that?" And so I get a lot of resistance and people saying, "No I don't want to do that." "You are just a rookie. How can you tell me what to do and to make these changes? They are not right. We tried these 15 years ago. They just re-named it and are calling it something else."

Ms. Yarrow's zone of enactment extended beyond her individual classroom and school district and was critical in helping her continue to improve her practice.

Moreover, she claimed that she met with silence when she talked with her colleagues about reforming mathematics instruction. Still, Ms. Yarrow practiced in ways that approximated the core ideas of the mathematics reforms. Ms. Yarrow looked for opportunities to learn outside her district. She tapped a variety of resources, especially professional conferences. She used these conversations to improve on her mathematics instruction.

I am just getting a little better. I am honing it. Every year I add something else or I do something different or I do something better.

Ms. Yarrow's zone of enactment extended beyond her individual classroom and school district and was critical in helping her develop her understandings of mathematics instruction and continue to improve her practice.

Contrasting cases

As noted earlier, 11 teachers in our sample did not make significant changes, although they reported attending to state and local policy and to the professional experts for guidance about their mathematics instruction. Of these 11 teachers, 6 worked in districts that had undertaken extensive efforts to encourage teachers to change the core of their mathematics practice.

A significant difference between these 11 teachers and the other 4 teachers concerned their zones of enactment.

The zones of enactment described by these 11 teachers were individualistic. These teachers did attend conferences or workshops about teaching, including district-supported professional development workshops on topics such as manipulatives, problem solving, and cooperative learning. Three reported talking with colleagues to get ideas about reforming their teaching. However, these discussions were chiefly about gathering activities they could transplant into their classrooms. They referred to encounters that were brief, not ongoing. These 11 teachers had no opportunities to test out their understandings of key reform ideas (e.g., problem solving) and no reason to question their enactment of the mathematics reforms.

Discussion and conclusion

1. State policy initiatives (such as holding schools accountable for student performance on the state MEAP test) were effective in getting teachers' attention about reforming mathematics instruction. However, they did not get teachers' attention about the core reform *ideas*, ideas they needed to understand if they were to change the core of their teaching. Although teachers gravitated to reform themes such as problem solving, most enacted these ideas in ways that failed to change the core of their practice in any fundamental way. Without opportunities to consider alternative understandings of core reform ideas, it is difficult to see how they might be motivated to change how they taught. It is, after all, very difficult to desire to practice in a way one cannot imagine—or see the need for in the first place.
2. Teachers need help to understand the core reform ideas and to access a rich array of social networks beyond their local schools. The professional sector provided opportunities for teachers to develop their knowledge and skills about reforming their instruction. But, the professional development workshops that most teachers attended were insufficient on their own to support the sort of learning teachers need if they are to change their teaching practice.
3. For teachers who do not have the necessary individual capacity (knowledge and skills) to understand the core of the reforms, their success depends in great part on their opportunities to discuss their practice and reform ideas with fellow teachers and experts. Such conversations enabled teachers to get beyond the surface dimensions of reform and see the implications of the reforms for the core of their teaching. Moreover, these interactions created incentives for teachers to change because of a sense of obligation to colleagues.
4. External accountability and incentives are important. But their ability to contribute, in a meaningful way, to changing the core of practice depends in great part on teachers' enactment zones. What is striking about Riverville's initiatives is the manner in which district leaders managed to bring both political accountability (in the form of state accountability measures) and professional accountability (by changing relations and expectations among teachers) together in the cause of instructional reform.

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