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David K. Cohen and **Deborah Loewenberg Ball**
Michigan State University

The research reported in the cases suggests that California's new policy has affected instructional practice. Many teachers have tried to change their mathematics teaching, and some have made significant changes. But practice also has had a profound influence on the new policy. The teachers in the cases did not simply assimilate new texts and curriculum guides. They enacted new instructional policies in terms of their inherited beliefs, knowledge, and practices. Hence when teachers changed in response to the policy, they did so in terms of their pre-existing practice, knowledge, and beliefs. They reframed the policy in terms of what they already knew, believed, and did in classrooms. The result in many classrooms was a remarkable melange of old and new math teaching. This may be only the beginning of the story of the California math framework. It remains to be seen whether the reform will continue, and, if it does, whether the California system will be able to support this reform adequately.

Our portraits of five elementary teachers show that instructional policy makes a difference. Yet they also show that the policy has been interpreted—and thus enacted—in a variety of ways. Here we explore some of the factors that seemed to contribute to the striking variations in interpretation and implementation that we saw. We begin with a closer look at the framework, and at the reform movement within which it is rooted. Next, because revised elementary textbooks were a key agent in implementation, we consider their role in changing practice. We then examine the intellectual and political context of this policy and conclude with some observations about the relations between practice and policy.

The Language and Rhetoric of Reform

In communicating the spirit and direction of reform, policy statements vary in their effectiveness. How does this policy work as a messenger of its vision of elementary mathematics instruction? One clue lies in the language of the reform. As is often the case with ambitious social reforms, the central ideas of the current movement to improve mathematics instruction seem particularly open to multiple interpretations. The language of this framework is, in some ways, vague. For example, few people would disagree with terms such as *understanding* and *problem solving*. That students need experiences with *concrete materials* or that they should be able to *apply* mathematical ideas will also not generate debate (California State Department of Education, 1985; National Council of Teachers of Mathematics (NCTM), 1989a; NCTM, 1989b). Yet what people mean by these terms can—and does—differ wildly. From one perspective, such vagueness in the policy's language is a strength: It may broaden the appeal of the reform movement, allowing recruits of rather different persuasions to join what they imagine to be the same parade. As one rather traditional teacher commented, "What do they think we've been doing—teaching for *mis*understanding?" From another perspective, such vagueness is a defect: After collecting varied and even

contrary tendencies under a single banner, the parade may become a melée.

One point seems plain: The current reform movement in mathematics instruction has collected quite a variety of stylish ideas and practices: from manipulatives to cooperative learning, from calculators to problem solving, from increased student talk to the inclusion of probability and estimation. These pieces are disparate and hence lend themselves to being picked up in random bits and then enacted in variously interpreted permutations of each bit. The leading ideas of this movement do not yet cohere in an integrated conception of mathematics teaching and learning, rooted in a distinctive epistemology and framing a distinctive practice. This quality of the movement's leading ideas also makes it more difficult for followers and bystanders to understand how the new instruction might look if enacted well. Indeed, it increases the likelihood that each teacher will apprehend and enact the ideas in his or her own terms.

Producing Instruction: The Relation of Text and Teacher

Texts have so far been the key instrument in California's plan to align mathematics instruction. Like policy statements, texts also vary in their effectiveness as agents of change. In some nations, the school system offers very prescriptive guidance for content coverage. Not only are courses required but topics within courses are also prescribed. Sometimes methods of teaching are suggested or even strongly recommended. Curriculum guides that discuss topics and the means of treating them often are provided. In such cases, textbooks and curriculum guides can offer extensive and focused guidance about instructional content. And in such systems it appears that teachers attend to the guidance, and that topic coverage is relatively homogenous (Porter, Floden, Freeman, Schmidt, & Schwille, 1988; Robitaille & Garden, 1989; Schwille et al., 1983; Travers & Westbury, 1989). Textbooks might be quite a potent agent of policy in school systems of this sort.

But prescriptions for instructional content tend to be quite vague in the United States (Floden et al., 1988; Porter et al., 1988; Schwille et al., 1983; Travers & Westbury, 1989). Prescription is strongest at the most general level, in course requirements: All states require various subject matter courses for elementary and secondary schools. Yet students and teachers have unusual latitude, even within these requirements. Mandatory high school English courses often can be satisfied in different ways, for instance (Powell, Farrar & Cohen, 1985). There is little prescription in topic coverage within courses in the U.S. Few state and local systems issue detailed curriculum guides, let alone prescribe topics within courses of curricula. Guidelines for how to deal with specific topics are equally rare. Hence there is relatively weak guidance about course content in most U.S. classrooms.

It often is said that U.S. teachers nonetheless teach more or less the same thing, because they all use textbooks, and all textbooks are quite similar. Many states and most localities do officially adopt textbooks, of course, and the texts are similar in some ways. But there are few state or local guidelines for what topics texts must cover. Ordinarily, several different texts are available for each subject at each grade level. Consequently, there is only moderate overlap in content coverage among texts within fields (Freeman et al., 1983). This should not be surprising: Textbooks after all are published by private firms that operate in relatively unregulated markets.

Many observers nonetheless argue that teachers teach more or less the same thing, at least when they use the same textbooks. Though there is little research on this matter, the available evidence contradicts common belief. Even when teachers use the same required texts, the content that they cover varies considerably from one teacher to the next (Porter et al., 1988; Putnam, Wiemers, & Remillard, 1989; Schwille et al., 1983). The authors of one study concluded that "the results of this investigation challenge the popular notion that the content of math instruction in a given elementary school is essentially equal to the textbook being used" (Freeman & Porter, 1989, p. 418). American teachers typically have much discretion in

their decisions about instructional content—including their use of text—and they exercise it (Cohen, 1990).

Hence textbooks are rather rubbery agents of policy, as things now stand in U.S. education. They differ substantially across publishers, and teachers make use of them in ways that fit with their assumptions and orientations. We certainly saw many different versions of "following the textbook" in the California classrooms that we observed. All but one of the teachers we visited claimed to be following the newly revised textbooks that their districts had adopted. Each one used and conscientiously attended to the text. Yet the teachers attended in their own ways, adapting the text to their own approach to teaching as well as their own view of mathematics. Some of these adaptations were relatively subtle. For instance, one teacher followed the text's suggestion that the class discuss alternative solution to problems. This was a new element in the text, added in response to the framework. The suggestion was intended to get divergent ideas out on the table so that students could explore alternatives, discuss what made sense, and explain their answers. However, in following the text's advice, this teacher conducted a traditional discussion in which the goal was to converge on a single right answer—thus frustrating the text's intention. Some other teachers adapted the texts in much more blatant ways. For instance, one simply omitted a novel topic—probability—that was in the new text, because she felt that students should learn the basics first.

Teachers' adaptations came in many varieties: We also saw teachers learning from the new textbooks. For instance, one rather traditional teacher made some important instructional changes precisely because his sense of professionalism led him to try to follow the new text faithfully. The book contained an innovative approach to fractions which he dutifully used with his students. The students began to reason about fractions in quite sophisticated and unexpected ways. The teacher was amazed but pleased. He confessed that he learned something from the experience: He never had imagined that his fifth graders could think and reason in such advanced ways. It seemed to him that if he continued to have such experiences, his teaching might change more fundamentally. Another teacher introduced new topics and many more concrete materials into her class because she was using a supplementary text that emphasized the use of manipulatives: Every lesson entailed students' use of beans or paper strips or counters or blocks. This teacher also seated her students in groups because the text suggested that "groupwork" was helpful to students. One moral of this story, then, is that texts and other curriculum materials can be important agents of change. But another is that in the very loose structure of U.S. education, these agents work only as teachers are able or inclined to let them work.

The Context of Practice: Layers of Reform

Although policies regularly announce a new instructional order, the classroom slate is never clean. Whatever novelties policymakers embrace, teachers must work with residues of the past. The new California math framework is part of an infatuation with higher-order thinking and teaching for understanding that began to grip Americans in the late 1980s. But between the mid-1970s and the mid-1980s, Americans had been flailing schools for flabby teaching and sagging Standardized Achievement Test (SAT) scores. Improvement of basic skills was a national enthusiasm. State competency tests were a popular way to improve teaching and students' test scores. Chapter 1 was pressed into service in the same cause, as were other state and local programs. In addition, state agencies, county school districts, local schools, and herds of educational consultants eagerly advertised several new schemes for more didactic teaching, such as direct instruction, "effective schools," and Madeline Hunter's Instructional Theory Into Practice. These schemes, all intended to improve students' scores on standardized tests, were urged on teachers across the country. Many California policymakers and practitioners embraced them enthusiastically. Teachers were trained in one or more of these approaches and administrators were trained to evaluate teachers' performance in the pre-

scribed pedagogy. Schools and classrooms abounded with fresh signs of these reforms in the districts we visited. The older reforms were still alive and kicking as the new framework was making its way toward classrooms.

The rapid succession of policy innovations is nothing new in U.S. education, but this seemed a particularly striking case. On the one hand, the new mathematics framework exhorted teachers and students to become serious and independent thinkers and to understand big mathematical ideas. This seemed to imply that students should be encouraged to come up with divergent approaches to solving problems. It also meant that students often would be puzzled, even stuck. On the other hand, state, federal, and local policymakers had just spent more than a decade pressing teachers to implement a direct and managed approach to instruction that focused on accuracy and convergent thinking. These approaches to instruction trafficked in utterly conventional and familiar conceptions of knowledge. Students and teachers were rewarded for attention to standard mathematical rules and routine procedures; getting the right answer was the order of the day. Successful teachers avoided puzzling students or letting them be stuck. Successful students solved routine problems with speed and efficiency.

We thought that there was a real conflict here: Yesterday's didactic policies and programs seemed sharply at odds with today's press for mathematical understanding. All of our teachers had been urged to adopt the earlier approaches and it looked very much as though they had, in one way or another. How could they adopt the new policies if they held onto the old ones? These earlier approaches had an additional advantage: The pedagogy and views of knowledge for which they stood were quite congruent with traditional values and experiences of teachers, administrators, and parents.

We were surprised to find that none of this seemed to be at issue for the teachers whom we observed. They appeared not to notice any contradictions between the two sets of policies, and seemed entirely untroubled by their juxtaposition. Teachers spoke and acted as though the two were entirely compatible. Indeed, when questioned they freely expanded on how well the new policy fit with the earlier initiatives. Some were positively eloquent on the subject. When they commented on the combinations of policies, it was to remark on the number, not the nature, of the demands to which they were being asked to respond.

How did this work out in practice? As a descriptive matter, the new policy that stressed understanding, explanation, cooperative work, and extended discourse with students was apprehended through the lens of older policies that stressed learning skills and facts, didactic teaching, individual work, and highly focused recitation. Many of the teachers whom we observed did change their practice in response to the new policy, but the frame for those changes was the pedagogy that had been pressed by the older policies. New wine was poured, but only into old bottles.

The result was a curious blend of direct instruction and teaching for understanding. Initially it seemed odd, but upon reflection it made sense. An observer has the leisure and independence to savor contradictions between today's and yesterday's policies, among other curiosities of classrooms. However teachers are busy and engaged actors, who must make their classrooms work: To do so, they must balance all manner of contrary tendencies (Fenstermacher & Amarel, 1983; Berlak & Berlak, 1981; Lampert, 1985). If teachers could not make past and present cohere, they would be unable to do anything at all in their classes.

It costs state legislators and bureaucrats relatively little to fashion a new instructional policy that calls for novel sorts of classroom work. These officials can easily ignore the pedagogical past, for they do not work in classrooms, and they bear little direct responsibility for what is done in localities—even if it is done partly at their insistence. However teachers and students cannot ignore the pedagogical past, because it is their past. If instructional changes are to be made, they must make them. And changing one's teaching is not like changing one's socks. Teachers construct their practices gradually, out of their experience as students, their pro-

fessional education, and their previous encounters with policies designed to change their practice. Teaching is less a set of garments that can be changed at will than a way of knowing, of seeing, and of being. And unlike many practices, teaching must be jointly constructed by both teacher and students. So if teachers are to significantly alter their pedagogy, they must come to terms not only with the practices that they have constructed over decades, but also with their students' practices of learning, and the expectations of teachers entailed therein.

We were surprised that the teachers with whom we spoke seemed so little distressed about the many different signals that they had been sent by government. All of them saw themselves as independent professionals, and thought that they had considerable autonomy from state government, but they seemed genuinely respectful of the many different policies and programs that had been aimed at their classrooms. Only one teacher was frankly cynical.

The Influence of Practice on Policy

Our discussion so far has focused on the impact of state policy on teaching practice, but another theme in these cases is that practice has a profound influence on policy. One might summarize our argument by saying that teachers do not simply assimilate new texts and curriculum guides, altering their practice in response to externally envisioned principles. Rather, they apprehend and enact new instructional policies in light of inherited knowledge, belief, and practice. Moreover, teachers' interpretations are diverse. Some of the teachers whom we observed missed the new framework's message; they thought they already did everything that the new policy exhorted them to do. Others changed their teaching, but in doing so reframed the new policy in terms of various preexisting ideas and practices. Hence the teachers whom we observed produced some remarkable mixtures of old and new mathematics instruction. For instance, in some of the cases previously presented, teachers tended to mechanize elements of the policy that they adopted, turning mathematical themes such as estimation or problem solving into discrete topics or activities. Yet even their mechanizations varied according to past practice and current preferences. Others ignored such topics in favor of more basic matters. Some teachers gave little attention to the framework's call for greater use of "manipulatives," using them only occasionally. Others absolutely doted on the new concrete materials, turning them into a central instructional activity. Some teachers seemed to think that children would learn complex ideas simply by moving little plastic cubes around on pieces of paper.

It is worth recalling, in this connection, that many observers believe state and federal policies tend to homogenize instruction. After all, they argue, all teachers receive the same governmental policy messages (Wise, 1979). But if our account is roughly correct, this new instructional policy probably has increased variability in mathematics teaching in California. One reason is universal: Any teacher, in any system of schooling, interprets and enacts new instructional policies in light of his or her own experience, beliefs, and knowledge. Hence to argue that government policy is the only operating force is to portray teachers as utterly passive agents without agency. That is unsupported by our investigations. Even the most obedient and traditional teachers whom we observed not only saw and enacted higher level policies in their own way, but were aware and proud of their independent contributions.

This general tendency is greatly amplified by two specific features in the present case. For one thing, we already noted that the policy is a bundle of disparate ideas, many vaguely stated, and is thus especially vulnerable to many different constructions. The new mathematics framework has been weakly specified so far, and it therefore offers teachers abundant opportunities to see the new policy as they like, and make of it what they will. Furthermore, the policy subsists in a system of education that is distinctive for the weak and inconsistent instructional guidance that it offers teachers (Cohen, 1990; Schwille et al., 1983). Even if the new policy were utterly coherent and highly specified, the governmental and extra-governmental systems through which it passes on the way to teachers are so fragmented that many differ-

ent sorts of advice are mixed together and few priorities are set among the many messages launched toward teachers. The organization and governance of U.S. schooling creates myriad opportunities for teachers to pick and choose among sources of advice, and it offers them a distinctively great and diverse menu of advice.

Hence the U.S. schooling system amplifies the impact of practice on policies in several different ways. Perhaps other new instructional policies have increased rather than reduced variability in practice; but the result seems particularly ironic in this case, because the new policy sought not only dramatic changes in instruction, but greater coherence as well. Alignment, after all, is a watchword in California's efforts to improve teaching and learning. Although state officials do not want to homogenize instruction, they do hope to press teaching and learning toward greater consistency as they press it toward greater intelligence. Yet whatever its effects on intelligence in teaching and learning, this policy seems likely to make instruction more variable rather than more consistent.

In considering the impact of practice on policy, one might wonder if the various changes were just a perversion of the framework's goals, or rather a step in the direction of more sophisticated mathematics teaching. Could both be true? The queries are reasonable. In response we would ask: Could traditional math teachers avoid such fragmentary and confused work as they tried to change their teaching? Can teachers simply abandon old knowledge and practices in one moment and produce brand-new approaches to instruction in the next? It seems unlikely. Most teachers probably could only unseat old knowledge and instructional practices gradually in the process of constructing new ones.

In this connection it is worth recalling the dilemma that we mentioned a few pages earlier. We accept that mathematics teaching and learning generally are poor, and, like the reformers in California, we believe that radical change is needed. Yet, if learning is to improve, the teachers who teach mathematics badly today are the ones who must do a different and better job tomorrow. New policies can only reach the practice that they seek to correct by way of the teachers who have fashioned the practices that want correction. Teachers are at once the agents who cause the instructional problems that state and federal policies of this sort seek to correct and the agents for their correction.

So if our early snapshots portray a muddle, it seems unavoidable. Teachers have picked up pieces of the reform, and interpreted and enacted them in light of what they know and can do, as well as what they believe they must do. There are deep problems with what most have done, but also some elements of promise. The policy appears to be in its early stages, but no one knows how much further implementation will go. At least one of our teachers feels that she is finished: She has responded to the policy and adapted her practices in light of new directions and goals. Several others, who were surprised to find themselves learning from the policy, seemed to think that their practice might change even more. Others are unsure.

California has launched a reform of great ambition and noble purpose, but its demands are imposing. So far teachers have been asked to make great changes, but they have not been offered many of the resources that might support such change. Few teachers have had opportunities to see examples of the sort of teaching that the state thinks it wants. Few have been offered opportunities to learn a new mathematics. Few have been given opportunities to cultivate a new sort of teaching practice, and even fewer have been offered assistance in the endeavor. In a word, teachers have yet to be engaged in the sort of conversation—with themselves, with other teachers, with university mathematicians, and many others—that would support their efforts to learn a new mathematics, and a new mathematical pedagogy.

We are left with questions. Will teachers carry these changes further on their own? Will state and other educational agencies help teachers to capitalize on the changes, by deploying resources to support and advance them? Can state or local agencies, or universities, or other institutions help teachers to learn from such early efforts at change, and to push beyond them? If they can, will they? And if such help is not forthcoming, how far can teachers be expected to get on their own?

The answers remain in the future, part of a story that remains to be written. Indeed, in the erratic politics of U.S. education, it remains to be seen whether more of a story will be told at all. Perhaps the California reforms will collapse, or state policymakers will devise another script entirely: It all remains to be seen. State education officials have made some encouraging changes, and have displayed political courage and intellectual ambition that are rare in American public education. Much remains to be done, though, if teachers are to have the wherewithal to make something of these hopeful initiatives. Real pedagogical change would thrive on the creation of a rich conversation, in and around classrooms, about mathematics, teaching, and learning. Yet creating such a conversation would be costly, time-consuming, and difficult for many teachers and policymakers. Teaching would thrive on such a rich and slow enterprise. But policymaking seems to thrive on schemes for swift change in instruction, swiftly adopted and often just as swiftly forgotten.

Notes

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Author

DAVID K. Cohen, Interim Dean for the College of Education and John A. Hannah Distinguished Professor of Education and Social Policy at Michigan State University, College of Education, 501 Erickson Hall, East Lansing, MI 48824-1034, *Specialization:* policy research.

DEBORAH LOEWENBERG BALL is an Assistant Professor at Michigan State University, 116K Erickson Hall, East Lansing, MI 48823. *Specialization:* research on teacher education and teaching, and mathematics education.