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ABSTRACT

Content-driven systemic school reform emerged in recent years as a major policy alternative in the United States. Major reforms include the establishment of state curriculum frameworks, the development of student assessments, and the adoption of new textbooks tied to the curriculum frameworks. Because successful implementation of content-driven reform depends on the linkages between state-level policymaking and school-level policy implementation, the central question is how state policies have changed the ways in which classroom activities are organized and managed by teachers. This paper presents findings of a study that investigated the multilevel linkages of state education reform to instructional practices in mathematics. Four stages of empirical analyses were conducted with a combination of the following survey data: the 1992 Council of Chief State School Officers (CCSSO) state survey, the 1990 and 1992 National Assessment of Educational Progress Trial State Assessment (NAEP TSA) eighth-grade school survey, and the 1990-91 Schools and Staffing Survey (SASS) public school administrator survey. The data suggest that current state curriculum frameworks need to be aligned with instructional materials as well as with student assessments. The findings also imply that policy implementation is a dynamic organizational process of interactions between policy characteristics and the institutional setting in a multilayered school system. Thus, systemic school reform needs to formulate desired connections between organizational levels in normative, structural, and functional arenas. The findings further suggest that the impacts of state curriculum and testing mandates on pedagogical practices between 1990 and 1992 were not substantial. Lastly, a comparison of educational outcomes in California and Minnesota showed that California's content-driven reforms have led to more successful instructional change than have Minnesota's outcome-based reforms. Four figures and 10 tables are included. Appendices contain descriptions of school- and state-level predictors. (Contains 35 references.) (LMI)

Multilevel Linkages of State Education Reform to Instructional Practices

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States and districts have used a variety of measures to influence the content of the school curriculum. The most commonly enacted policies rely on the regulation of inputs such as courses or credits and minutes of instruction. When *A Nation at Risk* called on states to establish or raise credit requirements in the core academic subjects of schooling, credit requirements provided little substantive guidance as to the content or purpose of the courses students should take. While evidence shows that graduation requirements did improve students' exposure to academic subjects over the decade, those courses nevertheless failed to provide students with a high level of academic content and critical thinking skills (Massell and Fuhrman, 1994). Thus, states became more active in defining the desired content of curriculum during the 1980s, and a recent action of many states has been to develop or revise state curriculum frameworks and guides in response to nationwide professional standard-setting activities (See NCTM, 1989).

While proponents of differing views on curriculum and testing concur on the need for all students to aim for common learning goals and to achieve at high levels, disagreements exist over how these objectives can be promoted, how standards should be defined and their attainment measured, and how learning goals should be pursued and evaluated (Porter, 1994). On the one hand, those who argue for standards-based school reform view coherent instructional guidance at the state level as a necessary starting point for local consistency in planning and management (Smith and O'Day, 1990; Wheelock, 1995). On the other hand, others argue that, given the nature of knowledge and understanding and the diversity of human experiences and paths to learning, it is not plausible to decide from places far from schools and classrooms what, how, and when ideas ought to be taught and student understanding tested (Clune, 1993; Darling-Hammond, 1993).

In order to weigh those arguments for and against centrally prescribed and hierarchically implemented content and performance standards, we need to know how content-driven state education policies have really worked to bring about desired instructional change. Case studies of curriculum reform find that new ideas hardly take root in the practice of teachers.[1] A remarkable melange of traditional and progressive approach to instruction has been noted: many

[1] Despite some progress in students' course-taking, new approaches to teaching math and science as advocated by NCTM have made little headway in teaching practices (Education Week, 1994. "Report Links Increased Enrollments in Math, Science to Reforms of 80's," Oct. 12, 11).

teachers tend to construct hybrids of particular progressive practices grafted onto what they ordinarily did in classrooms (Cuban, 1984a; Cohen, 1990). The gap between recommended practices and observed practices may be explained from two competing perspectives (Boyd, 1987). One explanation locates failure in the bureaucracy, arguing that top-down governance stifles practitioner creativity, deskills teachers, and hamstrings local initiative. In fact, a Carnegie Foundation for the Advancement of Teaching (1988) survey found that teachers do not believe the majority of the reforms have done much positively for the classroom and are troubled by the potential for negative impacts. A competing, bottom-up explanation identifies obstacles at the school level, where educators interpret reforms through the lens of current practice, exploit vague language to weaken change efforts, and modify policy goals to conform with local priorities. New ideas are not reinforced in the immediate work environment of students and teachers, and there is a natural tendency to substitute schoolwork for the goal of intentional learning (Elmore, 1995).

However, both perspectives fail to simultaneously take into account the characteristics of adopted policies and the context of school systems in which policies are implemented. Thus, more systematic analyses are needed to show how both top-down and bottom-up views can be combined to understand the relation between policymaking and implementation in a multi-layered school system and identify institutional and organizational conditions for successful instructional change. In light of these concerns, I focus on policy instruments with the potential to more directly influence the substance of schooling, that is, curriculum frameworks or guidelines, student assessments and textbook selection, and examine their linkages both at the state level and school level (See Figure 1). Even well-coordinated systemic reform policies are not expected to automatically lead to desired instructional change.[2] Thus, this study attempts to identify institutional and organizational factors that mediate the linkage between content-driven policies and instructional practices. Further, the effects of content-driven policies on instructional practices in mathematics will be investigated through multi-level analyses of the 1990 and 1992 National Assessment of Educational Progress Trial State Assessment (NAEP TSA) data.[3]

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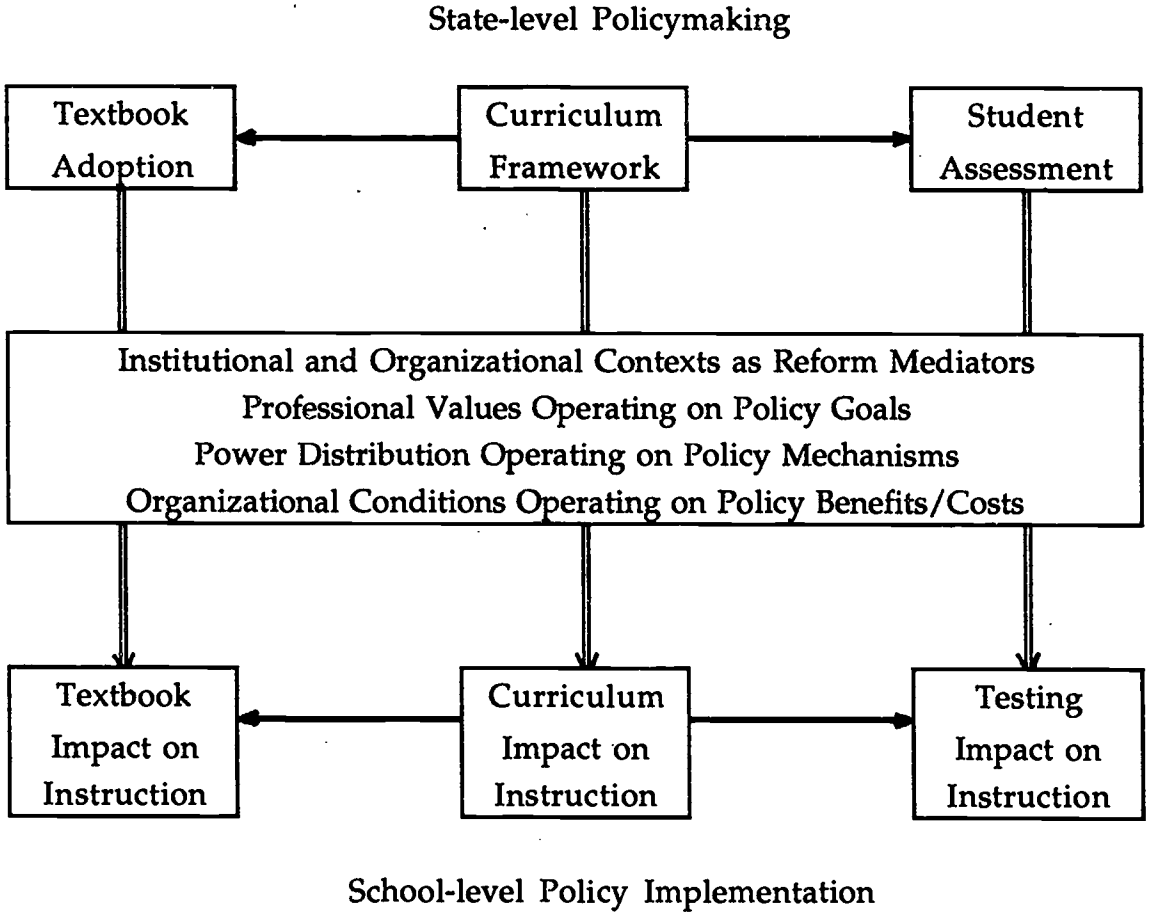
[2] Each of nested hierarchical layers in a school sytem has a conditional and contributory relation to events and outcomes occurring at adjacent ones (Barr and Dreeben, 1983)

[3] 37 states participated in the 1990 TSA in eighth-grade math; and, for the 1992 TSA , which also includes fourth-grade reading and math as well as eighth-grade math for the second time, 41 states participated. Hawaii, The District of Columbia and territories which participated in the trial

Finally, in order to supplement such quantitative analyses, I will look into curriculum reform and instructional change in two states, California and Minnesota: these states differ in the conditions and outcomes of school reform as well as policymaking and implementation activities.[4]

Figure 1. Linkages between Content-driven Policies and Instructional Practices



assessment programs are excluded in this study due to their lack of comparability. In both 1990 and 1992 NAEP TSA, information was also collected from teachers about some instructional materials and approaches currently used in math class.

[4] The choice of the two states are based primarily on the observations of previous case studies (see Marsh and Odden, 1993; Cuban, 1984b; Mazzoni, 1993; Massell and Fuhrman, 1994).

Linkages between Content-driven Policies and Instructional Practices

For many years states and districts have periodically devised curriculum frameworks or guidelines that were not equipped with challenging content and effective pedagogy. Recently, state curriculum frameworks are undergoing a process of change and redefinition as states continue to define their policy-making and leadership role in education. With the publication of the National Council of Teachers of Mathematics (NCTM) *Curriculum and Evaluation Standards for School Mathematics* (1989), states experienced a new round of activity with state curriculum frameworks, and worked on ways to represent the Standards in state frameworks. In fact, a Council of Chief State School Officers (CCSSO) survey found that math frameworks had been revised or developed, or were planned in response to the NCTM standards in 41 states (Blank and Dalkilic, 1992). In addition to problems with content and pedagogy, state curriculum frameworks also shortchanged instructional practices because the frameworks were not strongly linked with other policies, particularly tests and textbooks.

Before the release of *A Nation at Risk*, many states already had testing programs in place as a result of the minimum competency testing movement of the late 1970s.[5] Basic skills tests were designed to insure a minimum level of learning. However, research indicates that such tests promote a minimum approach to level of instruction where emphasis is placed on the rote memorization of discrete facts, on absolute "right" answers, and not on critical thinking skills. In addition, the framework or guides that many states used did not connect to the actual content of what students learned in the classroom. In light of such criticisms, many states in the late 1980s and early 1990s began modifying their testing programs and controlling textbook adoption. While policymakers began to reevaluate the nature of tests and textbooks and their effects on classroom instruction, many of the new curriculum frameworks and guides appear to play a formal role in the design and development of student assessment programs and textbooks. The 1992 CCSSO survey found that state

[5] By 1990 23 states were using tests to evaluate students for promotion to the next grade or graduation from high school, 38 used tests to monitor students, school and/or district performance, and 20 used them to identify students in need of remediation. However, a field research found that there are no substantial added benefits for students, particularly in whether teachers know more about students than before (Wilson and Corbett, 1990). Moreover, teachers perceive statewide tests as placing more negative demands on their already overcrowded schedule.

math assessment is linked to the state framework or learning outcomes in 37 states. At the same time, the survey found that the math framework is used in 24 states to select or recommend math textbooks.

Table 1. School-level Linkage between State Curriculum and Testing

State Curriculum Impact on Instruction		State Testing Impact on Instruction: No Impact		Some Impact		Great Impact		Total
	No Impact	143	(59.1)	76	(31.8)	22	(9.1)	241
	Some Impact	262	(41.7)	1123	(25.0)	241	(33.3)	1626
	Great Impact	57	(43.8)	468	(18.7)	966	(37.5)	1491
	Total	462		1667		1229		3558

Statistic	DF	Value	Prob
Likelihood Ratio Chi-Square	4	1204.992	0.000
Phi Coefficient		0.622	

Note: Row percent for the frequency of school principals belonging to each cell appears in parenthesis. The phi coefficient conveys the strength of relationship between two categorical variables.

Table 2. School-level Linkage between State Curriculum and New Textbooks

State Curriculum Impact on Instruction		New Textbook Impact on Instruction: No Impact		Some Impact		Great Impact		Total
	No Impact	71	(59.1)	131	(31.8)	39	(9.1)	241
	Some Impact	240	(14.7)	1060	(65.1)	328	(20.2)	1628
	Great Impact	135	(9.1)	890	(59.4)	472	(31.5)	1497
	Total	446		2081		839		3366

Statistic	DF	Value	Prob
Likelihood Ratio Chi-Square	4	115.294	0.000
Phi Coefficient		0.193	

Note: Row percent for the frequency of school principals belonging to each cell appears in parenthesis. The phi coefficient conveys the strength of relationship between two categorical variables.

While many states have curriculum frameworks, and most of states link student assessments to content standards, fewer states connect the curriculum frameworks to textbook content. This raises the question as to whether policy linkages at the state level, that is, linkages between content-driven policies are sustained at the school level and how these linkages function to change instruction. To answer those questions, I utilize the 1992 NAEP TSA school survey data in which principals were asked to rate the extent of instructional change that can be attributed to specific policies. The impact of the state curriculum mandate on instruction, as reported by principals, is related to the impact of the state testing mandates and textbook adoption on instruction. Instructional change that can be attributed to the state testing mandate is strongly related to instructional change attributed to the state curriculum mandate (See Table 1). On the other hand, instructional change due to the adoption of new textbooks is weakly related to instructional change due to state curriculum mandates. This indicates that there is also a tenuous link between the state curriculum and textbook adoption at the school level (See Table 2).

Given these horizontal linkages among content-driven policies, the central question is whether and how between-state differences in content-driven reform policies lead to variation in instructional change at the school level. In order to examine such vertical linkages between state policies and school practices, state-level policymaking variables extracted from the 1992 CCSSO state survey data are related to school-level policy implementation variables extracted from the 1992 NAEP TSA principal survey data. In terms of the impact of the state curriculum mandate on instruction, there is little difference between states that were revising their curriculum frameworks according to the NCTM standards as of 1991 and the states that were not (See Table 3). Consequently, the NCTM standards were not put in place at the school level until 1992. The modest linkage between the state testing mandate and instructional change indicates that statewide testing can be a more powerful policy instrument when it is directly linked to the state curriculum (See Table 4). On the other hand, state textbook adoption policy is hardly related to the impact of new textbooks on instruction, which indicates a tenuous linkage between curricular policies and instructional practices in loosely coupled school systems (See Table 5).

Table 3. Linkage between State Curriculum Policy and Instructional Change

		State Curriculum Impact on Instruction						
		No Impact		Some Impact		Great Impact		Total
State Math Curriculum Policy	No/ Developing[a]	76	(20.5)	206	(55.5)	89	(24.0)	371
	Yes[b]	130	(6.6)	958	(48.7)	880	(44.7)	1968
	Revising[c]	35	(3.4)	464	(45.1)	531	(51.5)	1030
	Total	241		1628		1500		3369

Statistic	DF	Value	Prob
Likelihood Ratio Chi-Square	4	146.629	0.000
Phi Coefficient		0.222	

[a] State has no math curriculum framework or it is developing one as of 1991.

[b] State has math curriculum guide or framework.

[a] Math curriculum guide or framework is being revised with NCTM standards.

Table 4. Linkage between State Testing Policy and Instructional Change

		State Testing Impact on Instruction						
		No Impact		Some Impact		Great Impact		Total
State Math Testing Policy	No/ Developing[a]	142	(33.6)	222	(52.7)	58	(13.7)	422
	Indirect[b]	144	(18.6)	441	(57.0)	188	(24.3)	773
	Direct[c]	175	(8.1)	1008	(46.4)	989	(45.5)	2172
	Total	461		1671		1235		3367

Statistic	DF	Value	Prob
Likelihood Ratio Chi-Square	4	331.187	0.000
Phi Coefficient		0.318	

[a] State has no statewide math assessment.

[b] Math curriculum guide or framework defines goals or objectives for instruction, and assessment is developed or selected to reflect goals and objectives.

[c] Math curriculum guide or framework defines content topics and skills to be assessed. Use of learning outcomes for the development of assessment is also regarded as direct linkage.

Table 5. Linkage between State Textbook Policy and Instructional Change

		New Textbook Impact on Instruction						
		No Impact		Some Impact		Great Impact		Total
State Math Textbook Policy	No Linkage[a]	217	(14.8)	879	(59.8)	373	(25.4)	1469
	Recommend[b]	101	(12.9)	509	(65.0)	174	(22.1)	784
	Select[c]	129	(11.5)	698	(62.2)	294	(26.3)	1121
	Total	447		2086		841		3374

Statistic	DF	Value	Prob
Likelihood Ratio Chi-Square	4	11.084	0.026
Phi Coefficient		0.057	

[a] There is no relation between math curriculum framework and textbook adoption.

[b] Math curriculum guide or framework is used to recommend a list of textbook with selection being made by local districts.

[c] Math curriculum guide or framework is used to select state approved textbooks.

Institutional and Organizational Reform Mediators for Instructional Change

Previous studies of state education reform focused on technical and practical aspects of policy implementation, but paid little attention to structural and normative factors that mediate policy effects. Case studies of curriculum reform find that local adoption is most successful when the curriculum frameworks are viewed as user-friendly while maintaining their capacity for instructional change, fit with local priorities, and allow for flexible adaptation. However, any systematic pattern of policy implementation in content-driven reform that is generalizable across the states was not examined. This study proposes a contingency model of policy implementation and tests the hypothesis that educators' responses to top-down policies, which is the key to successful implementation, depend on institutional and organizational contexts. On the other hand, previous studies of state education reform did not take into account multiple forces that compete to affect instructional practices at different layers of the school system. Thus, this study examines other external forces of instructional change that may supplement or conflict with state policies.

In the context of state education reform, policy implementation is depicted as a function of fit between major policy characteristics and corresponding contextual factors (See Figure 1). First, the compatibility of policy goals with professional values is critical to successful policy implementation. As the priority of state education policies has shifted from the equality of educational opportunity to academic excellence during the last decade, content-driven reform policies are more likely to be implemented in states where educators place greater emphasis on academic excellence. Secondly, the distribution of power in the state education system that fits with policy mechanisms affects the favorableness of policy implementation. As state education departments have actively engaged in reform activities such as designing tests, establishing curriculum guides, and assisting and monitoring districts, the content-driven reform policies are more likely to have an impact on instruction in the states where educators view curricular influence as more centralized at the top of the state education system. Finally, the implementation of content-driven policies is constrained by prevailing school conditions which determine policy costs and benefits for implementors. Since instructional change depends on the availability of organizational resources and capacities, content-driven reform policies are more likely to be implemented when they meet the needs of individual schools and raise the average policy benefit-cost ratio.

Building on the hypothesized relationships between top-down policies and bottom-up changes, this study attempts not only to examine several external sources of instructional change including state policies, but also to explain between-school and interstate variation in policy impact. This research involves a hierarchical data structure in the 1992 NAEP TSA 8th grade school data where schools are nested within states, and requires an application of the hierarchical linear model (see Bryk and Raudenbush, 1992). The following items from the principal questionnaire are used to identify external forces which are likely to cause instructional changes:[6]

[1] Has the state curriculum mandate changed instruction? (State Curriculum)
[2] Has the state testing mandate changed instruction? (State Testing)
[3] Have district/school tests changed instruction? (District/School Test)

[6] Principals' responses over the 3-scale items are gathered across 3100 schools in 40 states. Values are assigned to three response categories as follows: 1 for 'not at all,' 2 for 'to some extent,' and 3 for 'to a great extent.'

[4] Has public reporting changed instruction? (Public Reporting)
[5] Has adoption of new textbooks been an impetus for change? (New Textbooks)
[6] Have national reports changed instruction? (National Reports)

The above-listed outcome variables are treated as an interval scale and related to institutional and organizational factors at the school and state levels (See Appendix for a description of those predictors). At the school-level, each principal's reported instructional change due to external forces is a function of school-level context variables including social and racial composition of schools as follows:

School instructional change = f (Socioeconomic Status, Percent White, Professional Training, Teacher Autonomy, Ability Grouping, Communal Climate, Program Activities, Absence of Problems, Urban Location, Rural Location)

The school-level predictors are grand-mean centered so that state-level outcome variables represent the state average instructional change adjusted for between-state differences in those school characteristics.[7] At this point, I extract some information on state-level institutional characteristics from the 1990-91 Schools and Staffing Survey (SASS) data to explain interstate variation in those outcome variables. Specifically, I pose the following between-state model where the state mean instructional change due to external forces depends on professional values and the distribution of power in the state education system.[8]

State mean instructional change = f (State Influence, Local Influence, Principal Influence[9], Academic Excellence, Basic Skills, Personal Growth, Work Habits)

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[7] Grand-mean centering yields an intercept that can be interpreted as an adjusted mean for each group, in this case, state. In this way, any state-level effects of organizational variables on instructional change are adjusted away.

[8] Principals' view of educational goals and curricular influence are considered as state-level constructs for both theoretical and practical reasons. Theoretically, this study assumes an institutional unity of the state education system in terms of structural and normative aspects. Practically, the absence of school-level linkage between the SASS data and NAEP TSA data does not allow for the use of those variables as school-level predictors.

[9] Principals' curricular influence is so highly correlated with teachers' curricular influence at the state level that only one of the two variables is left in the equation to avoid the problem of collinearity.

When variance in outcome variables is partitioned into the school and state levels, between-school variance is much larger than between-state variance, partly due to measurement error in principals' responses (See the variance table in Table 6). Greater school-level variance relative to state-level variance means that the outcome variables vary more among schools within each state than among the 40 states. It is not surprising to see that state-based outcome variables (state curriculum and testing mandates) show larger state-level variance relative to school-level variance than district or school-based outcome variables (new textbooks and district/school tests) do. Percent of between-state variance for public reporting and national reports is smaller than that of state-based variables but greater than that of school-based variables. Thus, from such a pattern of partitioned variance, we may infer the locus of control for policymaking and the mechanism in which those policies or programs are implemented.

As seen in Table 6, the state average instructional change as perceived by principals, varies across the types and levels of policies or programs. The greatest impact is reported for the state curriculum mandate, followed by state testing, new textbooks, district/school tests, public reporting, and national reports, in this order. Thus, whether good or bad, state curriculum and testing policies seem to be most instrumental in bringing about instructional change. While national reports turned out to be least effective as an external leverage of instructional change, it needs to be recognized that the survey item "national reports" does not differentiate between professional and governmental efforts. For example, the NCTM's report on curriculum and evaluation standards in math originated from a consensus among teachers that changes were needed in math teaching, and the positive NCTM experience encouraged a set of federally funded efforts quite different in their genesis and approach. Most of the more recent national reports on standards were developed governmentally, rather than from professional efforts.[10]

[10] Thus, the relatively smaller impact of national reports on instructional practices does not necessarily indicate that national standards developed by professional associations are weak policy tools for instructional change than state-legislated guidelines.

Table 6. HLM Final Model of Instructional Change due to External Forces

	Estimated Effects					
	State Curriculum	State Testing	District/ School Test	Public Reporting	New Textbooks	National Reports
State-level Effects						
Mean Outcome	2.275***	2.140***	2.030***	2.017***	2.112***	1.909***
State Influence	0.234***	0.165**	0.060	-0.007	0.023	-0.062*
Local Influence	0.002	0.032	0.027	0.015	0.014	-0.034
Principal Influence	0.086*	0.047	0.062^	0.008	0.040	-0.026
Academic Excellence	0.065	0.139*	0.049	0.135**	0.051	0.018
Basic Skills	0.003	-0.084	-0.072^	-0.035	0.018	0.005
Personal Growth	0.066	-0.063	-0.026	0.015	0.062	0.027
Work Habits	0.018	0.027	0.041	0.001	0.072^	-0.024
School-level Effects						
Socioeconomic Status	-0.079***	-0.085**	-0.151***	-0.119***	-0.032	0.134***
Percent White	-0.003	-0.048	-0.139*	-0.174**	-0.017	-0.022
Professional Training	-0.015	0.003	0.024*	0.030**	0.006	0.028**
Teacher Autonomy	-0.010	-0.013	-0.023^	-0.036**	0.015	-0.006
Ability Grouping	-0.001	0.036	0.083**	0.050*	0.031	0.025
Communal Climate	0.004	0.006	0.043**	0.002	0.037**	0.079***
Program Activities	0.073***	0.063***	0.071***	0.066***	0.060***	0.145***
Absence of Problems	0.007	-0.009	-0.012	-0.023^	-0.016	-0.042**
Urban Location	-0.091**	-0.004	0.018	-0.125**	-0.018	0.051
Rural Location	0.058*	0.099**	0.030	0.070*	0.022	-0.093**
	Variance Table					
	Percent Variance Partitioned by Fully Unconditional Model					
School-level	86.6	75.2	94.1	89.5	95.2	93.5
State-level	13.4	14.8	5.9	10.5	4.8	6.5
	Percent Variance Explained by Final Model					
School-level	2.4	20.4	5.2	5.0	1.5	10.8
State-level	62.2	54.5	23.8	45.7	NA	10.0

Note: ^ P<.10, * P<.05, ** P<.01, *** P<.001.
All predictors are standardized (Mean=0; Standard Deviation=1). 'NA' in variance table indicates that variance explained by the final model is too small to be properly calculated.

At the state level, perceived instructional change due to external forces is related to the distribution of power in the state education system as a whole. The greater influence the state education department has on school curriculum, the greater impact the state curriculum and testing mandates have on classroom instruction. It indicates that the state curriculum and testing mandates rely on centralized power distribution. At the same time, the relatively small but positive effect of principal's influence on state curriculum implementation also indicates the possibility that state curriculum reform is actively incorporated by leading principals. By contrast, national reports turn out to have more appeal for instructional change in states where the state education department has a relatively small curricular influence. It indicates that the increasing role of the state education department in content-driven systemic reform may counteract national policy initiatives. Additionally, principals' view of educational goals also mediates or filters their perceived impact of state policies on instruction. The requirement that schools administer state tests and publicly report the test results has the greatest impact in states where principals place greater emphasis on academic excellence. It indicates that the normative basis of test-based school accountability policies is academic excellence.

At the school level, policy implementation is a function of organizational conditions. While the percent of variance explained by the final model at the school level is quite small, there are some remarkable patterns of statistically significant effects across outcomes variables. The negative effects of school SES for curriculum- and testing-related policies indicate that their policy benefits are greater for low SES schools than for high SES schools. It also suggests that low SES schools are more likely to need curricular guidance and technical support as provided by state curriculum and testing policies. In contrast, the opposite effect of school SES for national reports indicate that high SES schools are more able to benefit from the national reports by translating them into instructional practices. On the other hand, the school improvement variable (Program Activities) is a significant predictor across the board. Its positive effects for all outcome variables indicate that the policy implementation costs are lower for schools that are more accepting of and active in implementing schoolwide changes.

The effects of school racial composition (Percent White) are negatively significant for district/school tests and public reporting. It indicates that high minority schools tend to be more responsive to test-driven accountability policies. At the same time, schools that have well-trained but less autonomous

faculty tend to report that district/school tests and public reporting have a greater impact on instruction. Schools which adopt an ability grouping policy also tend to be more responsive to test-driven accountability policies. These patterns indicate that the attached implementation costs of test-driven accountability policies are lower for tightly coupled, professionalized, and academically differentiating schools. On the other hand, schools that have better academic ethos and social relations (Communal Climate) tend to benefit more from selected sources such as local evaluation, textbook adoption, and national reports. Other things being equal, urban schools are less likely to respond to state curriculum mandates and public reporting requirements than suburban schools, which in turn are less responsive than rural schools. This may be attributed to the fact that urban schools have a more heterogeneous student population and diverse student needs which make standardized top-down policy directives less relevant.

Impact of Content-driven Reform on Instructional Practices

One of the basic assumptions underlying current educational research is that children actively construct knowledge for themselves through interaction with their culture and environment (Resnick, 1987).[11] However, the current mathematics curriculum often fails to capitalize on the rich informal mathematics knowledge and understanding that children bring to instruction, thereby divorcing school mathematics from such familiar activities (Romberg and Carpenter, 1986). To help anchor mathematics concepts for students, it is important to present mathematics in the "everyday" context and encourage students to work together in groups to solve problems. Although recent state curriculum in math seems to move in the direction that the NCTM standards propose, it remains to be seen whether substantial changes occur at the classroom level in response to the newly adopted standards and tests. What students learn depends on the ways in which they engage in classroom activities. Their dispositions toward mathematics are also shaped by such experiences.

[11] The constructivist learning theory that many content-standards are also based on creates a paradox for them: if students construct knowledge in highly contextualized ways based on their diverse, culturally grounded experiences, teaching must be highly adaptive, and curriculum must allow for many starting points and pathways (Darling-Hammond, 1994).

Consequently, the goal of developing students' mathematical power requires careful attention to pedagogy as well as to curriculum (NCTM, 1991).

Previous studies found inappropriate pedagogy in U.S. math teaching. In the 1986 NAEP math study, neither upper nor lower quartile 13-year-olds reported much use of constructivist, student-centered approaches such as small group work, projects, and lab activities (Dossey et al., 1988). International comparison studies also showed that U.S. math instruction was dominated by "tell and show" approaches that encouraged "rote learning" and was more textbook oriented than that in other countries (McKnight et al., 1987). Recent case studies have shown that, in contrast to the computational, direct instruction approach[12] used in the United States, Japanese math teachers used "hands-on," Socratic teaching methods (Stigler and Stevenson, 1991). Further, the observed pattern of cognitive level and pacing in American math classrooms showed that the teacher as manager of classroom activity carries out functions that are not inherently pedagogical or intellectually complex; the teacher often arranges for intellectual activity by delegating its enactment to children alone or in groups (Stodolsky, 1988). By contrast, Asian classrooms are featured by whole-class teaching through which lessons are presented to all students in a well-organized fashion (Stevenson and Lee, 1995).

No single teaching method or learning experience can develop a range of mathematical activities as efficiently as a broad-based approach that includes individual and group work, some projects and activities accompanied by teacher explanation, and practical work with concrete materials in concert with practice of important techniques. More importantly, all children need to learn complex problem-solving skills which are not only desirable but have become necessary for responsible citizenship in a modern society (O'Day and Smith, 1993).[13] Student-centered instructional practices with a strong emphasis on higher-order thinking skills can be considered positive signs of implementation of many recent recommendations for the reform of school mathematics (NCTM, 1991).[14]

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[12] The ingredients of the direct instruction model are teacher pacing at a low cognitive level, and teacher specification of tasks, sequences, and structure. Teaching behaviors that are discouraged include use of higher-order, divergent, open-ended questions.

[13] The most important single message of recent psychological theory and research is that complex thinking processes are involved in even the most elementary mental activities (Resnick, 1987).

[14] For example, for instructional practices in 5-8 mathematics, the NCTM standards call for increased attention to the following: 1) actively involving students in exploring, conjecturing, analyzing, and applying math in both a mathematical and a real-world context, 2) using

In order to know the nature and direction of instructional changes due to external forces, we need to look more closely into teachers' instructional practices. I selected the information on classroom pedagogy from the NAEP TSA teacher questionnaire that was administered to eighth-grade math teachers. Teachers were selected if they taught the student the subject in which the student was assessed.[15] The following items from the 1990 and 1992 NAEP TSA teacher survey data are used to "measure" progressive instruction in math class:

[1] How much emphasis on reasoning/analysis? (T031511/T044608)[16]
[2] How much emphasis on communicating math ideas? (T031512/T044609)
[3] How often do students work in small groups? (T031403/T044503)
[4] How often do students write reports/do projects? (T031410/T044508)
[5] How often do students measurement and geometry? (T031404/T044512)
[6] How often do students use calculators? (T031405/T044505)
[7] How often do students use computers? (T031406/T044506)
[8] How often do students write about problem-solving? (NA/T044507)
[9] How often do students discuss math with other students? (NA/T044509)
[10] How often do students work real-life math problems? (NA/T044510)
[11] How often do students make up math problems? (NA/T044511)
[12] How often assess students with written responses? (NA/T044703)
[13] How often assess students with projects/portfolios? (NA/T044704)

Rasch measurement model is used to create a construct of "progressive instruction" from the survey data and to equate the two tests of different years and subjects (See Wright and Stone, 1979). In order to examining instructional change over time, teachers are tested two times, in 1990 when the NCTM standards were introduced, and in 1992 when the standards were expected to be much in place. There is also some corresponding change in the content of survey items on instructional practices: the 1992 test adds more NCTM-based practice items (e.g., problem-solving and application skills, and performance-based

appropriate technology for computation and exploration, 3) using concrete materials, 4) being a facilitator of learning, 5) assessing learning as an integral part of instruction.

[15] The purpose of drawing these samples was not to estimate the attributes of the teacher population, but to estimate the number of students whose teachers had various attributes and to correlate student characteristics and performance with the characteristics of their teachers (Johnson et al., 1994. The NAEP 1992 Technical Report, p. 86).

[16] Original variable names in the dataset appear in parenthesis: the items in the 1990 data precede their counterparts in the 1992 data. 'NA' indicates the absence of matching items in the dataset.

assessments) to the 1990 test. However, the two tests conduct parallel assessments to provide linkage between 1990 and 1992: there are six common items covering instructional emphasis on reasoning and communication, use of technology, small-group work on projects. The items can be categorized into three major categories: purpose, practice, and assessment. BIGSTEPS, Rasch measurement program, is used to construct objective measures from the responses of 20319 teachers to 13 items.

Table 7. Rasch Measurement of Progressive Instruction: Teacher and Item Statistics

Subject	Logit Measure	Standard Error	Reliability
Teachers			
M	-.53	.49	.69
SD	.89	.11	
Items			
M	.00[a]	.01	1.00
SD	1.11	.00	

[a] The item difficulty is centered at zero logit.

The items common to both test forms are used to equate the scale constructed from the 1992 data with the measures reported for 1990. As shown in Table 7, the results of the co-calibration show a perfect item separation (reliability=1). In other words, items are very well separated in terms of the difficulty of practicing those instructional practices. On the other hand, teacher separation reliability is modest (reliabilty=.69), which confirms the observation that American teachers are very similar in terms of their classroom practices (Goodlad, 1984). Since NAEP data are inappropriate for teacher-level analyses, teachers' measures are matched to their students and aggregated to create school-level constructs. Thus, my strategy is to conduct a multi-level analysis of the

relations between policies and practices by capturing the relevant properties of school-level and state-level variables. First, using a sample of schools from each state (2554 schools in 33 states), a school-level linear regression model is estimated for each school in each state to predict the association of school characteristics with progressive instructional practices as follows (See Appendix for a description of predictors):

Progressive instruction = f (Socioeconomic Status, Percent White, Professional Training, Teacher Autonomy, Ability Grouping, Communal Climate, Program Activities, Absence of Problems, Urban Location, Rural Location)

Simultaneously, a state-level regression model is estimated for 33 common states to predict the association of perceived policy impact with actual instructional change. Instructional change reported by principals is related to instructional practices reported by teachers at the state level. In order to control for past instructional practices at the state level, the 1990 state average measure of progressive instruction is included as a predictor. Some may question whether instructional change over two years can be meaningfully ascribed to policy effects. If the perceived impact of the state curriculum and testing policies on instructional change had already occurred before 1990 and much of instructional practices were in place by the end of last decade, the 1990 progressive instruction would be far from the "pure" pre-treatment measure that is a prerequisite for an appropriate adjustment variable in an analysis of policy effects. Nevertheless, the validity of controlling for the 1990 status of instructional practices relies on the assumption that principals' perception of instructional change is based more on the recent impact of state policies. Specifically, I pose the following between-state model:

State mean progressive instruction = f (90 Math Instruction, State Curriculum, State Testing, District/School Tests, Public Reporting, New Textbooks, National Reports)

Although most states mandated some form of statewide curriculum and standardized testing for instructional changes, the effects of implementing such content-driven policies on the daily practices of school staff and students have not been well documented by empirical research. In addition, it remains to be

examined what organizational conditions promote or hamper progressive instruction at the school level. On the one hand, under externally prescribed standards and increased pressures for outcome-based accountability, teachers may teach to the statewide test, increase their dependence on textbooks linked to the standards, and discourage student-centered classroom activities. On the other hand, teachers may actively incorporate content-driven policies into bottom-up instructional change rather than simply adapt themselves to the state curriculum and testing mandates. As seen in Table 8, whatever is true, there is much greater variation among schools than among states, which indicate very little systemic convergence among schools within each state.

At the school level, school socioeconomic status, professional training, teacher autonomy, and program activities are all positively related to progressive instruction whereas percent of white students in school and ability grouping policy are negatively associated with progressive instruction. Other things being equal, urban schools tend to be more active in progressive instruction than suburban schools. At the state level, the impact of content-driven state education policies on math instruction turned out to be statistically insignificant. It suggests that the effects of state curriculum and testing policies on instruction are not yet systemic as far as authentic pedagogical practices are concerned and that their longer-term effects remain to be evaluated.[17] On the other hand, the impact of new textbooks on progressive instruction is positive, whereas the impact of district/school tests on progressive instruction is marginally negative. These patterns suggest that there was a positive change in the content of new textbooks and that the content of current district and school tests needs to be revised.[18] Additionally, the insignificant effect of public reporting on instructional practices indicates that current test-based accountability policy is not effective for instructional change.

[17] If teachers rather than principals had been surveyed about instructional change, the relationship would be much stronger.

[18] Carnegie's survey (1988) also found that teachers occasionally strayed from sound instructional practices in order to get students to pass tests. Under high-stakes conditions, there was a decreased reliance on their professional judgment in instructional matters, increased time demands, more staff reassignments, greater pressure, more paperwork, and heightened concern about liability.

Table 8. HLM Final Model of Progressive Instruction in Math Class

Estimated Effects				
	Coefficients	Standard Error	t-Statistic	p-Value
State-level Effects				
Mean Outcome	-.547	.029	-18.766	.000
90 Math Instruction	.153	.034	4.535	.000
New Textbooks	.081	.037	2.157	.041
State Curriculum	-.043	.034	-1.291	.209
State Testing	.089	.058	1.538	.136
District/School Tests	-.094	.047	-1.994	.057
Public Reporting	.014	.046	.292	.773
National Reports	-.009	.031	-.288	.776
School-level Effects				
Socioeconomic Status	.080	.018	4.593	.000
Percent White	-.064	.018	-3.606	.002
Professional Training	.191	.012	15.823	.000
Teacher Autonomy	.044	.014	3.242	.004
Ability Grouping	-.127	.029	-4.352	.000
Communal Climate	.015	.015	.990	.332
Program Activities	.036	.016	2.339	.028
Absence of Problems	.027	.016	1.729	.096
Urban Location	.091	.091	2.301	.030
Rural Location	.026	.026	.757	.456

The Variance Table				
	Estimated Variance	Degrees of Freedom	Chi-Square	p-Value
state-level	.019	25	125.44	.000
school-level	.417			
	Percent variance partitioned by base model		Percent variance explained by final model	
state-level	7.5		51.3	
school-level	92.5		13.3	

Because of the limitation of the data, some findings need to be interpreted cautiously. First of all, this study focuses on an aggregate instructional change at the state level, thus ignoring enormous variation that may exist among schools and teachers in their policy implementation. More innovative schools that actively incorporated the state curriculum and testing mandates into their instructional practices may have experienced a greater instructional change. Secondly, this study examines instructional change between 1990 and 1992 and does not take into account the possibility that some systemwide instructional change occurred before 1990. It takes a long time before education policies relevant to the enacted curriculum are comprehensive and consistent and have the authority and power required to bring about intended change in educational practices. New instructional practices may already have been in place in some states in which content-driven policies was established and widely implemented long before the early 1990s (See the case of California in the next section). Thirdly, this study assumes a certain level of fit between principals' perception of general instructional change and teachers' actual practices in math class, and does not consider the possibility that teachers have virtually complete control over their pedagogical practices or that principals have inaccurate information on instructional change. If there were any systematic gap between principals' and teachers' responses across the 40 states, the relation between perceived impact of state policies and actual instructional practices might be spurious. Finally, this study relates instructional change only to pedagogical practices, and does not take into account change in other key instructional aspects.[19] Despite the statistically insignificant impact of state curriculum and testing mandates on progressive instruction, they may have advanced or upgraded the content of instruction by encouraging teachers to cover more challenging content in their math classes.

Cases: California and Minnesota

The linkages of state education reform to instructional practices are more evident when we compare two states that differ in their approach to school reform, especially the timing of curriculum reform, amount of technical support

[19] There are three major school delivery standards: enacted curriculum, effective pedagogy, and instructionally embedded resources (Porter, 1993). In this respect, the information from the NAEP is limited even though it can be used to construct a general indicator of instructional practices.

provided, and the content of curriculum frameworks. California was one of the first states to recognize traditional weakness in curriculum guides. Under Bill Honig's leadership the frameworks became not only the foundation for textbook adoption, but also the intellectual core of the state's student assessment program, staff development, accountability, and teacher certification (Massell and Fuhrman, 1994). Whereas the older frameworks offered lengthy lists of the facts and behavioral objectives and inputs such as the number of hours in class, the new frameworks are written in a more literary, narrative style to convey the information in a compelling and understandable way for teachers as well as for district curriculum supervisors (See Table 9). In contrast, Minnesota, with a strong tradition of local control and weak state intervention, pursued so-called "outcome-based education reform." At least initially, the outcome-based reform in Minnesota was distinct from the content-driven reform produced in California. The philosophy of reform in Minnesota was to posit goals in broad, nondisciplinary-based terms without specific reference to pedagogical details. However, Minnesota found that the outcomes alone were not specific enough to guide the development of assessments, and it started to develop new curriculum frameworks.[20]

Table 9. Math Curriculum Frameworks of California and Minnesota

	California (1992)	Minnesota (1991)
Basic Features	• Document Title: Mathematics Framework for California Public Schools, K-12 • State Mandate • Year: 1992 • No. of pages: 220	• Document Title: Model Learner Outcomes for Mathematics Education • State Mandate • Year: 1991 • No. of pages: 153

[20] Since the outcome documents could not be used as the basis for a comprehensive approach to outcome-based education or as the starting point for creating assessment tools, the Minnesota Department of Education appointed a "Learner Outcome Framework Team" to develop a "second-generation" of curriculum frameworks (Odden, 1994, p. 158).

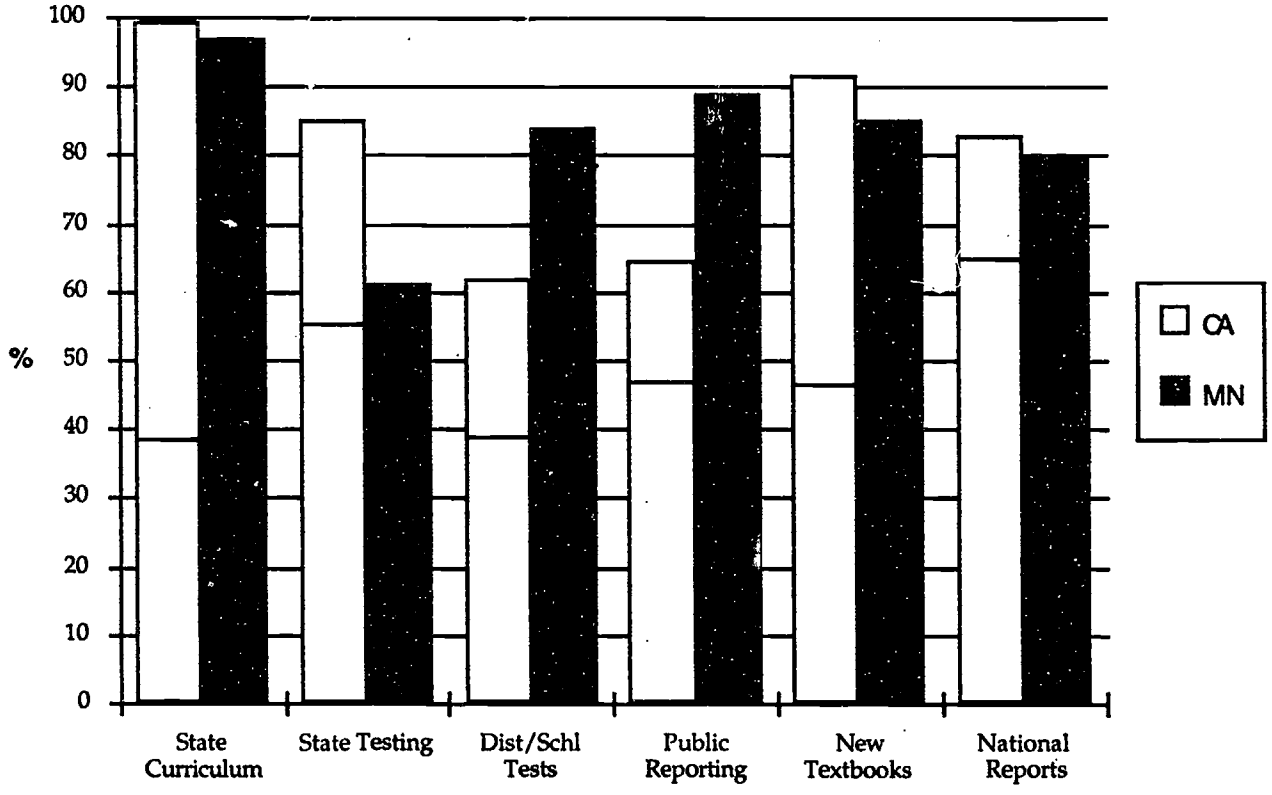
Major Purposes for the Framework (according to state supervisors)	• Provide a vision for math educators. • Provide criteria for instructional material	• Provide assistance to school districts developing K-12 curriculum. •Help educators take a global view in building a curriculum and show how to teach to the national standards
Sources of Funding	$30,000 annual State budge	State funds and Northern States Power grant
Development Activities (described in state frameworks)	• Expert Panel •Model Documents • Teachers involved in writing • Successive drafts reviewed • Pilot Study • Wide dissemination	• Expert Panel •Model Documents
Content Statement	Defines 13-14 content standards by grade block. E.g., Standard 9: Algebra: in grades 5-8, the math curriculum should include explorations of algebra concepts and processes ...	Defines 10 model learner outcomes for grades K-12 with an outline of math content and skills under each outcome. E.g., Learner Outcome: The student will apply number relationships and functions.
Methods of Presenting Content	• Examples/models •Activities/tasks • Diagrams/graphics	•Activities/tasks • Diagrams/graphics
Teaching Practices Addressed by Frameworks	• Constructive/active lessons • Technological applications • Assessment strategies • Interdisciplinary connections • Discourse and dialogue • Flexible use of time and space • Using tools and technology • Experiments • Writing and graphing	• Constructive/active lessons • Technological applications • Assessment strategies • Interdisciplinary connections • Using tools and technology • Experiments • Writing and graphing

Equity Addressed in Frameworks	•Vision/rationale • Vignettes • Instructional Strategies • Materials Selection • Assessment approaches • Community involvement • Policies and recommendations	•Vision/rationale • Staff development • Policies and recommendations
Linkages of Content with State Policies	• Professional Development (Existing) • State Assessment (Recommended) • Materials and texts (Existing)	• Professional Development (Recommended) • State Assessment (Recommended) • Technology Integration (Recommended)

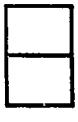
Note: The table is based on and reconstructed from the findings of the most recent study of state curriculum frameworks in mathematics (See Blank, 1995).

Such differences between the two states in their policymaking for content-driven reform are expected to bring about corresponding differences in instructional change at the school-level. As seen in Figure 2, the overall impact of state curriculum and testing mandates on instructional practices as perceived by principals is greater in California than in Minnesota. Further, the differences in reported impact are notable in "great" impact category, which indicates more drastic instructional change across the system in California. These differences can be understood in terms of quite different reform paths taken by the two states. Additionally, the greater impact of new textbooks in California is also attributed to the state's policy of linking challenging curriculum to textbook adoption. On the other hand, the overall impact of district/school tests and public reporting on instructional change is greater in Minnesota than in California although the latter exceeds the former in "great" impact category. It indicates that Minnesota' outcome-based reforms may have led to relatively widespread but incremental instructional change at the school level.

Figure 2. External Sources of Instructional Change



Note: Vertical number represents the percent of principals in each state who report great or some impact of horizontal categories on instruction in math classes (see an illustrated bar below)



—› percent of principals who repor: "great" impact (upper area)

—› percent of principals who report "some" impact (lower area)

The two states' different policy initiatives also indicate different barriers at the stage of policy implementation. While California used curriculum frameworks as vehicles for setting the criteria for the adoption of new textbooks, the state faced the difficulty of getting publishers to readily respond within the time-frame. In addition, the shorter cycle of textbook adoption poses a burden on local districts and teachers. In contrast, Minnesota's outcome-based plan anticipates that schools, not school districts, will develop their own curriculum. But many local schools and districts lacked the ability to create or assemble their own curriculum. Instead, they relied on publishers and other external agents for

both curricular materials and staff development activities to support the teaching of those curricular. In addition to such differences in the technical aspects of policy implementation, the two states also differ in the structural and normative conditions of their education systems that were identified as critical by the statistical analysis. As seen in Table 10, principals in California do not only place greater emphasis on academic excellence as most important educational goals but also view the state department of education as most influential actor in curricular decisionmaking than do principals in Minnesota. Those two factors together explain part of the differences in their reported impact of state policies.

Table 10. Profile of California and Minnesota: Professional Values and Power Distribution

		CA	MN
Professional Values[a]	Basic Skills	77.2	77.1
	Academic Excellence	51.4	42.4
	Work Habits	50.7	56.6
	Personal Growth	65.1	78.9
Power Distribution[b]	State Influence	75.3	49.6
	Local Influence	50.5	45.2
	Principal Influence	58.0	55.3
	Teacher Influence	59.4	65.8

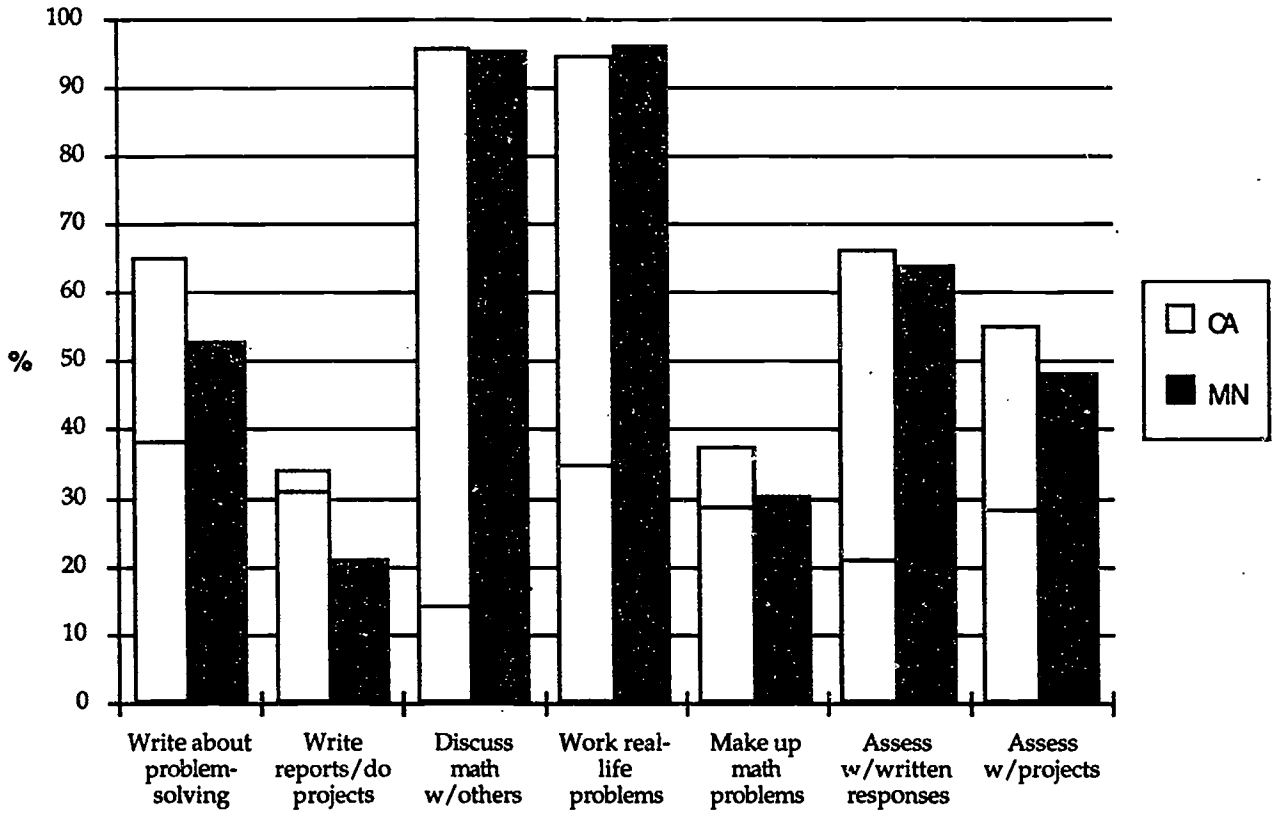
[a] Numbers represent percentage of public school principals in each state who choose each of these goals as one of the three that they considered most important.

[b] Numbers represent percentage of public school principals in each state who report each of these groups as having a great deal of influence; if they responded with a 5 or 6 on a 6-point scale of influence, with 6 representing a great deal of influence.

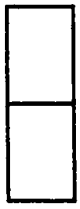
Despite different policymaking and implementation activities in the two states, it remains to be seen what teachers are really doing in their classrooms. As seen in Figure 3, 8th graders in California tend to have more opportunity to learn higher-order skills in math than 8th graders in Minnesota. More specifically, teachers in California tend to more frequently have their students write about problem-solving, write reports, do projects and make up math

problems, and do more performance-oriented assessments. Those differences in pedagogical practices can be explained partly by differences in the role of the state curriculum frameworks for instructional guidance. In addressing pedagogical practices in the curriculum frameworks, California used contextualized examples and vignettes illustrating teaching practices in relation to specific content and classroom situations, whereas Minnesota used lists and outlines arraying teaching practices with little or no detail about how practice is to be used within classrooms or by teachers (See Table 9). At the same time, some of the differences in progressive instruction can be explained by differences in their school-level organizational conditions. As seen in Figure 4, California has relatively more favorable school organizational conditions for bottom-up change than Minnesota: California excels Minnesota in the school-level capacity-building and improvement such as professional training, communal climate, and program activities.

Figure 3. Progressive Instructional Practices in Math



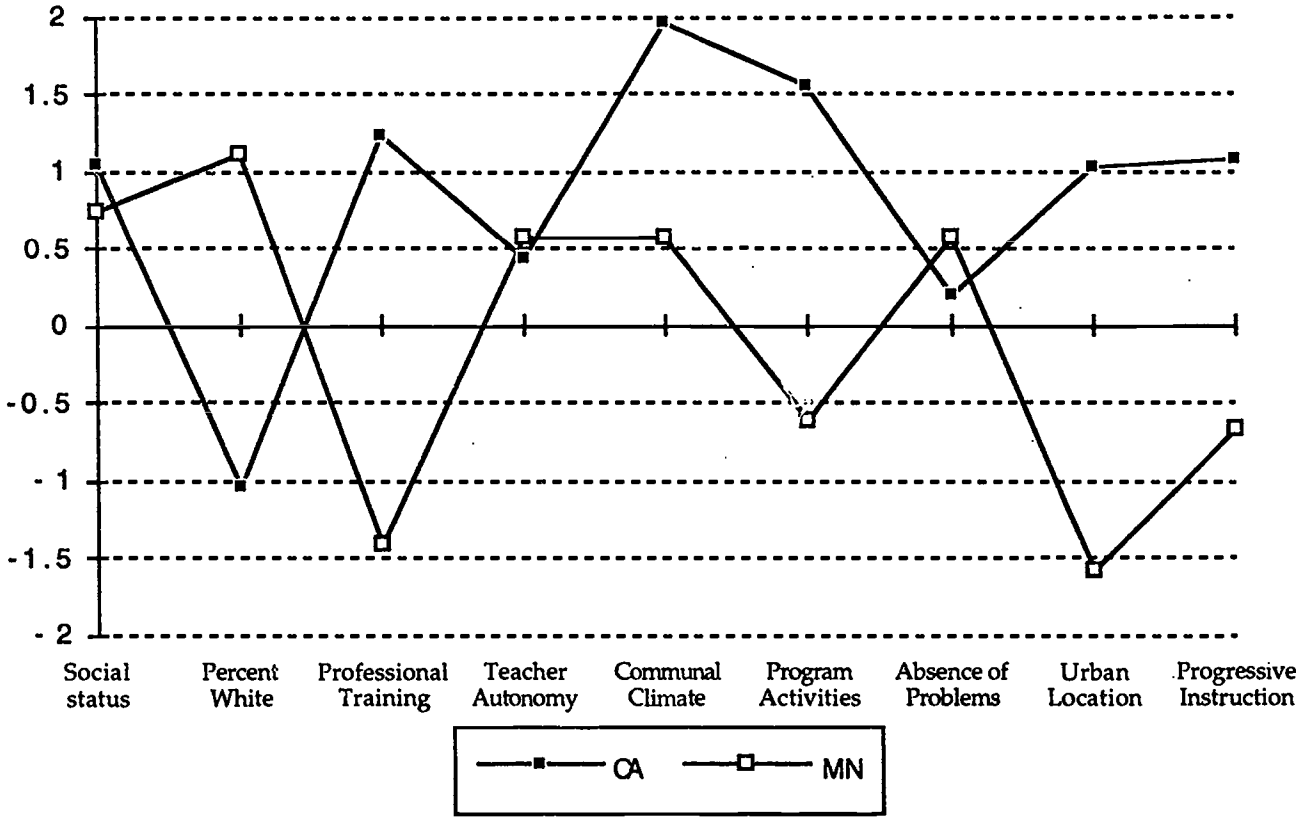
Note: Vertical number represents the percent of students in each state whose teachers report regular classroom practices for horizontal categories in their math classes (see an illustrated bar below)



—› percent of students whose teachers do the practices "daily or weekly" ("weekly or monthly" for assessment items)

—› percent of students whose teachers do the practices "once or twice a month" ("once or twice a year" for non-assessment items)

Figure 4. Profiles of Organizational Conditions and Progressive Instruction



Note: All of the above scales are standardized to have a mean of 0 and standard deviation of 1 across 40 states in the 1992 NAEP TSA.

Summary and Conclusion

Content-driven systemic school reform emerged in the past several years as a major policy alternative in the United States. This is in part due to the limits of current education policy to bring about instructional change at the classroom level. To address these deficiencies in educational policy, state policymakers proposed reform policies intended to significantly upgrade the quality of the curriculum and instruction delivered to all children. Major reforms include the establishment of state curriculum frameworks, the development of student assessments and the adoption of new textbooks tied to the curriculum frameworks. Although many states have recently incorporated the NCTM standards into their curriculum frameworks and tests, their classroom-level effects remain to be seen. Because successful implementation of content-driven reform depends on the linkages between state-level policymaking and school-level policy implementation, the central question is how state policies have changed the ways in which classroom activities are organized and managed by teachers.

In light of these concerns, this study attempted to investigate the multilevel linkages of state education reform to instructional practices in mathematics. Four stages of empirical analyses were conducted with a combination of the following survey data: the 1992 CCSSO state survey, the 1990 and 1992 NAEP TSA 8th grade school survey, and the 1990-91 SASS public school administrator survey. First, this study examined the linkages among three major policy instruments of content-driven reform, that is, curriculum frameworks, student assessments, and textbooks. At the state level, the development of state tests is more closely linked to state curriculum frameworks than is the adoption of textbooks. Likewise, at the school level, the perceived impact of state curriculum mandate on instruction is more strongly associated with the perceived impact of state testing mandate on instruction than with the perceived impact of new textbooks on instruction. Further, this study found that the advancement of state curriculum and testing policies is related to modest instructional change. These patterns suggest that current state curriculum frameworks need to be aligned with instructional materials as well as with student assessments. Consequently, the integration of state policy instruments would act to reinforce instructional change at the school level.

Second, this study proposed a contingency model of educational policy implementation and tested the hypothesis that the effectiveness of state education reform depends on a fit between key characteristics of the policies (policy goals, policy mechanisms and policy benefit/cost) and the institutional/organizational context of the state education system (professional values, the distribution of power and school conditions). At the state level, principals' greater emphasis on academic excellence turned out to promote the implementation of state testing and public reporting policies. At the same time, the state department of education's greater curricular influence turned out to increase the impact of state curriculum and testing policies on instruction but decrease the impact of national reports. At the school level, the socioeconomic status of schools is negatively related to school responses to top-down policies for instructional change, whereas the level of school improvement activities is positively related to instructional change due to external forces. These findings imply that policy implementation is a dynamic organizational process of interactions between policy characteristics and the institutional setting in a multi-layered school system. Thus, systemic school reform needs to formulate desired connections between organizational levels in normative, structural and functional arenas.

Third, this study explored the effects of content-driven state policies on instructional practices through a multilevel analysis. Principals' reports about instructional change due to state policies were used as policy implementation variables, which in turn are related to an instructional practice variable created from teachers' responses. Insofar as instructional change is intended to ensure every student a reasonable opportunity to learn what is recommended by the NCTM standards, the findings suggest that the impacts of state curriculum and testing mandates on pedagogical practices between 1990 and 1992 are not substantial. This study also found the negative effect of district/school tests and the positive effect of new textbooks on instructional practices during the same period, whereas the effects of public reporting and national reports turned out to be insignificant. Although these patterns indicate that instructional change is more likely to be induced at the district or school levels than at the national or state levels, the period of this study in examining instructional change may not be long enough to evaluate the effects of recent state content-driven policies since the NCTM standards for curriculum and for teaching were released in 1989 and still have been adopted by states and introduced into schools gradually and

naturally. Thus, a subsequent follow-up study is needed to explore longer-term policy effects.

Fourth, this study compared two states, California and Minnesota, to enrich the overall findings. Differences between the two states were detected in state-level curricular decision-making and school-level instructional change. Minnesota took a short-term incremental approach to curriculum reform and produced outcome-based documents that recommend a broader range of content at all grade levels without specific reference to pedagogical details. In contrast, California took a long-term comprehensive approach to curriculum reform and established a state framework that includes demanding content standards, instructional examples, activities, materials, and technology, and assessment exercises for implementing content in schools. While results-based initiatives assume that state or national standards will lead local educators to create curricular that will best meet their particular needs, content-driven reforms assume that once materials are selected and matching assessments created, local educators will learn and implement the new curriculum. While the two states' ultimate policy success remains to be seen, the findings of this case study show that, given their different institutional and organizational contexts, California's content-driven reforms have led to more successful instructional change than did Minnesota's outcome-based reforms.

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Appendix

School-level Predictors

The following variables are constructed from the 1992 NAEP TSA 8th grade teacher and administrator survey data.

1. The Social and Racial Composition of Schools

Socioeconomic Status: A factor composite of students' reports about parents' education and availability of reading materials at home, and school median income (school-level average of factor made from PARED, HOMEEN2, MEDINC). Student-level factor loadings are as follows: PARED, .77; HOMEEN2, .68; MEDINC, .63. Factor has an eigenvalue of 1.46 and explains 49 percent of the combined variance.

Percent White: Percentage of 8th grade white students in school (made from students' race variable, RACE).

2. Teaching and Learning Environment of the School

Absence of Problems: A factor composite of principals' reports about absence of schoolwide problems in the following aspects : student tardiness, absenteeism, cutting classes, physical conflicts, drug/alcohol, teacher absenteeism, racial and cultural conflicts, and student health (factor made from C032401-8). School-level factor loadings are as follows: C032401, .71; C032402, .71; C032403, .70; C032404, .74; C032405, .49; C032406, .62; C032407, .61; C032408, .64. Factor has an eigenvalue of 3.47 and explains 43 percent of the combined variance.

Communal Climate: A factor composite of teachers' reports about positiveness of school climate in the following aspects: teachers' relations with administration, teacher morale, student attitudes to academics, teacher attitudes to academics, parent support for academics, regard for school property, and relations between teachers and students (school-level average of factor made from C032501-7). Student-level factor loadings are as follows: C032501, .63; C032502, .71; C032503, .74; C032504, .69; C032505, .69; C032506, .67; C032507, .75. Factor has an eigenvalue of 3.40 and explains 49 percent of the combined variance.

3. School Capacities for Bottom-up Change

Program Activities: A factor composite of principals' reports about school improvement activities in the following aspects: involving parents as aides in class, encouraging parents to visit classes, having minimum requirement for homework, performance-based competition system for teacher, mentoring program for teachers, before/after school remediation program, summer-school program, and dropout prevention program (factor made from C032207-8, C032301, C032303-6, C032314). School-level factor loadings are as follows: C032207, .49; C032408, .56; C032301, .33; C032303, .28; C032304, .45; C032305, .57; C032306, ,54; C032314, .50. Factor has an eigenvalue of 1.81 and explains 23 percent of the combined variance.

Professional Training: A factor composite of teachers' reports about their training in the following areas: estimation, math problem-solving, use of manipulatives, use of calculators, students' math thinking (school-level average of factor made from T041701-2, T041708, T041704-5). Student-level factor loadings are as follows: T041701, .70; T041702, .67; T041708, .69; T041704, .68; T041705, .65. Factor has an eigenvalue of 2.31 and explains 46 percent of the combined variance.

4. Instructional Context of the School

Teacher Autonomy: A factor composite of teachers' reports about their instructional autonomy in the following aspects: selecting instruction materials, deciding course content/topics, and deciding sequence of content. (school-level average of factor made from T041101-3). Student-level factor loadings are as follows: T041101, .84; T041102, .89; T041103, .82. Factor has an eigenvalue of 2.16 and explains 72 percent of the combined variance.

Ability Grouping: A dummy variable for ability grouping of 8th-graders in math (C034402).

5. Location of the School

Urban Location: A dummy variable for the location of schools in urban area (SURBAN). The base category for comparison is suburban location.

Rural Location: A dummy variable for the location of schools in rural area (SURBAN). The base category for comparison is suburban location.

State-level Predictors

The following variables are constructed from 1990-91 SASS[1] public school administrator survey data.

1. Power Distribution in Curricular Decisions
State Influence: State average of principals' report about the influence of state department of education on curricular decisions (SEACURRC).
Local Influence: State average of principals' report about the influence of local board of education on curricular decisions (BRDCURRC).
Principal Influence: State average of principals' report about their own influence on curricular decisions (PRNCURRC).

2. Professional Values in Educational Goals
Basic Skills: logit of percent teachers giving high priorities to basic literacy skills (reading, math, writing, speaking) as educational goals (ASC115-7).
Academic Excellence: logit of percent teachers giving high priorities to academic excellence as educational goals (ASC115-7).
Personal Growth: logit of percent teachers giving high priorities to personal growth (self-esteem, self-knowledge, and so on) as educational goals (ASC115-7).
Work Habits: logit of percent teachers giving high priorities to work habits and self-discipline as educational goals (ASC115-7).

3. 1990 Progressive Instruction
90 Math Instruction: State average of a Rasch measure of progressive instructional practices constructed from the following eight items in the 1990 NAEP TSA data: emphasis on reasoning/analysis (T031511), emphasis on communicating math ideas (T031512), using measurement/geometry (T031404), calculators (T031405) and computers (T031406), having students work in small groups (T031403), and having students write reports/do projects (T031410).

[1] The 1990-1991 Schools and Staffing Survey (SASS) offers researchers the opportunity to study teachers' and principals' goals and beliefs on a much larger scale than that afforded by the smaller scale or case study research typically available to them.

4. Instructional Change Due to External Forces

State Curriculum: Logit of percent principals who report instructional change due to state curriculum mandate (C032603).

State Testing: Logit of percent principals who report instructional change due to state testing mandate (C032604).

District/School Tests: Logit of percent principals who report instructional change due to district/school tests (C032602).

Public Reporting: Logit of percent principals who report instructional change due to public reporting (C032606).

New Textbooks: Logit of percent principals who report instructional change due to adoption of new textbooks (C032601).

National Reports: Logit of percent principals who report instructional change due to national reports (C032607).